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## **SELECTED BIOMECHANICAL AND KINANTHROPOMETRICAL FACTORS IN RELATION TO PENALTY CORNER PERFORMANCE IN FIELD HOCKEY**

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The purpose of the study was to find out the relationship between biomechanical, kinanthropometric and performance factors in penalty corner push-in. Male (n=20) university field hockey players were randomly selected from Chennai city colleges for this study, the age of the subjects ranged from 18 to 28 years. The high definition camera (DCR SR65) was used to record the performances that were approximately transverse to the trajectory of the ball of the push in. The subjects were made to take three trials only. The collected data by using video camera were analysed through the "Silicon Coach Pro 7" Software. Video footage was digitized for data analysis of ball speed, drag time, stance width, front knee angle, right elbow angle, rear knee angle. Kinanthropometric variable such as height, weight, arm length, arm span, palm length, palm span. The data was analyzed by use of Pearson's product moment correlation using SPSS. The finding reveals that rear knee angle and height of the player showed significant relationship to the performance of penalty corner Push-in.

**KEY WORDS:** Biomechanics, Penalty Corner, Silicon Coach.

**INTRODUCTION:** Field hockey is one of the famous game played in more than 127 countries all over the world. According to the Wein (1981). Hockey is a dynamic game played by both sexes requiring high level of skills, excellent conditioning and well co-ordinated team effort. The Penalty Corner was introduced in 1908. Penalty corner is awarded for foul committed by the defending team in its own entire 23 meters area. Penalty corner is awarded to the attacking by the umpire depending upon the nature of foul committed at the time of the game. The penalty corner will offer more scoring opportunity because during penalty corner only five defenders will be permitted within the circle but all the attackers are permitted. The champions of today are seen perfect in the conversion of penalty corners. It is seen that different variations in penalty corner are being adopted and executed successfully. This requires lot of understanding among the specialized players. According to Bhangu (1997) stated that highest 35 percentage of the goal were scored through the Penalty corner by the Netherland team in Atlanta Olympics, which was the highest by a nation. Penalty corner execution can be separated into three progressive phases: the push-in, the trap and the strike. Kerr and Kevin (2006) opined that whole penalty corner process takes about 1.9 seconds and 2.3 seconds respectively for male and female players of national standards. It is essential that the chance must be utilized precisely as it offers an excellent scoring opportunity during the game.

The push starts with an attacker standing close to the goal line with at least one foot outside the field of play. The left shoulder points in the direction of the push. The hook of the stick rest against the ball. The push-in movements involves a rapid rotation of the hip, shoulders and arms in the direction of the trapper while the body weight is being transferred from the back foot to the front foot. The ball is dragged or pushed over the playing surface by the hockey stick for some distance and then released in the direction of the trapper. In the artificial surface dragging action is used frequently. The trap phase follows when the ball reaches top of the circles and is trapped by another attacking player just outside the circle. The trapper propels the ball back into the circles for the phase three to commence. In phase three a third attacker strikes the moving ball towards the goal or another attacking player. However, studies on biomechanical & kinanthropometric of the penalty corner little research to be currently available. The purpose of the study was to find out the relationship among the biomechanical & kinanthropometrical variable to performance in penalty corner push-in.

**METHODS:** Twenty university level male field hockey players were randomly selected from chennai city colleges for the study. The age of the subjects ranged from 18 to 28 years. The scores of the subject in penalty corner push-in were used as the criterion in the study. The performance of the subjects was assessed by three judges however the accuracy of Push-in was also added, the expert were asked to make a subjective assessment of the overall playing ability of the players using the 10 point scale which consist of 10 factors. The guidelines for rating were provided by the investigator. The average rating of three experts on the overall playing ability was considered as the score of subjects. To see the degree of agreement between the three qualified coaches, rank order correlation was used in this study. The results revealed high correlation, which means that there was a close agreement in rating between the coaches. Keeping in the mind of feasibility, experts opinion and available literature the following biomechanical & kinanthropometrical variables were selected namely Stance width, Front knee angle, Rear knee angle, Right elbow angle, Height, Weight, Arm length, Arm span, palm length, palm span and Ball speed for analysis. The static group design was used in the particular study.

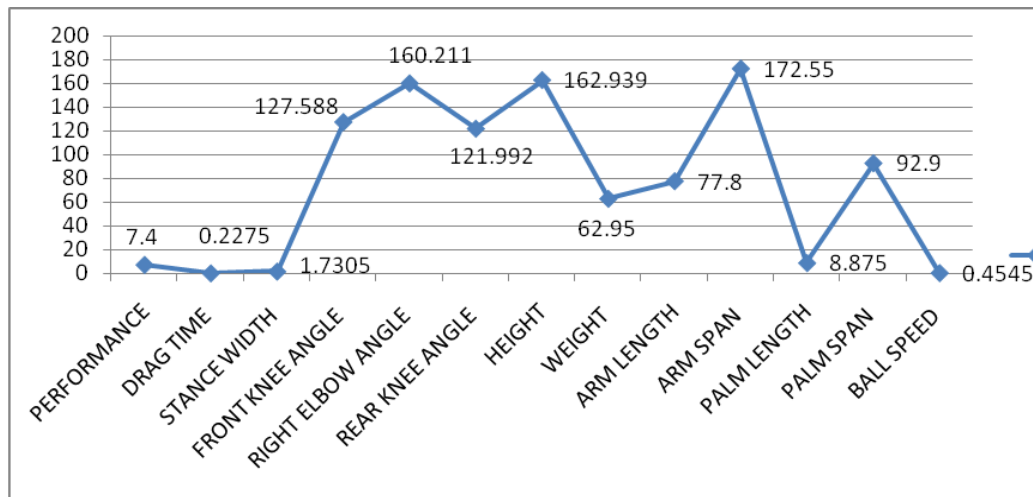
The high definition camera (DCR SR65) was used and set at 100 frame per second, recorded views that were approximately transverse to the trajectory of the ball of the push in performance. Each player has given three trials only. The best trial of each player were digitized and analysed. The Collected data by using video camera were analysed through the "Silicon Coach pro 7" software.

To find out the inter relationship between various factors namely ball speed, stance width, front knee angle, rear knee angle, Right elbow angle, Height, weight, arm length, arm span, palm length, palm span the Pearson's product moment correlations was analysed by using SPSS. The level of significance was fixed at 0.05

**RESULTS AND DISCUSSION:** Twenty men field hockey players who had represented minimum of University level were selected as subjects at random from Chennai city colleges, further the data were statistically analyzed by correlation. In analyzing the variables to find out the significant difference, the Pearson's product moment correlation needed was (2-tailed) at 0.05 level of confidence. The Table I showed that mean and standard deviation of male field hockey player

**Table 1**  
**DESCRIPTIVE STATISTICS**

<b>FACTORS</b>	<b>MEAN</b>	<b>S.D. (±)</b>
Performance (score)	7.40	1.04
Drag time (seconds)	0.22	0.03
Stance width (meters)	1.73	0.07
Front knee angle (degree)	127.58	19.46
Right elbow angle (degree)	160.21	12.04
Rear knee angle (degree)	121.99	18.59
Height (centimeter)	162.93	38.32
Weight (kilogram)	62.95	8.88
Arm length(centimeter)	77.80	4.16
Arm span (centimeter)	172.55	14.78
Palm length (centimeter)	8.87	.42
Palm span (centimeter)	92.90	5.62
Ball speed ( seconds)	.45	.05



**Figure 1: Showing the mean value of field hockey players.**

The Table-II Penalty Corner performance and its relationship with selected biomechanical and kinanthropometrical factors among field hockey players

**TABLE- II**  
**SELECTED BIOMECHANICAL AND KINANTHROPOMETRICAL FACTORS IN RELATION TO PENALTY CORNER PERFORMANCE IN FIELD HOCKEY**

Sl. No	Variables	Co-efficient of Correlation (r)
1	Drag time (seconds)	0.22
2	Stance width (meters)	-0.36
3	Front knee angle (degree)	0.03
4	Right elbow angle (degree)	0.03
5	Rear knee angle (degree)	0.47*
6	Height (centimeter)	0.50*
7	Weight (kilogram)	-0.37
8	Arm length(centimeter)	-0.06
9	Arm span (centimeter)	-0.15
10	Palm length (centimeter)	-0.29
11	Palm span (centimeter)	-0.30
12	Ball speed ( seconds)	0.16

\*significant at the 0.05 level

The table reveals that drag time, front knee angle, right elbow angle, ball speed showed insignificant relationship, Stance width, weight, arm length, arm span, palm length, palm span showed negatively insignificant to the performance variable. The factor such as rear knee angle, Height has significant relationship. Ness and kerr (2002) stated that stance width and ball speed were higher in experienced players but the current research did not resembles the study because the experience of the players differs from one another and execution of style varies individual to individual. There is no significant relation between the drag time and performance variable which replicates the previous study Ness and kerr (2002). The present result confirms that push-in rear knee angle and height were significant at 0.05 level.

**CONCLUSIONS:** Based on the result of the study the following conclusions were drawn. It was concluded that rear knee angle and height showed positive relationship when compared to performance of a penalty corner push-in.

There is no relationship between drag time, front knee angle, right elbow angle, ball speed, arm length & arm span when compared to performance variable.

The variable such as weight, stance width, palm length and palm span has weak negative relationship compared with performance variable.

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