

## Effect of isolated plyometric training and combined plyometric and strength training on Explosive Power in terms of Horizontal Distance among college men in Jammu and Kashmir

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### ABSTRACT

The purpose of this study was to find out the effect of isolated plyometric training and combined plyometric and strength training on agility of college men. To achieve the purpose, forty -five (N=45) men students in Govt. degree college Frisal Kulgam, Jammu and Kashmir, were selected as subjects. The age ranged between 19 – 23 years. The selected subjects were randomly assigned in to three equal groups of fifteen (n=15) subjects each such as isolated plyometric training group, combined plyometric and strength training group and control group. The experimental group underwent their respective experiment treatment for twelve weeks and a session on each day. Control group was not participated in any specific training apart from their regular activities. The Explosive Power in terms of Horizontal Distance test was taken as criterion variable for the present study and it was measured by Standing Broad Jump in Centimeters. All the subjects of three groups were tested on the selected dependable at prior to and after the training programme. The analysis of covariance (ANCOVA) was used to analyze the significant difference, if any between the groups. Level of confidence was fixed at 0.05 to find out the level of significance which was considered as an appropriate. The result revealed that there was a significant difference between isolated plyometric training group and combined plyometric and strength training group ( $1.89 \pm 0.14$  and  $2.07 \pm 0.17$ ) on Explosive Power in terms of Horizontal Distance and also the result of the study shows that the improvement of (0.15) on the Explosive Power in terms of Horizontal Distance was significant for combined plyometric and strength training group than isolated plyometric training group.

### INTRODUCTION

New advances in science makes it possible to turn faster and jump higher than ever before. Plyometric is a firm of exercises with links strength with speed of movement. There are two phases of muscle contraction during running or jumping motion. Muscle goes through a stretch phase and then a concentration phase. Plyometric are design to shorten the cycle time between the two phases. A rapid cycle time allows maximum energy transfer between stretch and concentration phases. The new frontal platform shoes have been shown to dramatically improve the efficiency of plyometric exercises. Training in frontal platform shoes is increasingly becoming the method of choice of serious sprinters and jumpers. No other method develops as quickly, the specific muscle groups and neural connections essential for running, speed and jumping height.

Traditional modalities to improve strength, include plyometric exercises and resistance training with movement patterns as close as possible to specific football skills, aiming to warrant the highest degrees of transference between strength gains and soccer technical skills. For this purpose, conditioning coaches often refer to the complex training method, which combines weight lifting of heavy loads with plyometric exercises for rest, in the same workout. (Robbin DW 2005). A plyometric training programme should consider the goal of the training for a particular period, should respect basic training principles, first of all the principle of individualization, a progressively increasing load (from

low intensity to high intensity exercises over a period of several years and also during annual training cycle), the principle of specificity (advanced athletes with plyometric method experiences should prefer specific exercises). It is also very important to have in mind their participation in the training cycles based on their actual health conditions, jump load and possible combination with other training exercises (Beachle & Earle, 2000; Bourne, 1994, Faigeubaun & Westcott, 2000, Fergenbaum & Wayne, 2001; Gambetta, 1998; Chu, 1998; Komi, 1992; Marvellous, 1999; Reddin & Johnson, 1999; Scates & Linn, 2003).

Plyometric is a type of exercise training designed to produce fast, powerful movements and improve the functions of nervous system., generally for the purpose of improving performance in sports. Plyometric movements, in which a muscle is loaded and then contracted in rapid sequence, use the strength, elasticity and innervations of muscle and surrounding tissue to jump higher and run faster, depending on the desired running goal. (Brook's 1996 and Goran 2007). Plyometric training is an integral component of training which many fitness specialists use for optimizing strength and power performance in several sports. (Davies et al. 2015; Ramirez-Campillo et al., 2018; Bogdanis, Danti et al. 2019). plyometric training has been applied in numerous studies, and there is a general consensus that it improves sport specific skill such as agility (Miller et al. 2006). It has been previously suggested that plyometric training improves sport specific agility in sports where sudden movements (acceleration stops and direction changes) are required (Yap and Brown 2000) participants performed two trials of agility test with five minutes recovery between test types. The best time of the two trials were considered for later analysis. Times to complete the agility tests were measured every time by the same three assisting people using a stop watch. The average of the time measured by three assistants was used for statistics. Until the end of the experimental status of the participants (PL or Control) was unknown for all assistants.

Plyometric has proven to be effective and efficient in developing power. Plyometric drills involve starting, stopping and change of movement directions which contribute to agility development (Miller et al. 2001). Previous studies showed that plyometric training when used in a periodized manner, can contribute to agility gains (Miller et al. 2006; Thomas et al. 2009). It was stated by Kukolj, Ropret, Ugarkovic and Jaric (1999) that dynamic movements requiring high muscle power are provided by methods such as plyometric training and that such training improve agility because agility performance is also a dynamic movement requiring high muscle power. Plyometric training not only strengthens the joints, tendons and muscles, but also trains the nervous system to react more efficiently all these effects help improve agility.

**KEY WORDS:** *Isolated plyometric, combined plyometric, strength training*, Explosive Power, Horizontal Distance.

## **MATERIALS AND METHODS**

The aim of this study was to find out the effect of isolated plyometric training and combined plyometric and strength training on Explosive Power in terms of Horizontal Distance test of college men in Jammu and Kashmir. To achieve this purpose forty-five men students studying bachelor's degree in Govt. Degree College Frisal Kulgam, UT of Jammu and Kashmir were selected as subjects during the academic year 2021- 2022 were randomly selected. The age of the subjects was ranged from 19 – 23 years. The selected subjects were divided in to three equal groups of 15 subjects each at random. Group-I isolated plyometric training group, Group-II combined plyometric and strength training group and Group-III Control group did not participate in any training programme other than their regular activities according to their curriculum. The experimental period was of twelve weeks. The requirements of the experimental procedures, testing as well as exercise schedules were explained to them so as to avoid any ambiguity of the effort required on their part and prior to the administration of the study. The investigator got the individual consent from each subject. The subjects underwent their

respective training programme under the strict supervision of the convenor of sports and assistant physical instructor of the Govt degree college Frisal Kulgam Jammu and Kashmir India. The data on Explosive Power in terms of Horizontal Distance test was collected by administering Standing Broad Jump in Centimeters. Pre-test were collected prior to the testing programme and post data were collected immediately after the twelve weeks of training programme on both the experimental group and control group.

### STATISTICAL PROCEDURE

The collected data from Isolated plyometric training and combined plyometric and strength training and control group during pre and post-test on selected criterion variable such as Explosive Power in terms of Horizontal Distance used for statistical treatment to find out the significance difference between the adjusted post means by computing the analysis of covariance (ANCOVA). The 0.05 level of significance was fixed to test the significance which was considered to be appropriate measures. Since three groups were compared, whenever obtained "F" ratio for the adjusted post-test was found to be significant the Scheffe's test was applied as post Hoc test to find out paired mean differences if any.

### RESULTS

Analysis of covariance for the pre-test, post-test and adjusted post-test mean values for Isolated plyometric training and combined plyometric and Strength training and Control group on Explosive Power in terms of Horizontal Distance.

#### Analysis of covariance of isolated plyometric training and combined plyometric and strength training and control group on Explosive Power in terms of Horizontal Distance

Table 1

Tests	IPTG	CPTSTG	CG	SOV	SOS	DF	MS	F-Ratio
Pre- test Mean	1.70	1.73	1.75	BG	0.017	2	0.009	0.185
± SD	0.12	0.23	0.26	WG	1.986	42	0.047	
Post- test Mean	1.89	2.07	1.74	BG	0.825	2	0.412	9.231*
±SD	0.14	0.17	0.28	WG	1.877	42	0.045	
Adjusted post-test Mean	1.91	2.06	1.72	BG	0.884	2	0.442	24.919*
				WG	0.728	41	0.018	

\*Significant at 0.05 level (Required table value 3.22 with df 2 ,42)

(The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 42 is 3.22 and degree of freedom 2 and 41 is 3.23) \*Significant at 0.05 level of confidence. The above data shows the pre-test means and standard deviation on Explosive Power in terms of Horizontal Distance of Isolated plyometric training and combined plyometric and strength training and control groups are  $1.70 \pm 0.12$ ,  $1.73 \pm 0.23$  and  $1.75 \pm 0.26$  respectively. The obtained F- ratio value 0.185 of Explosive Power in terms of Horizontal Distance is less than

the required table value 3.22 for degrees of freedom 2 and 42 at 0.05 level of confidence, which proved that the scores in Explosive Power in terms of Horizontal Distance before the training were equal and there were no significant differences. The post-test Mean and standard deviation on Explosive Power in terms of Horizontal Distance of Isolated plyometric training and combined plyometric and strength training and control group are  $1.89 \pm 0.14$ ,  $2.07 \pm 0.17$  and  $1.74 \pm 0.28$  respectively. The obtained 'F' ratio value 9.231 of Explosive Power in terms of Horizontal Distance is greater than the required table value of 3.22 for degrees of freedom 2 and 42 at 0.05 level of confidence. It implies that significant differences exist between three groups during the post test period on Explosive Power in terms of Horizontal Distance. The adjusted post-test Means on Explosive Power in terms of Horizontal Distance on isolated plyometric training and combined plyometric and strength training and control groups are 1.91, 2.06 and 1.72 respectively. The obtained 'F, ratio value 24.919 of Explosive Power in terms of Horizontal Distance is greater than the required table value of 3.23 for the degree of freedom 2 and 41 at 0.05 level of significance. Hence, it is concluded that significant differences exist between the adjusted post- test means of isolated plyometric training and combined plyometric and strength training and control group on Explosive Power in terms of Horizontal Distance. Since, the obtained 'F' ratio value in the adjusted post-test means is found to be significant, the Scheffe's test is applied as post hoc test to find out the paired mean differences, and it is presented below.

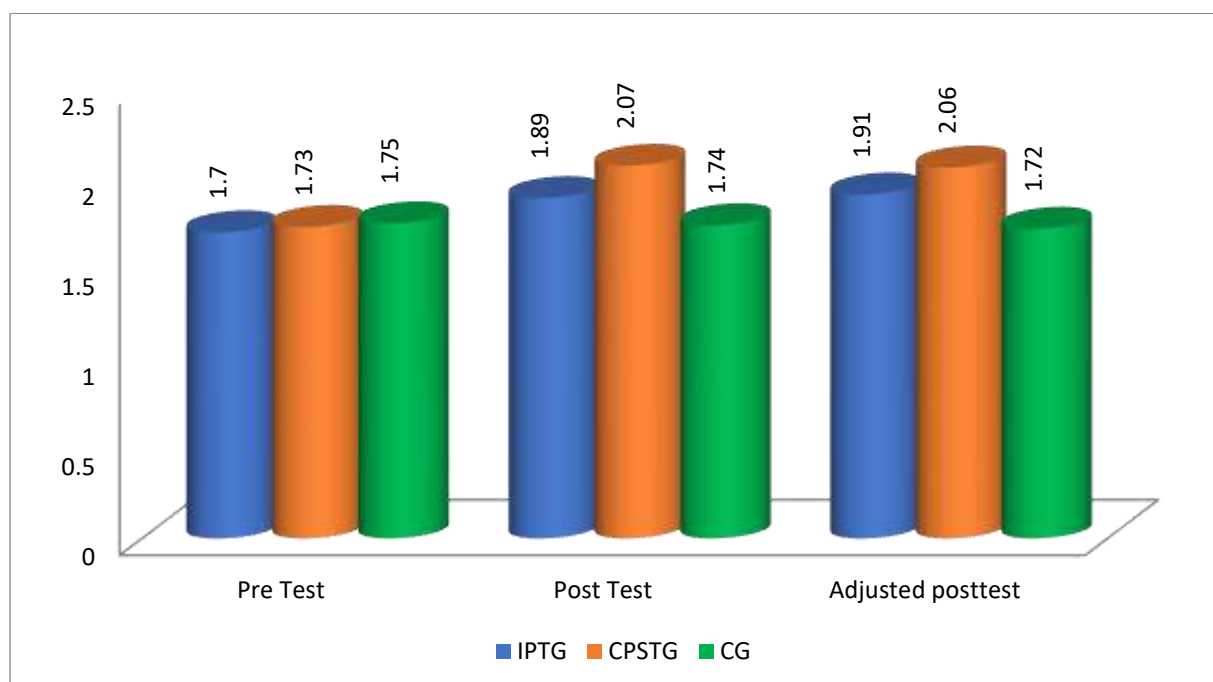
***Scheffe's post hoc test for the differences among paired means and experimental and control group on Explosive Power in terms of Horizontal Distance.***

<b>IPTG</b>	<b>CPTG</b>	<b>CG</b>	<b>MD</b>	<b>CI</b>
1.91	2.06	–	0.15	0.12
1.91	–	1.72	0.19*	
–	2.06	1.72	0.34*	

\*Significant,  $p \leq 0.05$

From the above table the Scheffe's post hoc analysis proved that significant mean differences exist between isolated plyometric training and combined plyometric and strength training and control group on Explosive Power in terms of Horizontal Distance. Since the Mean differences 0.19 and 0.34 are higher than the confidence internal value of 0.12 at 0.05 level of confidence. However, significant difference exists between isolated plyometric training and combined plyometric and strength training groups since mean difference is 0.15 higher than confident value of 0.12 at 0.05 level of confidence.

The result of this study shows that significant difference exists between isolated plyometric training group and combined plyometric and strength training group and control group on Explosive Power in terms of Horizontal Distance. However, the improvement of Explosive Power in terms of Horizontal Distance was significantly higher in combined plyometric and strength training group than isolated plyometric training group. It may be concluded that combined plyometric and strength training is better than isolated plyometric training in improving Explosive Power in terms of Horizontal Distance. The adjusted post mean values of isolated plyometric training group, combined plyometric and strength training group and control group are graphically represented in figure.



## DISCUSSION

The result of the present study points out that Explosive Power in terms of Horizontal Distance of the subject significantly improved due to isolated plyometric training and combined plyometric and strength training. The findings are also in agreement with the findings of Kryeziu et.al (2019) Effect of short-term plyometric training program is improved Explosive Power in young basketball players. Aalizadeh et.al (2015), conducted the study that effect of short-term plyometric training program on sprint, power and Agility on college men eighteen to twenty-three years players. The agility occurs due to the explosive power movements (Miller 2006), Agility also depends on muscle strength, speed, coordination and dynamic balance (Heang,2012), Kisner (Meylan & Malatest;2009) describes in three phases in plyometric exercises called stretch shortening cycle: phases during elongation are also called stretch cycle, and shortening phase is also called shortening cycle. In plyometric exercises basically focus on stretch shortening cycle to generate maximum power. The muscle function is drawn before concentric contraction is maximized, followed by rapid movements from the eccentric phase to the concentric which helps stimulate the proprioceptors to facilitate increased muscle recruitment in a minimum amount of time (Meylan & Malatesta,2009). With the no. of motor units activated the neural adaptation will increase with increase neural adaptation it can affect Explosive Power, especially to improve intermuscular coordination (Ramirez et.al 2014).

## CONCLUSION

Isolated plyometric training and combined plyometric and strength training have been shown to increase factors associated with Explosive Power in terms of Horizontal Distance. It is also concluded that significant differences exist between Isolated Plyometric and Combined Plyometric and Strength training groups improved the Explosive Power in terms of Horizontal Distance. The pre, post and adjusted post-test mean values of experimental group and control group on Explosive Power in terms of Horizontal Distance is graphically represented above.

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