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Utility of Plyometric Training for Improving Physical Fitness of Field Hockey Players

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1.0 Introduction

Because of great physical variations, it is very difficult to ascertain an individual's (hockey player's) general level of fitness or to compare his level with that of someone else. However, physical fitness can most effectively be determined by measuring the responses of the body to specific activities. Players who are physically fit can perform the same amount of work with less effort than those who are unfit (Astorino et al., 2004). Although there are certain studies that have categorically revealed benefits of the different training methods, there is much to be learned about the effects of intense physical exercise and its impact on the sports performance. However, it has been established, that lack of correct exercise results in impaired strength, endurance, and performance (Kumar and Kumar, 2005).

Physical fitness is the ability of a person's (hockey player's) body to meet the demands placed upon it by his work, by his way of life and by the necessity to meet emergency situations. Fitness is one of the basic elements which are essential for better performance in the field hockey (Devaraj and Desingurajan, 2016). The players must need to be in top physical condition for optimum performance. Physical fitness is considered as the fitness of the body, but in the modern concept physical fitness means fitness of both body and mind. Specifically, the field hockey players typically need good speed, endurance, muscular strength, agility (Hanjabam and Kailashiya, 2014) and explosive leg strength for better performance. Hence, there is a need to assess the impact of various physical fitness intervention methods like plyometric training for improving the physical fitness of the players (Kraemer, 2000; Lockie et al., 2014).

In view of the above, this study has been carried out to know the impact of plyometric training on the critical physical fitness criterion of field hockey players. A plyometric exercise is quick, powerful movement that starts with an eccentric (muscle-lengthening) action and is immediately followed by a concentric (muscle-shortening) action (Singh et al., 2014). Performing plyometric movements increases muscular power, which translates to higher jumps and faster sprint times. Moreover, combining plyometric moves with resistance training is a way to maximize power and performance (Villarreal et al., 2012). Such jumping related exercises force a rebound action known as the myostatic reflex, which bring out 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. Besides, the key objective of these jumping exercises (Dalrymple et al., 2010) 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. Thus, in view of the above information, it is evident that the plyometric training can be potentially used for improving the physical fitness of the field hockey players. However, since, there is dearth of studies that quantify effect of such trainings on the physical fitness of field hockey players. For this purpose, present study has been carried out to know the impact of plyometric training programme on physical fitness of field hockey players of Nagpur City.

2.0 Research Methodology

2.1 Selection of Subjects

To conduct the study 150 male field hockey players of Nagpur City were selected randomly as a sample. The subjects were randomly divided into two equal groups (75 subjects each for experimental and control group). The age group of the sample varied between 16 and 18 years.

2.2 Design of the Study

A Post Test Experimental Design was used for this study.

2.3 Selection of Criterion Measures

In view of the literature review as well as the understanding the researcher, following motor fitness component were considered for data collection. The variables of the study were speed, strength, agility and explosive leg strength. The plyometric training exercises were 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 from the field hockey players through standard experimental procedures. All the data was generated using standardized methods. Before primary 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.

Criterion measure		Test Procedure Used
• **Speed**	:	– 50 Yard dash test
• **Muscular strength of shoulder**	:	– Pull ups test
• **Explosive strength of legs**	:	– Vertical Jump test
• **Agility**	:	– Shuttle run test

2.5 Statistical Analysis of Data and Significance Level

Analysis of data was carried out with the help of SPSS 18.0 software. The mean, SD, 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 Field Hockey Players

Table 1:
Comparative assessment of speed of field hockey players of control and experimental groups post plyometric training period

Post Training	N	Mean	±SD	SE	MD	t ratio	P
Control	75	8.9	±1.7	0.8	1.8	2.548	<0.05
Experimental	75	7.1	±0.6	0.2			

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

Table 1 presents data of comparative assessment of results of 50 yard dash test scores indicative of speed of field hockey players post plyometric training period. The mean test scores of field hockey players belonging to control group was 8.9±1.7, while that of players from experimental group was 7.1±0.6 sec. The comparative assessment of the 50 yard test score showed that there is significant

(P<0.05) difference in the time needed to complete the test by players of control as well as experimental groups.

3.2 Muscular strength (of shoulder) of Hockey Players

Table 2:

Comparative assessment of strength of field hockey players of control and experimental groups post plyometric training period

Post Training	N	Mean	±SD	SE	MD	t ratio	P
Control	75	9	±1.4	0.9	-7	-3.564	<0.05
Experimental	75	16	±2.7	1.1			

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

Table 2 presents data of comparative assessment of results of pull ups test scores indicative of muscular strength (of shoulder) of field hockey players post plyometric training period. The mean test scores of field hockey players belonging to control group was 9±1.4, while that of players from experimental group was 16±1.1 numbers. The comparative assessment of the pull up test score showed that there is significant (P<0.05) difference in the average number of pull ups recorded for the players of control and experimental groups.

3.3 Explosive strength of legs of Hockey Players

Table 3:

Comparative assessment of explosive leg strength of field hockey players of control and experimental groups post plyometric training period

Post Training	N	Mean	±SD	SE	MD	t ratio	P
Control	75	38.6	±4.2	1.2	-18.7	-6.193	<0.05
Experimental	75	57.3	±3.9	0.9			

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

Table 3 presents data of comparative assessment of results of vertical jump test scores indicative of explosive strength of legs of field hockey players post plyometric training period. The mean test scores of field hockey players belonging to control group was 38.6±4.2 cm, while that of players from experimental group was 57.3±3.9 cm. The comparative assessment of the vertical jump test score showed that there is significant (P<0.05) difference in the vertical jump distance recorded for the players of control as well as experimental groups.

3.4 Agility of hockey players

Table 4:

Comparative assessment of agility of field hockey players of control and experimental groups post plyometric training period

Post Training	N	Mean	±SD	SE	MD	t ratio	P
Control	75	13.9	±3.4	1.8	-3.7	-0.409	<0.05
Experimental	75	10.2	±2.7	1.3			

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

Table 4 presents data of comparative assessment of results of shuttle run test scores indicative of agility of field hockey players post plyometric training period. The mean test scores of field hockey players belonging to control group was 13.9±3.4 sec., while that of players from experimental group was 10.2±2.7 sec. The comparative assessment of the shuttle run test score showed that there is significant

(P<0.05) difference in the time needed to complete the test by players of control as well as experimental groups.

Conclusions

Classically, field hockey has been a fast sport, consisting of two 35-minute halves, with a high demand on various facets of physical fitness. Moreover, now the demands of the game are changing very rapidly: a rule change means that international matches will be played in four 15-minute quarters. Since, the existing literature places greater emphasis on physiological facets (Chmielewski et al., 2006) such as repeated sprint ability and aerobic capacity, there is limited information available on other components of physical fitness in field hockey, such as agility, change of direction speed, strength and power. A common feature of hockey is the 'semi-crouched' position where players are lower to the ground. In view this the present study indicated that the performance of the hockey players can be improved through the use of plyometric training as it showed significant (P<0.05) improvement in the speed, muscular strength, explosive strength of legs and agility. Hence, it is concluded on the basis of study results that the physical fitness of the field hockey players can be remarkably improved through the practice of plyometric training procedures.

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