



## EFFECT OF VARIOUS INTENSITIES OF PLYOMETRIC TRAINING ON SPEED AND STRENGTH ENDURANCE

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### Abstract

The purpose of the present study was to find the effect of varied intensities of plyometric training on speed and strength endurance. For this purpose, sixty male players of studying in various departments of Manipal University, Mangalore, with the age group of 18 – 25 years were selected. They were divided into four equal groups, each group consisted of fifteen subjects, in which group - I (n = 15) underwent low intensity plyometric training (LPTG), group – II (n = 15) underwent medium intensity plyometric training (MPTG), group - III (n = 15) underwent high intensity plyometric training (HPTG) and group - IV (n=15) remained as control. The training period was three days in a week for twelve weeks. The selected criterion variables such as speed and strength endurance were assessed by administering 50 meters run and sit-ups test. Prior and after the training periods, the subjects were tested for speed and strength endurance. The Analysis of Covariance (ANCOVA) was applied as statistical tool, to find out which group has significantly improved the speed and strength endurance. Whenever the adjusted post-test mean 'f' ratio was significant, the Scheffé S was used as post hoc test. It was concluded after applying the statistical tool, that three training groups, when compared with the control group. The training period for the present study was twelve weeks and three days per week (alternative days). It was concluded from the result of the study all the training groups such as, low intensity plyometric (LPTG) training, medium intensity plyometric (MPTG) and high intensity plyometric (HPTG) training group were significantly improved their speed and strength endurance and moreover, there was no significant difference was occurred between the training groups on speed and strength endurance after their respective training programmes.

**Keywords:** Varied Intensities of Plyometric Training, Speed and Strength Endurance.

### INTRODUCTION

Training is a systematic process of repetitive progressive exercise of work involving, learning and acclimatization. (C.E. Kalf and D.D. Aruheim, 1993). Training means are various physical exercises and other objects methods and procedures, which are used for the improvement maintenance and recovery of performance capacity and performance readiness. (Hardhayal Singh, 1991) The basic training procedures will serve better when utilized with modifications suited to the individual or a group. The best training programme is that which increases the desired quality at a higher rate without causing unwanted effects. (Boucher and Malina, 1993)

Plyometric training enhances the tolerance of the muscle for increased stretch loads. This increased tolerance develops efficiency in the stretch shortening cycle of muscle action. During the stretching (eccentric lengthening phase) of muscle action a greater amount of elastic energy is stored in the muscle. This elastic energy is then reused in the following concentric action to make it stronger. This leads us to a fundamental principle of plyometric training: the rate, not the magnitude of the stretch, is that which determines the utilization of elastic energy and the transfer of chemical energy into

mechanical work. ([www.Gambetta.com](http://www.Gambetta.com))

Speed is one of the most important physical qualities required for successful performance in jumps, especially in the horizontal jumps and the plevault.

### MATERIALS AND METHODS

In this study, the effects of varied intensities of plyometric training on speed and strength endurance have been examined. Sixty male students studying in Manipal University, Mangalore were selected and divided into four equal groups, each group consisted of ten subjects, in which group -I (n = 10) underwent low intensity plyometric training, group – II (n = 10) underwent medium intensity plyometric training, group - III (n = 10) underwent high intensity plyometric training and group - IV remained as control. Speed was assed by administering 50 meters dash and for strength endurance, the sit-ups test was administered. The training period for the present study was twelve weeks and three days per week (alternative days). The Analysis of Covariance (ANCOVA) was applied as statistical tool, to find out which group has significantly improved the speed and strength endurance. Whenever the adjusted post-test

mean 'f' ratio was significant, the Scheffé S was used as post hoc test.

Table – I

ANALYSIS OF COVARIANCE ON SPEED OF LOW MEDIUM AND HIGH INTENSITY PLYOMETRIC TRAINING AND CONTROL GROUPS

	Low Intensity Plyometric Training Group	Medium Intensity Plyometric Training Group	High Intensity Plyometric Training Group	Control Group	'F' Ratio
<b>Speed (in seconds)</b>					
Pre-test Mean ± S.D.	7.953 ± 0.324	7.767 ± 0.504	7.852 ± 0.503	8.135 ± 0.351	2.049
Post-test Mean ± S.D.	7.775 ± 0.316	7.605 ± 0.487	7.663 ± 0.303	8.217 ± 0.303	6.089*
Adj. Post-test Mean	7.749	7.762	7.737	8.012	20.21*
<b>Strength endurance (in numbers/minute)</b>					
Pre-test Mean ± S.D.	26.73 ± 1.032	26.20 ± 0.862	26.27 ± 0.88	26.20 ± 0.862	1.193
Post-test Mean ± S.D.	29.47 ± 1.302	29.133 ± 1.06	29.87 ± 0.99	25.80 ± 0.861	46.21*
Adj. Post-test Mean	29.248	29.219	29.914	25.886	55.82*

\*Significant at .05 level of confidence. (The table value required for significant at .05 level with df 3 and 36 and 3 and 35 are 2.85 and 2.86 respectively).

The result of this study showed that there was a significant difference among low intensity plyometric group, medium intensity plyometric training group, high intensity plyometric training group and control group on

speed and strength endurance. Further to determine which of the paired means has a significant difference, the Scheffé S test was applied. The result of the follow-up test is presented in Table – II.

Table – II

SCHEFFÉ S TEST FOR THE DIFFERENCE BETWEEN THE ADJUSTED POST-TEST MEAN OF SPEED AND STRENGTH ENDURANCE

<b>Adjusted Post-test Mean on Speed</b>					
Low Intensity Plyometric Training Group	Medium Intensity Plyometric Training Group	High Intensity Plyometric Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
7.749			8.012	0.263*	0.11531
	7.762		8.012	0.25*	0.11531
		7.737	8.012	0.275*	0.11531
<b>Adjusted Post-test Mean on Strength Endurance</b>					
29.248			25.886	3.362*	0.444468
	29.219		25.886	3.333*	0.444468
		29.914	25.886	4.028*	0.444468

\* Significant at .05 level of Confidence.

Table – II shows that the adjusted post-test mean difference in speed between low intensity plyometric training group and control group, medium intensity plyometric training group and control group

and high intensity plyometric training group and control group were 0.263, 0.25 and 0.275 respectively, which was significant at .05 level of confidence.

Table – II also shows that the adjusted post-test mean difference in strength endurance between low intensity plyometric training group and control group, medium intensity plyometric training group and control group and high intensity plyometric training group and control group were 3.362, 3.333 and 4.028 respectively, which was significant at .05 level of confidence.

It may be concluded from the results of the study that there was a significant improvement of speed after the low intensity plyometric group, medium intensity plyometric training group and high intensity plyometric training group. The results of the study also show that there was a significant improvement in strength endurance after the low intensity plyometric group, medium intensity plyometric training group and high intensity plyometric training group. It was also found that there was no significant difference between the training groups on selected criterion variables such as speed and strength endurance.

### Discussion

All the training groups, such as, low, medium and high intensity plyometric training group, were improved their speed when compared with the control group. Where as, all the training groups were differ significantly each other, moreover, the high intensity plyometric training group have much higher improvement in speed when compared with the low and medium intensities of plyometric training group. Gopinath (2000) also found that there was a significant improvement in speed after the plyometric training programme. de Villarreal, Gonzalez-Badillo and Izquierdo (2008) also found that there was a significant improvement in maximum strength after the different frequencies of plyometric training.

The improvement in strength endurance was significant for the low intensity plyometric group, medium intensity plyometric training group and high intensity plyometric training group when control group. Sundaramoorthy (1999) also found that there was a significant improvement in strength endurance after the plyometric training.

### Conclusions

Based on the result of the study, the following conclusions were drawn:

1. All the training groups, such as, low, medium and high intensity plyometric training group, were

improved their speed when compared with the control group.

2. The improvement in strength endurance was significant for the low intensity plyometric group, medium intensity plyometric training group and high intensity plyometric training group when compared with the control group. The training load in stretch-shortening exercise may not be sufficient to improve the strength endurance for low, medium and high intensities of plyometric training group.
3. The overall result of the study shown that there was no significant difference occurred between the training groups, such as, low intensity plyometric group, medium intensity plyometric training group and high intensity plyometric training groups respectively.

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