

Biomechanical Study on Drag Flick in Field Hockey

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ABSTRACT

Field hockey is a game played with a ball and stick. In this game players attempt to score goals by hitting, pushing or flicking the ball with hockey sticks into the opposing team's goal. In field hockey the penalty corner was introduced for offences by defenders in the circle. In recent years, the innovation of drag flick becomes a vital part of teams attacking arsenal due to goal scoring opportunity. In the execution and conversion of drag flick, various factors are involved. Amongst all, biomechanical factor is one of the decisive factors which have been neglected by the Indian researchers. Thus, the present study was designed to reveal the related biomechanical factors of drag flick execution in penalty corner. For the purpose of this study, All India Interschool (3) and Senior State (2) level male hockey players were recruited using stratified random sampling method. The mean of All India Interschool players in age, height and weight were 21 yrs (SD 3), 162 cm (SD 7.55) and 54.67 kg (SD 5.03) and mean of Senior State players were 20 yrs (SD 1.41), 159.5 cm (SD 2.12) and 49.5 kg (SD 2.12), respectively. To obtain data, two high speed Canon Legria HF S10 camcorders operating at 60 Hz were used. The players and ball movements during the drag flick execution were recorded. Video footages were downloaded, slashed to desired footages and edited for biomechanical analysis. The selected biomechanical variables were ball velocity, acceleration, stick velocity at drag flick, displacement of ball, step length, contact time, contact length and segmental angles were shoulder angles, elbow angles, hip angle and knee angle. All variables were digitized with the help of Silicon Coach Pro7 motion analysis software. The acquired data of the variables were subjected to descriptive statistical analysis and computing t-test among All India Interschool and Senior State players. The results showed there were no significant differences among the groups at 0.05 level of significance.

Key Words: Field Hockey, Drag Flick, Penalty Corner, Ball Velocity, Acceleration and Biomechanics

INTRODUCTION:

Field hockey is a game played with a ball and stick. In this game players attempt to score goals by hitting, pushing or flicking the ball with hockey sticks into the opposing team's goal. In field hockey the Penalty Corner was introduced in 1908 for offences by defenders in the circle and the rules have been amended from time to time. In recent years, the penalty corner, particularly with the advent and popularization of the drag flick, has gained importance as a vital part of the game as a goal scoring opportunity. The innovation of drag flick becomes a vital part of teams attacking arsenal. It is imperative technique which makes the game more spectators orientated. The drag flick is especially common during penalty corners, and are used as a variant to the 'straight shot' or hit. The main difference between the drag flick and the hit is that the drag flick is classified in the rules of field hockey, as a push, which are allowed to be raised higher from a penalty corner first shot. On the other side it is the characteristic of drag flick that being allowed to be lifted at goals are often nearly as powerful as a hit.

In recent years sports performance is not just a matter of basic skills, rather host of variables influence it. Research development in the field of Sports Science such as Kinesiology, Biomechanics, Kineanthropometry, Excise Physiology, Psychology etc. have been barrowed and applied in games and sports to enhance performance of athletes.

Scientific method especially Biomechanics has been introduced for determining abilities and maximizing them through training, modifying and improving previous technique and developing new techniques, equipments, skills etc. In biomechanics extensive research has been conducted into the nature of the interaction of arms and legs in walking, running, throwing, human body segment inertial properties, angular momentum analyses, kinematics of jumping etc. Consequently, biomechanics has emerged as an important area of scientific investigation in a variety of disciplines. Included among these are automobile safety, biomedical engineering, ergonomics, exercise science, orthopedic surgery, physical rehabilitation and sports.

The drag flick becomes extremely important aspect of field hockey because it gives a clear chance to convert it into a goal. However, there is still a lack of scientific research done on field hockey as compared to other sports. Researcher unable to locate a single study related to drag flick penalty corner in field hockey this clearly indicates that area is neglected by researcher. It will be of great interest for sports scientist, hockey coaches and players/ specialist to study the mechanics involved



in the drag flick execution. This would provide information that will enhance the performance of drag flick specialists. Hence, this study is purpose to analyze the drag flick of All India Intersarsity and Senior State with different biomechanical variables and segmental angles and observed the mechanical efficiency during the execution of penalty corner.

METHODS:

Participants:

Five elite hockey drag flickers of All India Intersarsity and Senior State levels players were randomly selected for the study. All the selected players had readily agreed and volunteered to act as subject for the study. The mean of All India Intersarsity players in age, height and weight were 21 yrs (SD 3), 162 cm (SD 7.55) and 54.67 kg (SD 5.03) and mean of Senior State players were 20 yrs (SD 1.41), 159.5 cm (SD 2.12) and 49.5 kg (SD 2.12), respectively.

Equipments and Facilities:

The experimental apparatus used in this research work were two camcorders, tripods, measuring tap, lime power, markers, hockey sticks, hockey balls and hockey goal post.

Data Acquisition:

To acquire biomechanical data, high speed two Canon Legria HF S10 camcorders were used to capture movements of drag flick execution in penalty corner. One camcorder mounted at a height of 5 feet, placed at 8 meters away perpendicular to the penalty spot (top of 'D') at frontal axis and the other was placed above the goal post at sagittal axis. The shutter speed of the camcorder was adjusted at a higher speed (1/1000 of a second) in order to eliminate the blurring effects while processing the recordings. The subjects were asked to perform three drag flick execution of penalty corner.

Data Analysis:

After recording, all the video footages were downloaded into personal computer and slashed to desired footages. Considering the clarity of the footage, accuracy bit and experts judgment only one

best of three for each drag flick execution of penalty corner were selected and subjected to biomechanical analysis. The ball velocity, acceleration, step length, stick velocity at drag flick, displacement of ball, contact time, contact length, shoulder angles, elbow angles, hip angle and knee angle were taken as variables and digitized with the help of Silicon Coach Pro7 motion analysis software.

Statistical methods:

The acquired data of the variables were subjected to descriptive statistical analysis i.e. mean, standard deviation and t-test.

RESULTS:

The results of the statistical analysis of mean, standard deviation and t test are presented in the following tables.

Table 1: Descriptive analysis of the Selected Biomechanical Variables

Variables	Groups	Mean	SD	Calculated t
L	II	99	08	33
	S	39	65	
T	II	59	05	39
	S	53	10	
VD	II	74	29	19
	S	11	11	
L	II	89	15	90
	S	92	26	
V	II	1.85	86	74
	S	0.99	33	
DB	II	4.47	15	30
	S	4.63	11	
cc.	II	3.67	81	63
	S	5.22	59	

Tab. 't' 3.18 at 0.05 level of significance

CL= Contact Length (m)

SD = Standard Deviation

CT= Contact Time (s)

AII = All India intervarsity

SVD= Stick Velocity at drag Flick (m/s)

SS = Senior State

SL=Step Length (m)

BV= Ball Velocity (m/s)

DB= Displacement of Ball (m)

Acc. = Acceleration (m/s²)

The table-1 indicated that onset phase of drag flick penalty corner execution there were no significant differences observed among the All India Intersivity and Senior State at the biomechanical variables. It is due to that all calculated 't' values are less than tabulated 't' value 0.05 level of significance. The table also revealed that All India Intersivity players have high deviation in Acceleration (33.67 ± 1.81) and low deviation in CT (0.59 ± 0.05). On the other side the Senior State players also have high deviation in Acceleration (36.22 ± 8.59) but, a minute differences in low deviation of CT (0.53 ± 0.10), SVD (2.11 ± 0.11) and LDB (14.63 ± 0.11).

Table 2: Descriptive analysis of the Selected Segmental Angles

variables	roups	mean	D	alculated t
SA	II	09	9.29	71
	S	9	5.77	
SA	II	22	0.58	35
	S	12	49	
EA	II	34.67	02	84
	S	36	41	
EA	II	12.33	5.37	73
	S	08	83	
A	II	5	73	
	S	5	24	
A	II	56.67	51	20
	S	51	41	

Tab. 't' 3.18 at 0.05 level of significance

RSA= Right Shoulder Angle SD = Standard Deviation
LSA= Left Shoulder Angle AII = All India Intersarsity
REA= Right Elbow Angle SS = Senior State
LEA= Left Elbow Angle
HA = Hip Angle
KA= Knee Angle

The reading of table-2 showed that during the execution of drag flick penalty corner, the calculated 't' is less than tabulated 't'. This indicates there were no significant differences among the All India Intersarsity and Senior State at the all segmental angles. This table also indicated that All India Intersarsity players have high deviation in RSA (109 ± 19.29) and low deviation in HA (26 ± 1.73). The Senior State players also have high deviation in RSA (99 ± 36.77) and low deviation in two angles REA (136 ± 1.41) and KA (161 ± 1.41).

DISCUSSION:

The result of the present study revealed that there were no significant differences among the All India Intersarsity and Senior State players during the execution of drag flick penalty corner at the biomechanical variables. The finding of study supported with the study of Kerr and Ness (2006) examined the 3-D kinematics of the field hockey penalty corner push in. The insignificant differences among the groups of on ball velocity may be due to increasing the movement of shoulder relative to the hip during the swing. According to Joyee et al (2010) studied on Methodological consideration for the 3-D measurement of the x factor and lower trunk movement in golf.

The result also revealed that there is insignificant difference among the All India Intersarsity and Senior State during the execution of drag flick penalty corner at the segmental angles. The outcome of the study endeavor the study of Hussain et al on analysis of arm movement in badminton forehand long and short service.

CONCLUSION:

On the basis results obtained, it may be concluded that there were no significant differences found among the All India intervarsity and Senior State players at all the biomechanical variables as well as segmental angles at 0.05 level of significance.

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