

**EFFECT OF PLYOMETRIC EXERCISES ON LEG STRENGTH AND  
FLEXIBILITY OF INTER-COLLEGIATE KHO KHO PLAYERS**

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**Abstract**

The present study was undertaken to measure the effect of Plyometric Exercises on leg strength and flexibility of Inter collegiate kho kho players studying in the affiliated colleges of Kashmir University. The results have shown that there was no improvement of plyometric exercises on leg strength and flexibility of kho kho players. Thus it can be concluded that strength gains can be transformed into power only by applying specific power training programme. Hence the hypothesis which was set earlier is hereby rejected.

**Keywords:** Plyometric Exercises, Leg strength, Flexibility, kho-kho players, Power training programme.

**Introduction**

The term “Plyometrics” also known as “Jump training” or “Plyos” was coined by Fred Wilt after watching Soviet athletes prepare for their events in track and field (Wilt, Fred & Yesis, Micheal 1984). Plyometric exercises are exercises in which muscles exert maximum force in short intervals of time, with the goal of increasing power (Speed-strength). This training focuses on learning to move from a muscle extension to a contraction in a rapid or “explosive” manner, such as in specialized repeated jumping (Chu, Donald 1998).

Plyometrics includes explosive powerful training exercises that are trained to activate the quick response and elastic properties of the major muscles in the body. It was initially made famous by Soviet Olympians in the strength programs of elite sporting athletes worldwide. Sports using Plyometrics include basketball, tennis and volleyball as well as the various codes of football (Fitness Pro Magazine).

Many Professional and Olympic athletes use plyometrics training to improve muscular strength and jumping abilities which therefore increases power. There are varying levels of intensity to Plyometrics. Another benefit of Plyometrics are that you can vary your level of intensity which means anyone looking to improve strength and jumping training can be involved regardless of fitness. With there being so many exercises this means you are less likely to get burned out and have a wide range of exercises to choose from. Another good

reason with so many exercises being available are that you can find exercises that don't require the use of any equipment. It also increases muscular strength and endurance, also increases metabolic rate which increases weight loss and heart rate. (Pros of the Plyometrics Workout)

### **Statement of the Problem**

The statement of problem was to see the "Effect of Plyometric exercises on flexibility and leg strength of kho kho players".

### **Purpose of the study:**

The main purpose of the study was to determine the effect of Plyometric exercises on kho-kho Players.

### **Significance of the Study:**

The significance of the study was justified on the basis of the following grounds:

1. The finding of the study would help to know the effect of Plyometric exercises on flexibility and leg strength of kho-kho players.
2. The study would serve as a reference data for physical education teachers and coaches for the selection of eligibility athletes.
3. The results would help to understand the relationship of variables with each other.
4. The study will provide base for new researchers.

### **Hypothesis:**

On the basis of literature and Researcher's own perception it was hypothesized that there would be a significant effect of Plyometric exercises on flexibility and leg strength of kho kho players of Kashmir valley.

### **Delimitations:**

1. The study was delimited to only male inter-collegiate kho kho players of Southern Colleges of Kashmir valley.
2. Data was collected from inter-collegiate students of Kashmir valley.
3. The study was delimited to 40 male subjects.
4. The study was further delimited to 20 control group subjects and 20 experimental group subjects.
5. The age group of the subjects was ranging from 19-25 years.
6. The study was restricted to the following tests.
  - Sit and Reach Test
  - Standing Broad Jump

**Limitations:**

1. Any motivational technique to motivate or discourage the students was not used when various tests were taken.
2. Family background, physical condition, life style, socio-economic status of the subjects was also considered as the limitations of the study.
3. Mental status of the subjects was also considered as limitations of the study.

**Operational Definitions:**

**Leg Strength;**

The ability of leg muscles to perform quickly in efficient manner in co-ordination to the rest body muscles under the conditions of fatigue and exhaustiveness (**Vannier and Poindexter, 1976**).

**Flexibility;**

The range of movement in a joint is known as flexibility. For example touching of fingers to toes while sitting or standing without bending knees (Devinder K Kansal).

**Kho Kho;**

Kho Kho is an Indian sport played by team of twelve players who try to avoid being touched by members of the opposing team, only 9 players of the team enter the field ([www.wikipedia.org](http://www.wikipedia.org)).

**METHODOLOGY:**

As research demands a systematic method and procedure, likewise this research article adopts the following procedures including information regarding research design. The research article has been divided into the following headings;

**Source of data:**

The data pertaining to this study was collected from Southern Inter-collegiate kho kho players of Kashmir Valley.

**Selection of Subjects:**

The forty (40) male inter-collegiate students were selected from the Kashmir valley.

**Sampling Method;**

The simple random sampling method was applied to select the subjects for this study.

**Criterion Measures;**

The following criterion measures were chosen for the testing of hypothesis;

1. **Flexibility:-** Flexibility was measured with the help of Sit and Reach test.

**2. Standing Broad Jump:-** Leg strength was measured with the help of Standing Broad Jump.

**Selection of the Tests;**

1. Sit and Reach test
2. Standing Broad Jump.

**Description of the Tests:**

1. **Sit and Reach test:**

**Purpose:-** To measure the flexibility.

**Equipments:-** Sit and Reach Box/Table.

**Procedure:-**

The subject is asked to remove the shoes and place his/her feet against the testing box while sitting on the floor with straight knees. Then the subject is asked to place one hand on the top of the other so that the middle finger of both hands kept together at the same length. The subject is instructed to lean forward and place his/her hands over the measuring scale lying on the top of the box near its mark coinciding with the front edge of the testing box. Then, the subject is asked to slide his hands along the measuring scale as far as possible without bouncing to hold the farthest position for at least one second.

**Scoring:-**

Each Subject is given three trials and the highest score nearest to an inch is recorded and 10 inches are subtracted from the recorded reading to obtain the flexibility score which is compared with the standard table. The best trial (maximum distance) is used as the final score of the test. (Devinder.K Kansal 1996)

**2. Standing Broad Jump:**

**Purpose:-** To measure the Power and Leg Strength.

**Equipments:-** Floor, mat or long jump pit may be used, measuring tape, marking tape/chalk or a peg.

**Procedure:-**

The subject is asked to stand behind the starting line with the feet parallel to each other. He / She is instructed to jump as farthest as possible by bending knees and swinging arms to take off for the broad jump in the forward direction. The subject is given three trials.

### Scoring:-

The distance between the Starting line and the nearest point of landing provides the score of the test. The best trial is used as the final score of the test. (Devinder. K Kansal 1996)

### Collection of data:-

The data pertaining to the study was collected by administering the tests for the selected items. Before collection of data, the subjects were given a chance to practice the prescribed tests so that they should become familiar with the tests and know exactly what is to be done to ensure uniform testing condition, the subjects were tested during morning and data was collected.

### Plyometric Training Schedule of four weeks:

S.No.	Exercise	1-2 week	3-4 week	Repetitions
1	Single or Double hops	15 jumps	20 jumps	4
2	Ankle jumps	10 jumps	15 jumps	3
3	Side jumps	20 jumps	30 jumps	4
4	Straddle / Spot jumps	10 jumps	20 jumps	4
5	Side jump over the Bench	10 jumps	15 jumps	3
6	Zig-Zag jumps	15 jumps	20 jumps	4
7	Double leg jumps	15 jumps	20 jumps	3
8	Box jumps	10 jumps	15 jumps	3

**NOTE:-** 5-7 Seconds rest after Each Repetition.

### Statistical Test

In order to find out the effect of four weeks plyometric exercises on various inter-collegiate kho-kho players paired 't' test was employed. The level of significance was kept at 0.05 to test the hypothesis.

### Results and Discussions

The data collected on 40 male subjects before and after 4 weeks training programme on leg strength and flexibility was analyzed by using SPSS 17 for comparing the means of pre test and post test of control and experimental groups and was again statistically analyzed

by applying 't' test to check the significant difference among the selected groups. Therefore, separate tables and graphs have been presented for each item as follows:

**Table No.1. showing the comparison of mean between the pre test and post test in leg strength of the controlled group of kho kho players.**

Variables	Pre test		Post test		Mean	Sd. error	D.F	Obt. 't'	Tabulated 't'	Significance
	Mean	S.D	Mean	S.D						
Leg Strength Controlled group	224.400	10.61974	223.9500	9.70336	-.5500	.47281	38	-1.163	2.021	p>0.05

The **table No.1.** shows the analyzed data in leg strength of controlled group kho kho players. The pre test means of leg strength was 224.400 for controlled group and the post test means of leg strength was 233.9500. The obtained 't' of controlled group is -1.163 which is less than the tabulated table value of 2.021. Hence the pre test was not significant at 0.05 level of confidence.

**Table No.2. Showing the comparison of mean between the pre test and post test in leg Strength of Experimental group of kho kho players.**

Variables	Pre test		Post test		Mean	Sd. error	D.F	Obt. 't'	Tabulated 't'	Significance
	Mean	S.D	Mean	S.D						
Leg Strength Controlled group	234.0500	12.48778	240.500	11.23189	-6.5000	1.37171	38	-4.739	2.021	p>0.05

The **table No.2.** Shows the analyzed data in leg strength of kho kho players. The pre test mean of experimental group was 234.05 and 240.50 in the post test. The obtained 't' of the experimental group is -4.739 which is lower than tabulated value 2.021. Hence it is not significant at 0.05 level of confidence.

**Table No.3. showing the comparison of mean between the pre test and post test in flexibility of the controlled group of kho kho players.**

Variables	Pre test		Post test		Mean	Sd. error	D.F	Obt 't'	Tabulated 't'	Significance
	Mean	S.D	Mean	S.D						
Leg Strength Controlled group	11.2500	2.12442	11.7000	2.2663	-4.4411	.47281	38	-1.013	2.021	p>0.05

The **table No.3.** Shows the analyzed data in flexibility of kho kho players. The pre test mean of flexibility was 11.2500 and 11.7000 in the post test of controlled groups. The obtained 't' is -1.013 which is less than the tabulated value of 2.021. Hence there was no significant difference at 0.05 level of confidence.

**Table No.4. Showing the comparison of mean between the pre test and post test in flexibility of the experimental group of kho kho players.**

Variables	Pre test		Post test		Mean	Sd. error	D.F	Obt 't'	Tabulated 't'	Significance
	Mean	S.D	Mean	S.D						
Leg Strength Controlled group	11.5500	2.37354	13.0000	2.29416	-1.45000	0.19835	38	-7.310	2.021	p>0.05

Similarly **Table No.4.** shows the pre test mean of flexibility of the experimental group which was 11.500 and in post test it was 13.00 and the obtained 't' -7.310 which is less than the tabulated value. Hence it is not significant at 0.05 level of confidence.

So the hypothesis set earlier is hereby rejected.

### **Discussion on findings**

It has been observed from the analysis of data that there was no significant difference between the same components among the groups after the administration of training programme and there was no improvement in both the selected components of the leg strength and flexibility of the kho kho players.

### **JUSTIFICATION OF HYPOTHESIS:**

In the beginning of this study it was hypothesized that there would be positive effect of plyometric exercises on leg strength and flexibility of kho kho players, but in contrary to this the effect of 4 week training programme of plyometric exercises showed no significant difference in the leg strength and flexibility of kho kho players. Hence, the hypothesis which was set earlier is hereby rejected.

### **Conclusion**

Within the limitations of the study and based on statistical data analysis it is concluded that there was no significant effect on flexibility and leg strength of kho kho players on application of plyometric exercises. Since Power is essential for flexibility and leg strength, which was not gained enough in kho kho players as revealed by the study. This justifies the non significant effect of plyometric exercises on flexibility and leg strength of kho-kho players.

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