



Correlations of Biomechanical Characteristics with Ball Speed in Penalty Corner Push-In

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Abstract

The aim of this study was to investigate the inter-relationship among the biomechanical factors in Penalty corner push-in. Men (n=18) Hockey players represented university were purposively selected from Tamil Nadu state, India for this study, the age of the subjects ranged from 18 to 28 years. The high definition camera (Casio EX 10) was used to record the performances that were approximately transverse to the trajectory of the ball of the push in. Video footage was digitized using Max traq software for data analysis of Stance width, Stick angle, Drag distance, Stick velocity and Ball speed. The data was analyzed by using Pearson's correlation coefficients was used to find out the interrelationship between the variables using SPSS. The finding reveals that the stance width has significant correlation with ball speed. Among the selected independent variables stance width and drag distance having highest correlation followed by stance width and stick angle.

Keywords: Biomechanics, Penalty Corner, Men, Max Traq, SPSS.

Introduction

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. Depending upon the nature of foul penalty corner is awarded, with penalty corner one has greater scoring opportunities, 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. (Viswanath & Kalidasan 2012).

Penalty corner execution can be separated into three progressive phases: the push -in, the trap and the strike. Kerr & Kevin (2002) opined that all over the entire penalty corner takes about 1.9 seconds and 2.3 seconds respectively for male and female players of national standards of Australia. It is essential that it is performed precisely as it offers an excellent scoring opportunity during the game. Biomechanics is the study of the mechanics of living things.

It demands knowledge of both biology and various branches of physics and engineering which comprises of mechanics. Biomechanics is a sciences that examined the internal and external forces acting on a human body and the effects produced by these forces. 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 rests 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, the phase three consists of a third attacker striking the moving ball towards the goal or another attacking player. Some researchers have focused on penalty corner push-in techniques in field hockey (Kerr & Ness, 2006 and Viswanath & Kalidasan 2012). Push-in part in penalty corner plays critical role in conversion of penalty corner. If push-in is with great speed, the striker has extra time before defender reach the penalty circle. However there is a paucity of research on the kinematics of the penalty corner push-in execution, for this purpose successful execution of the push-in is defined as pushing the ball accurately with in

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the 0.60 meters line in front of the first post and the unsuccessful execution is defined as ball which deviate beyond the 0.60 meters and limited to 2 meters is referred as a unsuccessful penalty corner push-in. The purpose of the study was to investigate the inter-relationship among the biomechanical factors in Penalty corner push-in.

Methods

Eighteen Men Hockey players who represented university were purposively selected from Tamil Nadu state for the study. The age of the subjects ranged from 18 to 28 years. The subjects had past playing experience of at least four years in hockey were taken as subjects. To acquire biomechanical data, with the assistance of technical person the high definition camera (Casio EX 10) was used to capture movements of push-in. The camcorder mounted at the height of one meter, placed 6 meters away perpendicular to the trajectory of the ball of the push in. The shutter speed of the camcorder was adjusted at (1/4000 of a second) in order to eliminate the

blurring effects while processing the recordings. A cage with the dimensions of 1.0 × 1.0 m at 4 control points was used to calibrate the space, in which the push-in was performed. After a 15 min standard warm-up session, participants perform the push-in from the right side of the field; three successful push-in was recorded. Players were told to push the ball as fast as they could, as if they were in actual game conditions. The Stance width, Stick angle, Drag distance, Stick velocity and Ball speed were taken as variable and digitized with the help of Max Traq software. Descriptive statistics and Pearson's correlation coefficients were applied to establish the relationships among the variables measured. Data were analyzed using SPSS (Statistical Package for Social Science) version 15.0. The level of significance was fixed at 0.05.

Results and Discussion

The descriptive statistics for biomechanical characteristics for all players are presented in the table below

Table 1. Mean and Standard Deviation of Biomechanical Characteristics on University Hockey Players

	N	Minimum	Maximum	Mean	Std. Deviation
Stance width	18	0.80	1.21	1.01	0.15
Stick angle	18	16.10	31.00	24.60	4.48
Drag distance	18	1.20	1.80	1.56	0.18
Stick velocity	18	3.90	5.50	4.82	0.39
Ball speed	18	14.99	17.88	16.21	0.98

Table 2. Correlation Matrix of Selected Biomechanical Variables and Ball Speed in University Hockey Players

	SW	SA	DS	SV	BS
SW	1	-.529*	.696**	.340	.686**
SA		1	-.345	-.143	-.373
DS			1	.376	.426
SV				1	.037
BS					1

*Significant at 0.05 level

** Significant at the 0.01 level

SW. – Stance width, SA – Stick angle, DS – Drag distance, SV- Stick velocity, B.S- Ball Speed.

It was evident from the above table –II correlation exists among the Hockey players, the result of the study reveals that the university hockey players, the stance width has significant correlation with ball speed. Among the selected independent variables stance width and drag distance having highest correlation followed by stance width and stick angle. Ball speed and stance width in penalty corner push-in play an important role in the success of the penalty corner execution, the findings were found to be consistent with the previous results of a study conducted by Kerr and Kevin (2002).

During the push-in, the body should be moved in a well developed kinematic chain in order to generate the necessary power. A wrong technique may also play an important role in increasing the risk factors for the injury.

Conclusions

From the present study it is concluded that, the stance width has significant correlation with ball speed. Among the selected independent variables stance width and drag distance having highest

correlation followed by stance width and stick angle.

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