

# **Effect of Plyometric Training Combined Strength and Mobility Training on Explosive Power Flexibility and Sprinting Ability**

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## **Abstract**

The purpose of the present study was to find the effect of plyometric training and combined strength and mobility training on explosive power, flexibility and sprinting ability. For this purpose, forty male trainees from India Sports Promotion Academy, Y.M.C.A., Nandanam, Chennai, Tamilnadu, in the age group of 15 – 16 years were selected as subjects. They were divided into four equal groups, each group consisted of ten subjects, in which group – I underwent plyometric training, group – II underwent combined strength and plyometric training, group – III underwent combined strength, mobility and plyometric training and group – IV acted as control group. The training period for this study was three days in a week for twelve weeks. Prior to and after the training period the subjects were tested for explosive power, flexibility and sprinting ability. The selected criterion variables, such as, explosive power, flexibility and sprinting ability, were tested by administering, standing broad jump, sit and reach test and 100 meters dash. It was concluded from the results of the study that all the training groups have improved explosive power, flexibility and sprinting ability

**Key words:** Plyometric training, Strength training, Explosive Power, Sprinting ability

## **Introduction**

Athletic performance has dramatically progressed over the past few years. Performance levels, unimaginable before, are now common and the number of athletes capable of outstanding results is increasing. A broader base of knowledge about athletes now exists, which is reflected in training methodology.

Sports training is a scientifically based and pedagogically organized process which through planned and systematic effect on performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competition.

Plyometrics is a type of exercise training designed to produce fast, powerful movements, and improve the functions of the nervous system, generally for the purpose of improving performance in sports. Plyometrics has been shown across the literature to be beneficial to a variety of athletes. Benefits range from injury prevention, power development and sprint performance amongst others.

While plyometrics assists in rapid force development (power), weight training assists in maximal force output (strength). Power refers to the combined factors of speed and strength.

Strengthening one's muscles through resistance training offers many benefits and makes it easier to do one's daily routine. One can find that carrying your briefcase, doing laundry and hauling groceries becomes easier when one's arm and chest muscles are toned.

Mobility, or joint mobility, is the ability to move a limb through the full range of motion—with control. Mobility is based on voluntary movement while flexibility involves static holds and is often dependent upon gravity or passive forces.

Explosive power mainly depends on strong muscle. The abdominal and leg strength play a vital role on a performance of jumpers.

Barrow and McGee observed that “within the same joint flexibility may vary from time to time depending in such factors as warm up temperature effects, relaxation and pain tolerance”.

Eicher (1975) is of the opinion that speed is the product of two factors stride length and frequency. Increasing either factor automatically increase a runner's sprinting speed.

## **Methods**

In this study it was to find out the effect of plyometric training and combined strength and mobility training on explosive power, flexibility and sprinting ability. To achieve the purpose, forty male trainees from India Sports Promotion Academy, Y.M.C.A., Nandanam, Chennai, Tamilnadu, in the age group of 15 – 16 years were selected as subjects. They were divided into four equal groups of ten each, in which, group – I underwent plyometric training, group – II underwent combined strength and plyometric training, group – III underwent combined strength, mobility and plyometric training and group – IV acted as control group who did not participate any special training apart from the regular activities.

For every training programme there would be a change in various structure and systems in human body. So, the researcher consulted with the experts then selected the following criterion variables: 1. explosive power, 2. flexibility and 3. sprinting ability. The selected criterion variables such as, explosive power, flexibility and sprinting ability, were tested by administering, standing broad jump, sit and reach test and 100 meters dash.

## **Analysis of the Data**

Analysis of covariance was used to determine the differences, if any, among the adjusted post test means on selected criterion variables separately. Whenever the 'F' ratio for adjusted posttest mean was found to be significant, the Scheffé S test was applied as post-hoc test. The level of significance was fixed at .05 level of confidence to test the 'F' ratio obtained by analysis of covariance.

**Table-I**  
**Analysis of Covariance and 'F' ratio for Explosive Power, Flexibility**  
**and Sprinting Ability of Plyometric Group Combination of**  
**Strength and Plyometric Training Group Combination**  
**of Strength Mobility and Plyometric Training**  
**group and Control Group**

<b>Variable Name</b>	<b>Group Name</b>	<b>Plyometric Training Group</b>	<b>Strength and Plyometric Training Group</b>	<b>Strength Mobility and Plyometric</b>	<b>Control Group</b>	<b>'F' Ratio</b>
<i>Explosive Power (in Cms)</i>	<i>Pre-test Mean ± S.D</i>	2.239± 0.198	2.172± 0.1978	2.326± 0.22	2.238± 0.182	1.547
	<i>Post-test Mean ± S.D.</i>	2.488± 0.194	2.35± 0.165	2.556± 0.223	2.259± 0.172	4.964*
	<i>Adj. Post-test Mean ± S.D.</i>	2.422	2.440	2.503	2.288	61.79*
<i>Flexibility (in Inches)</i>	<i>Pre-test Mean ± S.D</i>	8.49± 0.255	8.56± 0.232	8.57± 0.2066	8.56± 0.2319	0.227
	<i>Post-test Mean ± S.D.</i>	8.57± 0.254	8.54± 0.239	8.72± 0.216	8.53± 0.216	1.446
	<i>Adj. Post-test Mean ± S.D.</i>	8.620	8.523	8.703	8.513	14.599*
<i>Sprinting Ability (in Sec)</i>	<i>Pre-test Mean ± S.D</i>	13.10± 0.44	13.15± 0.739	13.58± 0.576	13.442± 0.71	1.328
	<i>Post-test Mean ± S.D.</i>	12.77± 0.359	12.84± 0.629	12.72± 0.565	13.45± 0.768	3.229*
	<i>Adj. Post-test Mean ± S.D.</i>	12.965	12.990	12.486	13.338	31.519*

\* 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 2.87 respectively).

**Table-II**  
**Scheffe S Test for the Difference between the Adjusted Post-Test Mean of Explosive Power, Flexibility and Sprinting Ability**

<b>Adjusted Post-test Mean of Explosive Power</b>					
<b>Plyometric Training Group</b>	<b>Strength and Plyometric Training Group</b>	<b>Strength Mobility and Plyometric Training Group</b>	<b>Control Group</b>	<b>Mean Difference</b>	<b>Confidence Interval at 0.05 level</b>
2.422	2.440			0.018	0.04731
2.422		2.503		0.081*	0.04731
2.422			2.288	0.134*	0.04731
	2.440	2.503		0.063*	0.04731
	2.440		2.288	0.152*	0.04731
		2.503	2.288	0.215*	0.04731
<b>Adjusted Post-test Mean of Flexibility</b>					
<b>Plyometric Training Group</b>	<b>Strength and Plyometric Training Group</b>	<b>Strength Mobility and Plyometric Training Group</b>	<b>Control Group</b>	<b>Mean Difference</b>	<b>Confidence Interval at 0.05 level</b>
8.62	8.523			0.097	0.0972
8.62		8.703		0.083	0.0972
8.62			8.513	0.107*	0.0972
	8.523	8.703		0.18*	0.0972
	8.523		8.513	0.113*	0.0972
		8.703	8.513	0.19*	0.0972

<b>Adjusted Post-test Mean of Sprinting Ability</b>					
<b>Plyometric Training Group</b>	<b>Strength and Plyometric Training Group</b>	<b>Strength Mobility and Plyometric Training Group</b>	<b>Control Group</b>	<b>Mean Difference</b>	<b>Confidence Interval at 0.05 level</b>
12.965	12.990			0.025	0.2558
12.965		12.486		0.479*	0.2558
12.965			13.338	0.373*	0.2558
	12.990	12.486		0.504*	0.2558
	12.990		13.338	0.348*	0.2558
		12.486	13.338	0.852*	0.2558

\* Significant at .05 level of confidence.

## Results

Table – I showed that there was a significant difference among plyometric training and combined strength and mobility training on explosive power, flexibility and sprinting ability.

Table – II shows that the Scheffe *S* test on explosive power for the difference between adjusted post-test mean of plyometric training group and, strength, mobility and plyometric training group (0.081), plyometric training group and control group (0.134), strength and plyometric training group and strength, mobility and plyometric training group (0.063), strength and plyometric training group and control group (0.152) and strength, mobility and plyometric training group and control group (0.215) which were significant at .05 level of confidence. But there was no significant difference was exist between plyometric training group and strength and plyometric training group (0.018) on explosive power.

Table – II also shows that the Scheffe *S* test on flexibility for the difference between adjusted post-test mean difference of plyometric training group and control group (0.107), strength and plyometric training group and strength, mobility and plyometric training group (0.18), strength and plyometric training group and control group (0.113) and strength, mobility and plyometric training group and control group (0.19), which was significant at .05 level of confidence. The adjusted post-test mean difference between plyometric training group and strength and plyometric training group (0.097) and plyometric training group and strength, mobility and plyometric training group (0.083), which were insignificant at .05 level of confidence.

Table – II shows that the Scheffe *S* test on sprinting ability for the difference between adjusted post-test mean difference of plyometric training group and strength, mobility and plyometric training group (0.479), plyometric training group and control group (0.373), strength and plyometric training group and strength, mobility and plyometric training group (0.504), strength and plyometric training group and control group (0.348) and strength, mobility and plyometric training group and control group (0.852) were significant at .05 level of confidence. But there was no significant difference between plyometric training group and strength and plyometric training groups (0.025) on sprinting ability after the training programme.

## Conclusions

1. It was concluded from the results of the study, the explosive power, flexibility and sprinting ability has improved significantly after the respective training programme.
2. When compared with the control group, both the training groups has significantly improved in all the criterion variables, such as, explosive power, flexibility and sprinting ability.
3. It was also concluded from the results of the study, that there was no significant difference between the plyometric training group and strength and plyometric training groups explosive power and sprinting ability, but in flexibility there was no significant difference has occurred between plyometric training group and strength and plyometric training group and plyometric training group and strength, mobility and plyometric training group.

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