



A study on the effects of vertical, horizontal and combination of elastic power and running speed on sprinting and jumping performance of college athletes

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Abstract

The Purposive sampling technique was used to select eighty men students studying in Degree Colleges in Visakhapatnam District. After preparing a list of subjects ranged from Seventeen to Twenty one years of age, the investigator checked the health record of these subjects maintained by the college and also at his own level with the help of a qualified Doctor who conducted medical tests to ensure that the subjects were medically fit to undergo the type of training programme, they were further subjected to qualify in Depth Jump and Reach performance test. From the ninety two subjects five were unable to perform depth jumping efficiently. The study was delimited to the men students studying in Degree Colleges in Visakhapatnam District. The study was the students studying in Arts & Science courses. The study was the selected speed and jumping variables that is the Elastic Power, Running Speed and Long Jump performance as dependent variables. The study was the Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training as independent variables.

Keywords: elastic power, running speed and vertical, horizontal jumping performance

Introduction

Running and jumping (along with lifting and throwing) are the most fundamental of human athletic movements. The Olympic Motto of "Citius, Altius, Fortius" (faster, higher, stronger) illustrates the applicability of these basic performance attributes. However, to avoid digressing into a history lesson, suffice it to say that in sprint/jump training we strive to develop all athletic performance attributes to some extent.

Every athlete is in a continual process to improve his performance. Many hours of hard training are devoted every year toward this goal. Many people realize that the only way to improve performance is through hard training. History has shown a diverse opinion on which training methods is the most effective for developing the body.

Vertical Jump: The vertical jump test is a test of lower body power. The test was first described nearly 100 years ago (Sargent, 1921). The procedure below describes the method used for directly measuring the vertical jump height jumped. There are other methods such as using timing systems that measure the time of the jump and from that calculates the vertical jump height.

Depth Jump: Depth Jumps are a type of plyometric exercise that specifically uses potential energy and the force of gravity to store energy in the muscles and tendons. The DEPTH JUMP is performed by having the athlete step off an elevated platform, landing, then reversing the eccentric action into a concentric vertical upward action of at least ≥ 20 cm to harness potential energy. However, this height is a variable factor that can be manipulated to change the "intensity" of the plyometric exercise. Once the athlete contacts the ground after the step off, it is paramount to immediately rebound; therefore, redirecting the stored potential energy in the form of kinetic energy vertically while the amortization phase must be minimal. This whole process creates a kinetic energy system that uses the myotatic stretch reflex to generate very large amounts of muscular power, which is believed to be the link between speed and strength.

Statement of the Problem

The problem thus stated as follows; "A Study on the Effects of Vertical, Horizontal and combination of Elastic Power and Running Speed on sprinting and jumping performance of College Athletes"

Objectives of the Study

This study had the following objectives.

- To evaluate the effects of Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training on Elastic Power.

- To evaluate the effects of Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training on Athletic Power.
- To evaluate the effects of Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training on Running Speed.
- To evaluate the effect of effects of Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training on Long Jump performance.
- To evaluate the comparative effects of vertical plyometric training Horizontal plyometric training and combination of vertical and horizontal plyometric training on elastic power.
- To evaluate the comparative effects of vertical plyometric training Horizontal plyometric training and combination of vertical and horizontal plyometric training on athletic power.
- To evaluate the comparative effects of vertical plyometric training Horizontal plyometric training and combination of vertical and horizontal plyometric training on Running speed.
- To evaluate the comparative effects of vertical plyometric training Horizontal plyometric training and combination of vertical and horizontal plyometric training on Long jump performance.

Hypotheses

- There would be no significant difference between pre and post-test scores of four groups (three experimental groups and one control group) on Elastic Power.
- There would be no significant difference between pre and post-test scores of four groups (three experimental groups and one control group) on Running Speed.
- There would be no significant difference between pre and post-test scores of four groups (three experimental groups and one control group) on Long Jump performance.
- There would be no significant difference among four groups (three experimental groups and one control group) on Elastic Power.
- There would be no significant difference among four groups (three experimental groups and one control group) on Running Speed.
- There would be no significant difference among four groups (three experimental groups and one control group) on Long Jump performance.

Delimitations

- The study was delimited to the men students studying in Degree Colleges in Visakhapatnam District.
- The study was delimited to the age group of 17-21years.
- The study was delimited to the students studying in Arts & Science courses.
- The study was delimited to the selected speed and jumping variables that is the Elastic Power, Running Speed and Long Jump performance as dependent variables.
- The study was delimited to the Vertical Plyometric Training, Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training as independent variables.

Limitations

- The subjects of the study were having different nature of habits, dietary habits, socio-economic status, socio-cultural background, personal exercise routine and experiences. These were considered as limitations of the study as the investigator was unable to control these extraneous variables.
- The psychological factors like motivation, stress, tension, anxiety etc. may have an effect on the results because no special techniques were used to control these factors.

Definitions of Terms

Plyometrics: Exercise involving repeated rapid stretching and contracting of muscles (as by jumping and rebounding) to increase muscle power.

Elastic Power: "Elastic Power may be defined as ability of muscle or groups of muscles to release (exert) maximum force per unit of time during stretch-shorten cycle. During stretching phase, tension is developed in the muscle. The release of tension developed at the time of rapid stretching in a muscle, per second during stretch-shorten cycle is called Elastic Power of that muscle". (Chu, 1992).

Running Speed: "The main differences are pace and effort. One definition of jogging speed is 4 to 6 miles per hour (mph), while running can be defined as 6 mph or more

Vertical Plyometric Training: "Plyometrics, also known as jump training or plyos, are exercises in which muscles exert maximum force in short intervals of time, with the goal of increasing power (speed-strength).

Horizontal Plyometric Training: "Horizontal plyometric training includes the exercises performed by jumping bouncing or hopping while horizontally progressing on one or two legs or with alternating the legs e.g. extended skip". (Mach, *et al.*, 1979).

Combination of Plyometric Training Plyometrics is a type of exercise training that uses speed and force of different movements to build muscle power. Plyometrics training can improve your physical performance and ability to do different activities.

Significance of The Study: The present study explored an innovative method of training based on Plyometric Training; it was the Combination of Vertical and Horizontal Plyometric Training. The study would be useful to know the effects of Vertical Plyometric Training, Horizontal Plyometric Training and their combination on selected speed and jumping variables (Elastic Power, Running Speed and Long Jump performance). The study would also be useful to understand the comparative effects of Vertical Plyometric Training, Horizontal Plyometric Training and their combination on selected speed and jumping variables (Elastic Power, Running Speed and Long Jump performance). Thus, the findings of this study would add to the existing knowledge in the area of sports training. It would be of great practical significance for coaches, physical educationists and sports scientists.

Design of The Study: This was an experimental study. Random group design was adopted to divide the eighty subjects randomly into four equal groups of twenty subjects in each. Then, the subjects were randomly assigned to three experimental groups and one control group. The four groups were named as follows:

1. **VP:** Vertical Plyometric Training group
2. **HP:** Horizontal Plyometric Training
3. **CP:** Combinational of Vertical and Horizontal Plyometric training group
4. **CG:** Control Group

Selection of Subjects: Purposive sampling technique was used to select eighty men students studying in Degree Colleges in Visakhapatnam District. After preparing a list of subjects ranged from Seventeen to Twenty one years of age, the investigator checked the health record of these subjects maintained by the college and also at his own level with the help of a qualified Doctor who conducted medical tests to ensure that the subjects were medically fit to undergo the type of training programme, they were further subjected to qualify in Depth Jump and Reach performance test. From the ninety two subjects five were unable to perform depth jumping efficiently. Then eighty subjects were selected by dropping the seven extreme scores that were farthest from the median 17.4 (Appendix-A). Mean and standard deviation for 87 subjects was 17.58 and +2.54 respectively. These values were remained 17.43 and +2.02 for selected eighty subjects.

Selection of Variables

Dependent Variables: The principle stimulus in power training is performing a movement dynamically linked with the force magnitude taking place in the same exertion. For instance, during sprinting an athlete's force of leg propulsion is three and one-half times that of his or her body weight, but the force used to throw a javelin is much smaller. Thus the force of acceleration is the main stimulus for power training. In acyclic sports (i.e. jumping events), power is the determinant ability for achieving a good result. On the other hand, in cyclic sports (i.e. sprinting), power is brought into action repetitively and rapidly. Considered these general characteristics of sports requiring power and reflect them in a strength training programme (Bompa, 1999). Thus, Investigator selected the following dependent variables of acyclic nature, cyclic nature and combining both acyclic and cyclic nature activities:

5. Elastic Power
6. Running Speed

Independent Variables

The comparative effects of vertical and Horizontal Plyometric Training were searched by various researchers (Hortobagyi *et al.* 1990) but no evidence was found about the effect of their combination. Thus, Investigator selected the following independent variables:

1. Vertical Plyometric Training
2. Horizontal Plyometric Training
3. Combination of Vertical and horizontal Training

Criterion Measures

The criterion measures for testing the hypothesis were:

Elastic Power: Elastic Power of the subjects was measured by using the Depth Jump and reach test as described by (Dhaliwal, 2001).

Running Speed: Running Speed of the subjects was measured by using the 50 - Yard Dash test as described by (Johnson and Nelson, 1982)

Procedure for Administration of Tests: During all the testing sessions, subjects participated in a warm-up program and volume and intensity of warming up was kept constant throughout all testing sessions. All the five tests were divided into two groups based on the relatedness of skills involved and conducted in the two days to avoid the effect of fatigue on performance as follows:

Day – 1

- a. Vertical Jump
- b. Depth Jump Test

Day – 2

- a. 50 yard dash test
- b. Standing Broad Jump test
- c. Running Long Jump Test

In the day-1, Vertical Jump Test was followed by Depth Jump Test according to the level of intensity as advocated by Chu (1998); (Radcliffe and Farentinos, 1999). In the second day, 50-yard dash test was followed by Standing Broad Jump Test as Bompa (1999) described that speed training arouse the athlete's central nervous system for strength development. Running Long Jump was conducted at last due to the most time consuming as compared to other two tests and its performance was outcome of sprinting (as measured by 50-yard dash test) and horizontal jumping ability (as measured by Standing Broad Jump Test). 3-5 minutes rest was given between the tests due to the energy required was attaining from the phosphagen system (Bompa, 1999). 1-minute recovery of slow jog was given between trials for Vertical Jump Test, Standing Broad Jump Test and Depth Jump Test. 2-minutes recovery of slow jog was given between trials for Running Long Jump test.

The test re-test scores (Appendix-B) for each variable were then correlated and coefficients obtained have been presented in Table- 1. It is evident from Table-1 that the data pertaining to different tests were quite reliable and objective as the correlation coefficients ranging from 0.817 to 0.965 were significant at .05 levels.

Table 1: Correlation Coefficients of Test Re-Test Scores

Sl. No	Test	Correlation Coefficients
01	Vertical Jump	0.927
02	Depth Jump	0.896
03	50 Yard dash test	0.818
04	Standing Broad Jump Test	0.966
05	Running long Jump Test	0.900

Experimental Plan: After reviewing the literature in the field, judging ability of the subjects and establishing a reliable procedure for administration of tests, Investigator prepared the experimental plan to conduct the study as follows:

Table 2: Experimental Plan

Week	Session	Day wise						
		Monday	Tuesday	Wedne	Thursday	Friday	Saturday	Sunday
Before training	Morning	DJT	--	PS-II	--	CGTD1	CGTD2	VPTD1
	Evening	--	--	--	IS	--	--	--
1	Morning	VPTD2 HPTD1	HPTD2 CPTD1	CPTD2	--	--	--	--
	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
2	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
3	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
4	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
5	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
6	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
7	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
8	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
9	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
10	Morning	--	--	--	--	CGTD1	CGTD2	VPTD1
	Evening	VPT	HPT	VPTCP	VPT	HPT	HPTCP	--
After training	Morning	VPTD2 HPTD1	HPTD2 CPTD1	CPTD2	--	--	--	--
	Evening	--	--	--	--	--	--	--

D.J.T. = Depth Jump Testing, P.S.-II = Pilot study-II I.S. instruction session CGTD1= Conducting tests of day one for CG Group CGTD2=Conducting tests of day two for CG group VPTD1= Conducting tests of day one for VP group VPTD2= Conducting tests of day two for VP group HPTD1= Conducting tests of day one for HP group HPTD2= Conducting tests of day two for HP group CPTD1= Conducting tests of day one for CP group CPTD2= Conducting tests of day two for CP group VPT= Vertical Plyometric Training; HPT= Horizontal Plyometric Training; VPTCP= Vertical Plyometric Training of CP group HPTCP= Horizontal Plyometric Training of CP group

Selection of Exercise: Depth jumping was selected for Plyometric Training programme according to the findings of pilot study-I. Depth jump training is a common and most searched form of Plyometric drill. Its various modified forms have been developed and searched. Bobbed (1990) stated that the most important variable to be controlled is depth jumping technique. Depth jumps have been modified to generate greater stresses at the joints of the hip, knee, and ankle (Holcomb, Lander, Rutland, & Wilson, 1996a). Thus, it is important to mention the technique used in the present study. Depth jumps performed in the present study were based on the recommendations of Chu (1998). The procedure to perform the depth jumps, followed in the present study has been explained below

1. Begin by Standing on the elevated platform with toes close to the front edge; feet shoulder width apart.
2. Drop from the elevated surface to the mat by taking Step off keep torso up right and land on both feet.
3. As the flight of drop occurred, prepared for landing by flexing at knees & hips and dorsiflex the ankles. It was important to get the arms as far back and as straight as possible to be brought rapidly forward and up as 1 concentric contraction occurs for liftoff.
4. Immediately upon landing performed jump up as high as possible Vertical Plyometric Training and jump forward as far possible for Horizontal Plyometric Training.

Table 3: Load of Training Program

Week	Box Height (in centimeters)	Sessions per week	Number of sets per session	Number of repetitions per set	Total foot contacts in a week
1	20	2	6	10	2X6X10=120
2	25	2	6	10	2X6X10=120
3	30	2	6	10	2X6X10=120
4	25	2	6	10	2X6X10=120
5	30	2	6	10	2X6X10=120
6	35	2	6	10	2X6X10=120
7	30	2	6	10	2X6X10=120
8	35	2	6	10	2X6X10=120
9	40	2	6	10	2X6X10=120
10	35	2	6	10	2X6X10=120

Administration of Training Programme: After warm up, 20 subjects in an experimental group were trained simultaneously at four training stations under the supervision of station leader, five in each training group. A cone was placed ahead of the dropping height at the distance 11 meters for vertical depth jump training and 12.10 meters for horizontal depth jump training to give 15 seconds rest walk between repetitions. These distances were determined according to the average of walking distances of 10 subjects covered in 15 seconds after performing vertical and horizontal depth jump. Another cone was placed at 220 meters from the first cone to give 1.5 to 2 minutes pause of slow jog between sets. After completing the depth jumping program and the recovery jog, all subjects participated in the cool-down program.

Collection of Data: The necessary data were collected by administering the tests for measuring Elastic Power, Athletic Power, Running Speed and Long Jump performance on the eighty subjects selected for this study. Tests were conducted in two days according to the established procedure of test administration before start of training and after the experimental period of ten weeks for each group. All the tests were administered in play grounds men students studying in Degree Colleges in Visakhapatnam District. The subjects participated in an instruction session before the pre-test to ensure proper technique and comprehension of the testing process. Tests were demonstrated by the trained athletes. To ensure uniformity in the testing conditions, the subjects were tested in the morning sessions by the same testers, under the supervision of the Investigator.

Statistical Design: Paired t-test was used to identify any significant differences between the pre-tests and post-tests means of all the groups for the dependent variables. An Analysis of Covariance was used to determine significant differences for dependent variables within the four groups. When a significant difference among the groups was observed, a pair-wise comparison of the groups was done by using the Scheffes post-hoc test to identify direction and significant differences between the groups. The level of significance was set at 0.05 in order to test the differences to be considered significant.

Results of The Study: Elastic Power

Depth Jump Test: Analysis of paired t-test for the means of pre-test and post-test scores of the three experimental groups and one control group on Depth Jump Test performance has been presented in Table-IV and the means of these groups have been exhibited in Figure-I.

Table 4: Importance of Differences between Pre-Test and Post- Test Means of Three Experimental Groups and the Control Group With Regard To Athletic Power As Measured By Depth Jump Test

Groups	Pre-test	Post- test	Differences between means	Standard error of differences	't' ratio
VP	17.94	19.424	1.474	0.116	12.5637*
HP	17.04	17.824	0.774	0.084	9.1309*
CP	17.924	18.84	0.924	0.097	9.4543*
CG	17.424	17.1	0.074	0.1711	0.4380

Importance at 0.05 level $t_{.05}(19) = 2.09$

It is evident from Table-IV that all the three experimental groups had exhibited significant improvement in the variable Elastic Power as measured by Depth Jump Test after period of ten weeks training as the obtained 't' ratios 12.5637, 9.1309 and 9.4543 for Groups VP, HP and CP respectively were found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degrees of freedom 19. Also it can be observed from Table-III that the control group (Group-CG) has not shown significant difference between pre-test and post-test means as obtained 't' ratio 0.4380 was found lesser than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degrees of freedom 19.

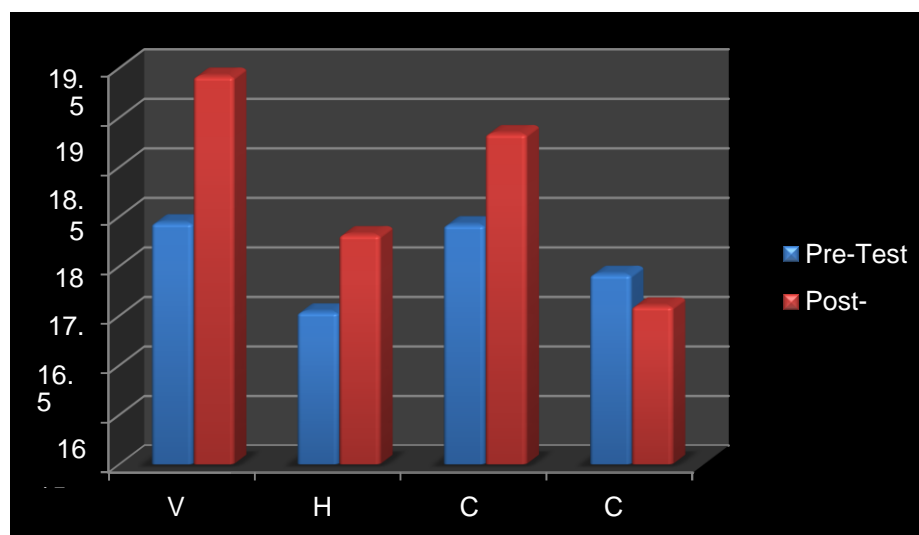


Fig 1: Pre-Test and Post Test Means of Three Experimental Groups and The Control Group In Depth Jump Performance

Since the random group design was employed in the study, the dal further subjected to Analysis of Covariance, to find out significant differences, any, among the three experimental and one control group. The Analysis < Covariance is presented in Table-IV.

Table 5

Sources of variation	Sum of squares	Degrees of limited	Mean sum of squares	F-ratio
Between groups	21.56	3	7.1912	26.02*
With in groups	20.71	75	.2767	

* Significant at 0.05 level $F_{ratio} = 0.5(3,75) = 2.73$

t is evident from Table-V that the results of Analysis of Covariance (ANCOVA) among three experimental groups and control group with regard to the variable of Elastic Power as measured by Depth Jump Test were found statistically significant after imparting ten weeks training as the obtained F-ratio 26.02 was found higher than the tabulated value 2.73 required to be significant at 0.05 level of significance with degrees of freedom (3, 75). Since the F-ratio obtained was found to be significant, Scheffe's post-hoc test was employed to study the direction and significance of differences between the paired adjusted final means. The ordered paired adjusted final means and difference between means for all the four groups in depth jump performance are presented in Table-V.

Table 6: Importance of Differences of Paired Adjusted Final Means of Three Experimental Groups and the Control Group With Regard To Athletic Power As Measured By Depth Jump Test

Means (Groups)				Difference between means	Scheffe's critical difference
VP	HP	CP	CG		
19.0255	18.2472			0.7782*	0.4757
19.0255		18.4733		0.5521*	0.4757
19.0255			17.5537	1.4717*	0.4957
	18.2472	18.4733		0.2260	0.4957
	18.2472		17.5537	0.6935*	0.4758
		18.4733	17.5537	0.9195*	0.4757

* Significant at 0.05 level

Table-VI reveals that all the three experimental groups were significantly different in their adjusted final means when compared to the adjusted final mean of control group. The mean difference 0.7782 between Group-VP and Group-HP was also found significant in favor of Group-VP. The mean difference 0.5521 between Group-VP and Group-CP was also found significant in favor of GroupVP. However, the mean difference 0.2260 between Group-HP and Group- CP was not statistically significant.

Running Speed

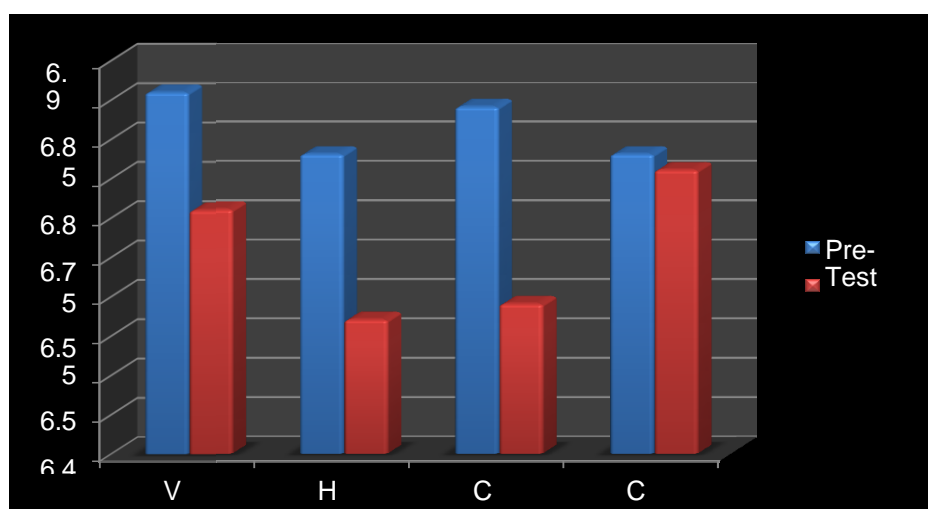
50 yard dash test: Analysis of paired t-test for the means of pre-test and post-test scores of the three experimental groups and one control group on 50-yard dash test performance has been presented in Table-VI and the means of these groups have been exhibited in Figure-II.

Table 7: Importance of Differences between Pre-Test and Post- Test Means of Three Experimental Groups and the Control Group With Regard To Athletic Power as Measured By 50 Yard Dash Test

Groups	Pre-test	Post- test	Differences between means	Standard error of differences	't' ratio
VP	6.86	6.7164	0.1534	0.01707	8.9871*
HP	6.7804	6.5794	0.2009	0.01674	12.0018*
CP	6.842	6.5984	0.2444	0.01216	20.0879
CG	6.7814	6.76	0.0114	0.01321	0.8695

Importance at 0.05 level $t_{.05}(19) = 2.09$

It is evident from Table-VII that all the three experimental groups had exhibited significant improvement in the variable Running Speed as measured by 50-yard dash test after period of ten weeks training as the obtained 't' ratios 8.9871, 12.0018 and 20.0879 for Groups VP, HP and CP respectively were found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degrees of freedom 19. Also it can be observed from Table-VI that the control group (Group-CG) has not shown significant difference between pre-test and post-test means as obtained 't' ratio 0.8695 was found lesser than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degrees of freedom 19.

**Fig 2:** Pre-Test and Post-Test Means of Three Experimental Groups and The Control Group In 50 Yard Dash Performance

Since the random group design was employed in the study, the data further subjected to Analysis of Covariance, to find out significant differences, if any, among the three experimental and one control group. The Analysis of Covariance is presented in

Table 7: Importance of Differences of Paired Adjusted Final Means of Three Experimental Groups and the Control Group With Regard To Running Speed Measured By 50 Yard Dash Test

Means (Groups)				Difference between means	Scheffe's critical difference
VP	HP	CP	CG		
6.673	6.6112			0.0626	0.1176
6.673		6.5783		0.0955	0.1176
6.673			6.8008	0.1268*	0.1176
	6.6112	6.5783		0.0328	0.1176
	6.6112		6.8008	0.1895*	0.1176
		6.5783	6.8008	0.2224*	0.1176

* Significant at 0.05 level

Table-VIII reveals that all the three experimental groups were significantly different in their adjusted final means when compared to the adjusted final mean of control group. However, the differences for the remaining paired means were not significant. But, in general, the trend was in favor of Combination of Vertical and Horizontal Plyometric Training.

Conclusions

Based on the findings of this study, the following conclusions were drawn:

- Vertical Plyometric Training leads to significant improvement in (vertical jump and standing broad jump), Elastic Power, Running Speed and Long Jump performance.
- Horizontal Plyometric Training leads to significant improvement in (vertical jump and standing broad jump), Elastic Power and Running Speed performance.
- Combination of Vertical and Horizontal Plyometric Training leads to significant improvement in (vertical jump and standing broad jump), Elastic Power, Running Speed and Long Jump performance.
- Vertical Plyometric Training is significantly more effective for improving vertical jump performance as compared to Horizontal Plyometric Training.
- Vertical Plyometric Training is significantly more effective for improving depth jump performance as compared to Horizontal Plyometric Training and Combination of Vertical and Horizontal Plyometric Training.
- Horizontal Plyometric Training is more effective for improving Running Speed performance as compared to Vertical Plyometric Training.
- Vertical Plyometric Training is more effective for improving Long Jump performance as compared to Horizontal Plyometric Training.
- Horizontal Plyometric Training alone does not cause significant improvement in Long Jump performance.

Recommendations: Although the investigator has put in his best efforts on the present study, still the topic has a wide scope for further research. Thus, for future research and in the light of the results and conclusions of the study following recommendations are made.

- The similar study may be conducted by using female athletes.
- The similar study may be conducted by using Plyometric exercises other than depth jumps.
- Study may be conducted to compare the different durations of step for progression to increase dropping height for depth jump training, instead of one week as used in the present investigation.
- The similar study may be conducted to assess the effects of detraining processes on speed and jumping performance for male and female athletes.
- Plyometric Training should be specific according to the requirement of targeted motor performance.

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