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Effect of Ballistic Resistance and Plyometric Training on Reaction Time of University Sprinters

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Abstract

The present study was conducted to determine the effects of Ballistic resistance and plyometric training on reaction time of noviced sprinters. The subjects for the study were selected on the basis of random group design. Thirty (N=30) male students were selected as subject for the present study from LNIPE, NERC, Guwahati, Assam INDIA. All the subjects ranged between the chronological age of 18-25 years. The selected subjects were further divided into three groups. Ballistic resistance training was assigned to group "A" Plyometric training as group "B" while group "C" acts as control. "Electronic Reaction timer" was used to measure reaction time. The subjects were subjected to the six week of ballistic resistance and plyometric training programme. To find out the effects of ballistic resistance and plyometric training programme on reaction time, analysis of covariance (Ancova) was employed. The results showed that the no significance F-ratio (=2.75) for the pre test means and significant F-ratio (=17.88) for post test means, since tab.0.05 (2, 27) (=3.35) required for significance F ratio cal. t (=3.58) which is significant as it is greater than the F value tab.05 (2, 26) (=3.37) required for significance that .05 level. For further analysis "Post-Hoc Test" (LSD Test) was applied. The obtained value showed significance difference for the plyometric training groups when compared with control group F-ratio (.63). The treatment of plyometric training for six weeks shown significant improvement in reaction time, since cal. t (=.63)> CD .05 (=.62).

Keywords: Ballistic resistance training, Plyometric training, Reaction time, Noviced Sprinters

INTRODUCTION

Ballistic resistance training trains both the fast-twitch and the slow-twitch fiber. Second, ballistic weight training provides a highly effective cardiovascular workout. A ballistic lift requires full muscle utilization and this elevates the heart rate. By measuring the time of the lift and the rest period between lifts the lifter will keep his heart rate at an elevated rate throughout the workout. Ballistic lifting is an effective method for not only increasing muscle strength and speed, but also an effective means to gain flexibility and burn fat. A ballistic lift is an athletic move that activates and trains the fast-twitch muscle fiber. In traditional weight training the lifter must hold the weight, slow down the weight, stop the weight and then return the weight to the starting position. These weight lifting motions require mostly slow-twitch fibers and take more than one second to complete. Ballistic training trains muscle to be fast. Fast-twitch muscle fiber is only activated for a short time before shutting off.

Plyometric is a method of developing explosive power. Previously referred to as jumping training the term plyometric first appeared in literature in the late 1960.Yuri verkhoshensky the father of plyometric. He was the discovered for Russian high jumpers and triple jumpers. Plyometric as a term was formed from the Greek root pleythein which loosely translated means to increase. An American coach by the name of Fred Wilt is believed to be the first person to use the term Plyometrics to describe the jump training that some U.S coaches were implementing with their athletes. The plyometric term as coined by an American track and field coach in 1975 Fred Wilt his thinking was to combine two Latin words 'Pilo' and 'Metric' which again loosely translated means more to measure. Plyometrics is basically working what is termed a "Stretch Reflex" of the muscle. Plyometrics can help maximize power in the stretching and shortening cycle of a muscle or muscle group. They also promote reflex power through a broader range of motion than most endurance athlete's use.

METHODOLOGY

SUBJECTS

The subjects for the present study were selected on the basis of random group design. Twenty (N=30) male students were selected as subject for the present study from LNIPE, NERC, Guwahati (Assam), INDIA. All the subjects ranged between the chronological age of 17-22 years. The selected subjects were further divided into three groups. Ballistic resistance training was then assigned to group "A" Plyometric training as group "B**"** while group "C" acts as control**.** "Electronic Reaction timer" was used to measure reaction time. The subjects were subjected to the six week of ballistic and plyometric training programme. To find out the effects of ballistic training and plyometric training programme on reaction time of Lovely professional university, analysis of covariance was employed**.**

REACTION TIME TEST

OBJECTIVE

The reaction time test measures the speed of reaction in response to a visual stimulus**.**

REQUIRED RESOURCES

Electronic reaction timer supplied by Anand agencies, Poona

TEST PROCEDURE

There were four (4) wooden boards marked as A, B, C and D. Out of these A and B were the staring boards and C and D were the stepping boards. The subject stood on the starting board putting one foot on each board. After the onset of an auditory stimulus he lifts one of the legs which was pre-determined and which was told to the subjects from A and B and step on C and D.

The tester pressed one of the short keys giving the required stimulus (Auditory). Short key was a double key which give the stimulus and also started the chronoscope. As soon as the subject received a stimulus he lift his foot from the right or left A or B boards and steps on the left or right C or D boards, which stopped the chronoscope and the reaction time to the auditory stimulus was recorded. The time out the best of the three trials was recorded in seconds.

SIX WEEK OF BALLISTIC RESISTANCE TRAINING PROGRAMME

TRAINING WEEK	NAME OF EXERCISE	SETS	REPETITIONS	RECOVERY TIME	TRAINING INTENSITY
1-2 WEEK	Overhead shot throw Rebound Overhead Shot Throw Underarm Throw/Toss Rebound Throw/Toss	8	15 each set	40sec	LOW
3-4 WEEK	Overhead shot throw Rebound Overhead Shot Throw Underarm Throw/Toss Rebound Throw/Toss	8	15 each set	30sec	MEDIUM
5-6 WEEK	Overhead shot throw Rebound Overhead Shot Throw Underarm Throw/Toss Rebound Throw/Toss	8	15 each set	40sec	HIGH

SIX WEEK OF PLYOMETRIC TRAINING PROGRAMME

TRAINING WEEK	NAME OF EXERCISE	SETS	REPETITIONS	RECOVERY TIME	
1-2 WEEK	Box to box jump Hurdle jump Medicine ball throw Hopping in stairs	8	15 each set	35sec	LOW
3-4 WEEK	Box to box jump Hurdle jump Medicine ball throw Hopping in stairs	8	15 each set	35sec	MEDIUM
5-6 WEEK	Box to box jump Hurdle jump Medicine ball throw Hopping in stairs	8	15 each set	35sec	HIGH

FINDING

The study was conducted to find out the effect of ballistic training and plyometric training on reaction time of noviced sprinters. The result pertaining to significant difference, if any, between ballistic training, plyometric training and control groups were assessed by the analysis of covariance for the reaction time is presented in tables.

Table 1. Analysis of covariance for the three experimental groups and control group in standing broad jump performance

Source of variation	D.F	Sum of Square X	Sum of Squares Y	Sum of Squares x.y	Sum of Squares y.x	MSS y.x
Between groups (influence factor)	2	0.014	0.20	-0.04	3.19	1.59
Within groups (other fluctuations)	26	0.077	0.15	1.02	-13.23	-0.50
Total	28	0.092	0.35	0.97	-10.04	

The analysis of data in table 1 for two experimental and the control group on reaction time. Performance indicates no significance F-ratio of 2.75 for the pre test means and significant F-ratio of 17.88 for post test means respectively. There by indicating no significant difference in the initial means and post test means for the groups. F ratio for the adjusted post means indicate a value of 3.58 which is significant as it is greater than the F value of 3.37 required for significance that .05 level. This indicates that there is significance difference from pre to post means among the groups in reaction time. The paired adjusted final means following the post-hoc test analysis and the differences between the means among the four groups are presented in table.

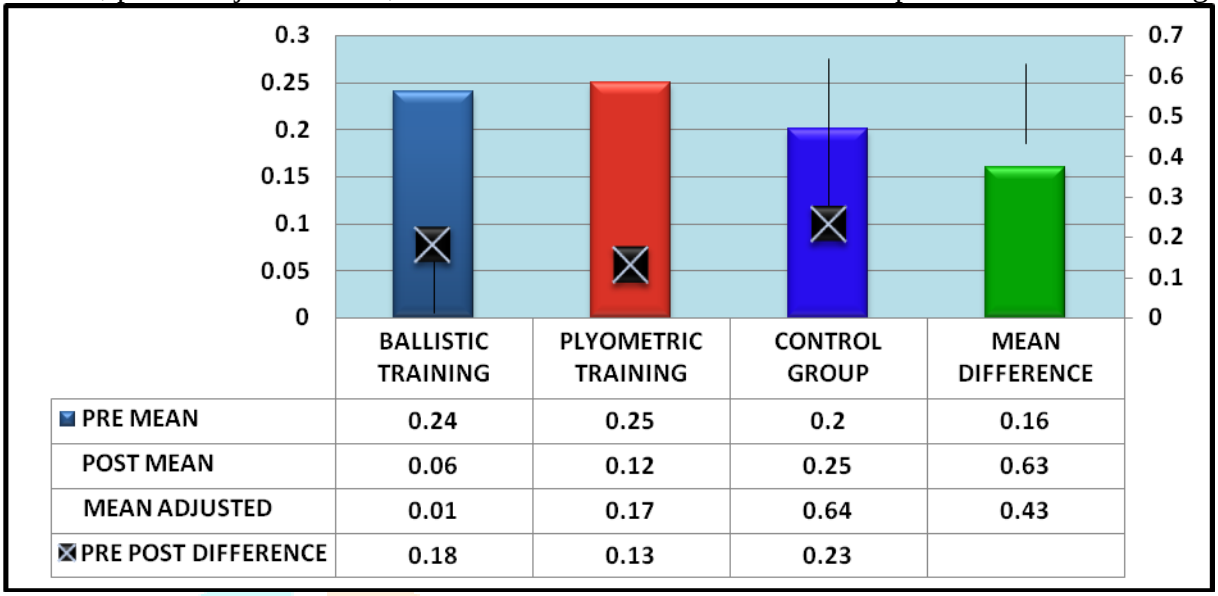
Table 2. Paired adjusted final means and differences between means among the experimental group and control group on reaction time

Ballistic training	Plyometric training	Control group	Adjusted mean difference	CD at 5% level
0.01	.17		.16	.62
	.17	.64	.47	
0.01		.64	.63*	

*indicate significant difference CD at 5% level

Table-2 shows that the differences between the paired adjusted final means among the ballistic training, plyometric training and control groups indicates significance difference for the plyometric training groups when compared with control group (.63). However the difference among ballistic training and control group is not significant as the mean difference values are lesser then the critical difference value of 0.62 required for significance.

Figure-1. Mean, paired adjusted mean, mean difference of reaction time of experimental and control group



	BALLISTIC TRAINING	PLYOMETRIC TRAINING	CONTROL GROUP	MEAN DIFFERENCE
PRE MEAN	0.24	0.25	0.2	0.16
POST MEAN	0.06	0.12	0.25	0.63
MEAN ADJUSTED	0.01	0.17	0.64	0.43
PRE POST DIFFERENCE	0.18	0.13	0.23	

The graphical representation on pre and post test means paired adjusted means and mean difference of the experimental and control groups are shown in figure 1.

DISCUSSION

The aim of the current study was to find out the effect of ballistic resistance and plyometric training on a 6-week training programme. From the results it is evident that the six week of plyometric training programme showed significant improvement in reaction time. The plyometric training programme groups were shown significant improvement in reaction time of noviced sprinter. This result is concurring with previous studies which found plyometric training to improve movement velocity capability. The findings is supported by the study conducted by McBride, J. M., T. Triplett-McBride, A. Davie, and R. U. Newton to evaluate the effect of an 8-week training program with heavy- vs. light-load jump squats on various physical performance measures and electromyography (EMG). This investigation indicates that training with light-load jumps squat results in increased movement velocity capabilities and that velocity-specific change in muscle activity may play a key role in this adaptation.

Our finding provides further support to the notion that plyometric training can demonstrate benefits in a short period of time. Indicating those twelve sessions of plyometric training is sufficed for initial improvement. There is a limited amount of information about the effects of resistance training on motor performance sculls in youth. Although it is attractive to assume that a stronger and more powerful adolescent will perform better on motor performance tests, the data is equivocal. Several studies involving youth have noted significant improvements in the long jump, vertical jump, sprint speed and agility run time following resistance training (Falk & Mor, 1996; Weltman et al., 1986; Lillegard, Brown, Wilson, Henderson, & Lewis, 1997) Plyometric training alone, as has been shown by this study and others carried out by authors such as Blattner and Noble (1979) and Bosco (1982), can also have a significant effect in increasing hip and thigh power that is measured by the vertical jump. Bosco believes that this results from enhancing motor unit recruitment and improving the muscles' ability to store kinetic energy within the elastic components of the muscle (Bosco, et. al., 1982). This may enhance hip and thigh power by increasing the explosive capabilities of the athlete. The transfer of this explosiveness to activities other than the vertical jump needs further investigation

CONCLUSION

The results from our study are very encouraging and demonstrate the benefits plyometric training can have on reaction time. Not only can athletes use plyometrics to break the monotony of training, but they can also improve their speed and agility while working to become more agile. In addition, our results support that improvements in reaction time can occur in as little as 6 weeks of plyometric training which can be useful during the last preparatory phase before in-season competition for athletes.

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