

**Impact
Factor
3.025**

ISSN 2349-638x

Refereed And Indexed Journal

**AAYUSHI
INTERNATIONAL
INTERDISCIPLINARY
RESEARCH JOURNAL
(AIIRJ)**

Monthly Publish Journal

VOL-IV

ISSUE-VII

JULY

2017

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CHIEF EDITOR – PRAMOD PRAKASHRAO TANDALE

The Effect of Plyometric Training Programme on Physical Fitness of Hockey Players

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1.0 Introduction

Physical Fitness is not being able to perform certain feats that show one's strength. It is the condition of your body as a whole: the physiological, biochemical and mental state. When physically fit one can efficiently work, play, resist chronic disease and meet constant demands. Everyone has a different level of complete physical fitness, which once reached, rewards him/her with a richer and more enjoyable life. Isolated performances do not have a true indication of physical fitness. To decide if someone is physically fit, he has to look at his body, at his performance and at his response to stress and to physical exertion.

Each person is different and the aim is to discover whether one has reached his individual potential of physical fitness. He may be unfit but still skilled enough at a sport to perform better than someone who is fit. However, such aspect is not valid in many sports and one amongst these sports is field hockey. The hockey players typically need to have good speed, Endurance, muscular strength, agility and good explosive leg strength. Though a body can stand a lot of abuse, unless the person is physically fit he cannot perform in a desired way in the field hockey game. Thus, to improve the physical fitness, there are many intervention methods and plyometric training is one of them.

Plyometric may be defined as "jumping exercises that involve a rapid deceleration of body mass followed immediately by rapid acceleration of that body mass in an opposing direction" (Wathen, 1993). These jumping exercises force a rebound action known as the myostatic reflex, that elicit the contraction of the both homonymous and synergist muscles while inhibiting antagonist muscles in an effort to produce a fast response to an applied stimulus (Chu, 1984). The main objective of these hopping and bounding exercises is to convert elastic energy generated by both the force of gravity and body weight during eccentric or lengthening muscle contraction into an opposite force during the concentric or shortening contraction (Dialloo, 2001). Given the above information, it is understood that plyometric training has the potential to assist help hockey players in increasing movement speed and power by developing quicker reaction times. Hence, this study has been carried out to study the effect of plyometric training programme on physical fitness of hockey players.

2.0 Research Methodology

2.1 Selection of Subjects

To conduct the study 100 hockey players who represented district level tournament were selected as a sample. The subject was randomly divided into two equal groups (50 subjects for experimental group and 50 subjects for control group). For the present study only male players were selected from Nagpur district. The age group of the sample ranged from 14 to 18 years. The entire sample was selected randomly.

2.2 Design of the Study

A quasi-experimental group design (pre/ post-test design) method was employed by the researcher.

2.3 Criterion Measures

To solve above mentioned problem following motor fitness component were considered. The dependent variables of the study were Speed, Endurance, Strength, Agility and Explosive leg strength. However, the independent variables were the following selected ten plyometric exercises, which are Squat Jumps, Jump to Box, Lateral Jump to Box, Split Squat Jumps, Tuck Jumps, Lateral Box Push Offs, Bounding with Rings, Box Drill with Rings, Zigzag Hops and Depth Jumps.

2.4 Primary Data Collection

Primary data was collected through experimental procedures. The data was collected by using standardized methods according to following procedures. Prior to data collection, a pilot study was conducted to establish the reliability and validity of the test procedures as well as the tester. All the plyometric training procedures as well as the measurement of the dependent variables was carried out as per standard methods.

- Speed of the hockey players was determined using 50 Yard dash test
- The dynamic endurance of abdominal muscles of the subjects was measured by using Bent Knee Sit Ups test
- The muscular strength of shoulder of hockey players was measured using Pull ups test
- The subject’s explosive strength of legs was determined using Vertical Jump test
- The speed and coordinative ability or agility of the subject’s was determined using Shuttle run test

2.5 Statistical Analysis of Data and Significance Level

Analysis of data was done with the help of SPSS 18.0 software. The descriptive statistics, such as mean, standard deviation, minimum, maximum, etc. were determined from the collected data. The comparative assessment was done using paired ‘t’ test. The significance level was chosen to be 0.05 (or equivalently, 5%).

3.0 Analysis of Data and Results of the Study

3.1 Speed of Hockey Players

Table 1:

Comparative assessment of the Speed of Hockey Players Pre and Post Plyometric training period

Group	Training	N	Mean	±SD	SE	MD	t ratio	P
Control	Pre-training	50	8.7	1.2	0.6	-0.1	0.046	NS
	Post-training	50	8.6	1.3	0.5			
Experimental	Pre-training	50	8.8	1.1	0.5	-1.4	-2.019	<0.05
	Post-training	50	7.4	0.8	0.4			

SD: Standard deviation; **SE:** Standard error; **MD:** Mean difference; **P:** Probability

Above **Table 1** presents results of comparative assessment of speed of hockey players pre and post training period. The mean speed of hockey players belonging to control group was 8.7±1.2 and 8.6±1.3 sec pre and post training respectively. Furthermore, the mean speed of hockey players belonging to experimental group was 8.8±1.1 and 7.4±0.8 sec pre and post training respectively.

3.2 Endurance (of abdominal muscles) of Hockey Players

Table 2:

Comparative assessment of the Endurance of Hockey Players Pre and Post training period

Group	Training	N	Mean	±SD	SE	MD	t ratio	P
Control	Pre-training	50	28	4.2	1.9	2	0.642	NS
	Post-training	50	30	5.6	1.8			
Experimental	Pre-training	50	29	5.2	2.1	17	4.625	<0.05
	Post-training	50	46	4.2	1.7			

SD: Standard deviation; **SE:** Standard error; **MD:** Mean difference; **P:** Probability

Above **Table 2** presents results of comparative assessment of endurance of hockey players before and after training period. The mean number of bent knee sit-ups of hockey players belonging to control group was 28±4.2 and 30±5.6 numbers pre and post training respectively. The comparative analysis showed that there is no significant difference in the endurance of hockey players (belonging to control group) before and after the training. Furthermore, the mean bent knee sit-ups number of hockey players belonging to experimental group was 29±5.2 and 46±4.2 numbers pre and post plyometric training respectively.

3.3 Muscular strength (of shoulder) of Hockey Players

Table 3:

Comparative assessment of the Strength of Hockey Players Pre and Post training period

Group	Training	N	Mean	±SD	SE	MD	t ratio	P
Control	Pre-training	50	8	1.3	0.6	-1	-0.068	NS
	Post-training	50	7	2.2	0.5			
Experimental	Pre-training	50	8	2.1	0.6	6	2.138	<0.05
	Post-training	50	14	2.7	0.9			

SD: Standard deviation; **SE:** Standard error; **MD:** Mean difference; **P:** Probability

Above **Table 3** presents results of comparative assessment of muscular strength of hockey players pre and post training. The mean pull ups of hockey players belonging to control group was 8±1.3 and 7±2.2 numbers pre and post training respectively. The comparative analysis showed that there is no significant difference in the strength of hockey players (belonging to control group) before and after the training. Furthermore, the mean number of pull ups of hockey players belonging to experimental group was found to be 8±2.1 and 14±2.7 numbers pre and post training respectively.

3.4 Explosive strength of legs of Hockey Players

Table 4:

Comparative assessment of the Explosive Leg Strength of Hockey Players Pre and Post training period

Group	Training	N	Mean	±SD	SE	MD	t ratio	P
Control	Pre-training	50	42.6	4.6	1.3	1.7	0.946	NS
	Post-training	50	44.3	5.2	1.5			
Experimental	Pre-training	50	43.2	6.1	1.9	15.9	3.564	<0.05
	Post-training	50	59.1	3.7	0.8			

SD: Standard deviation; **SE:** Standard error; **MD:** Mean difference; **P:** Probability

Above **Table 4** presents results of comparative assessment of pre and post training period explosive leg strength of hockey players. The mean distance indicating explosive leg strength of hockey players belonging to control group was 42.6 ± 4.6 and 44.3 ± 5.2 cm pre and post training respectively. The comparative analysis showed that there is no significant difference in the explosive leg strength of hockey players (belonging to control group) before and after the training period time. Furthermore, the distance indicative of explosive leg strength of hockey players belonging to experimental group was 43.2 ± 6.1 and 59.1 ± 3.7 cm pre and post training respectively.

3.5 Agility of hockey players

Table 5:

Comparative assessment of the Agility of Hockey Players Pre and Post training period

Group	Training	N	Mean	±SD	SE	MD	t ratio	P
Control	Pre-training	50	12.7	1.3	0.6	-0.1	-0.064	NS
	Post-training	50	12.6	1.5	0.4			
Experimental	Pre-training	50	12.4	1.4	0.5	-1.9	-2.134	<0.05
	Post-training	50	10.5	0.8	0.3			

SD: Standard deviation; **SE:** Standard error; **MD:** Mean difference; **P:** Probability

Above **Table 5** presents results of comparative assessment of pre and post training period agility of hockey players. The time taken by hockey players belonging to control group was 12.7 ± 1.3 and 12.6 ± 1.5 sec pre and post training respectively. The comparative analysis showed that there is no significant difference in the agility of hockey players (belonging to control group) before and after the training. Furthermore, the mean time taken by hockey players belonging to experimental group was 12.4 ± 1.4 and 10.5 ± 0.8 pre and post training respectively.

Conclusions

- **Speed:** The comparative assessment showed that there is significant ($P < 0.05$) decrease in the time needed to finish the 50 yards by hockey players after the plyometric training. Thus, the study results indicate that the plyometric training has significant effect on the speed of the hockey players.
- **Endurance (of abdominal muscles):** The comparative assessment showed that there is significant ($P < 0.05$) increase in the endurance of hockey players after the training. Thus, the study results reveal that the plyometric training has significant effect on the endurance of the hockey players.
- **Muscular strength of shoulder:** The comparative assessment showed that there is significant ($P < 0.05$) increase in the strength of hockey players after the training. Thus, the study results reveal that the plyometric training has significant effect on the strength of the hockey players.
- **Explosive strength of legs:** The comparative assessment showed that there is significant ($P < 0.05$) increase in the explosive leg strength of hockey players after the training. Thus, the study results reveal that the plyometric training has significant effect on the explosive leg strength of the hockey players.

- **Agility of hockey players:** The comparative assessment showed that there is significant ($P < 0.05$) improvement in the agility of hockey players after the plyometric training. Thus, the study results reveal that the plyometric training has significant effect on the agility of the hockey players.

Overall, it is concluded that the physical fitness of the hockey players can be significantly improved by the plyometric trainings.

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