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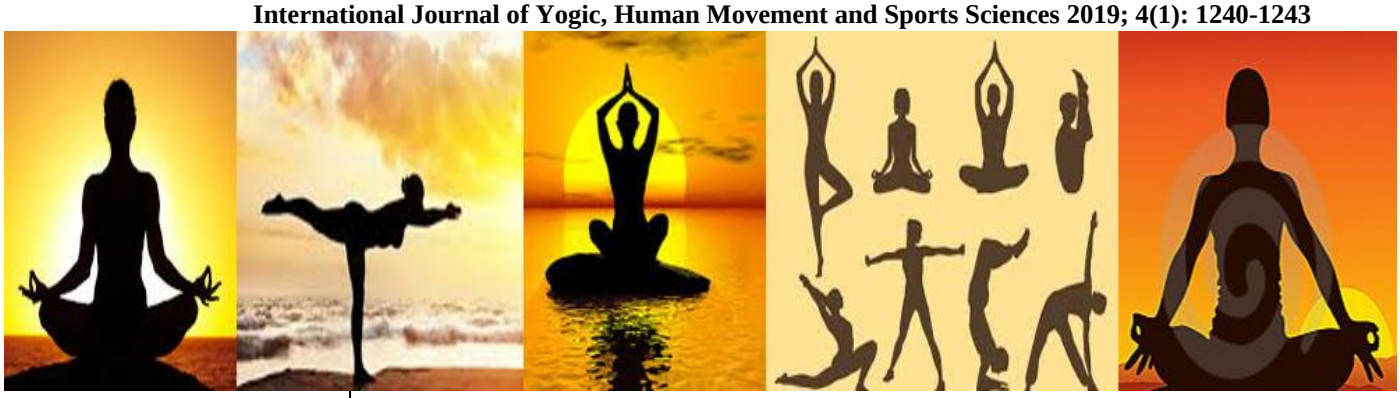

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Rajdeep Kaur
M.Phil Scholar, Department of Physical Education Punjabi University Patiala, Punjab, India

Dr. Amarpreet Singh
Assistant Professor, Department of Physical Education Punjabi University Patiala Punjab, India

Correspondence
Rajdeep Kaur
M.Phil Scholar, Department of Physical Education Punjabi University Patiala, Punjab, India

Relationship of kinematical analysis and performance of scoop in hockey

Rajdeep Kaur and Dr. Amarpreet Singh

Abstract
The purpose of the present study was to investigate the relationships between the kinematic analysis and performance of hockey players. Total Five Female Hockey players were select as a sample who had represented at inter university level were selected as a sample on the basis of performance in preceding competition. The age of the samples was between 21 to 25 years. Selection of Variables: angle of elbow joint, angle of knee joint and linear acceleration of hockey stick at the time of scoop and performance of hockey players. The Kinematic Analysis of hockey players mean, standard deviation and Karl Pearson's product moment coefficient correlation were employed with the help of statistical package of SPSS. The level of significance was set at 0.05. The outcome of the study shows that significant relationship with performance (.951, .955) of hockey players in angle of elbow joint & angle of knee joint variables and insignificance relationship with performance (-0.29) linear acceleration of hockey stick at the time of scoop.

Keywords: Kinematic, elbow angle, angle of knee joint, linear acceleration, etc.

Introduction
Biomechanics is the science concerned with the internal and external forces acting on the human body and the effects produced by these forces. More specifically, Biomechanics is the study of human movement and describes the forces which cause this movement. Biomechanics can play a crucial role in both injury prevention as well as performance enhancement. It is important for athletes of all ages and skill levels to understand the importance of education to develop proper mechanics. Education can come in multiple forms, but with the emphasis on the visual learner in today's society, visual feedback is one of the most effective ways to modify an athlete's technique and allow them to perform at the most efficient level possible. An athlete's ability to perform efficiently and injury free are two key features in performance outcome and can both be improved with Biomechanical analysis. " (Ardanynazlim, 2012) [1].
Biomechanical analysis can benefit of all ages and skill levels Hockey players. Whether you are a weekend runner or a high-performance sprinter, biomechanical analysis can be beneficial to you as it will allow you the opportunity to develop more efficient movement patterns. This can benefit the weekend runner by allowing them to increase their distance and run pain-free, while the high-performance sprinter can benefit from a more efficient running stride and allow them to shave milliseconds of off their personal best time. (Kimber, 2017) [3].

Biomechanical characteristics of field hockey
Field hockey is a team sport in which the aim is to put the ball into the opponent's goal using hockey sticks. A field hockey match consists of two 35-minute halves during which two teams of 11 players (men or women) compete against each other. The team which scores more goals wins. Field hockey games can be played outdoors, on a 91 × 55 m field covered with artificial grass, or indoors following some rule modifications forced by gym sizes. Players in a team are divided into such formations as the goalkeeper, defenders, midfielders and forwards, with each formation attempting to accomplish different tasks. The goalkeeper and defenders protect their own goal; the forwards try to score goals and the midfielders create offensive actions and assist the defenders. A field player during a field hockey game covers an average distance of 10 km, although there are differences between formations: 9.3 km for defenders, 10.3 km for

midfielders, and 10.8 for attackers. The longest distance is covered by walking or jogging (around 9 km altogether), and the shortest distance by sprinting (around 250 m). The forwards are the fastest, and defenders are the slowest players. An average HR for a field hockey player is 135 bpm, and there are no significant differences in HR between the formations [6]. The main technical elements of field hockey are dribbling, passing and shooting. Contrary to ice hockey, where the puck can be touched with both sides of the stick, in field hockey the ball can be only played with the flat side. This rule together with the short length of the stick (95 cm) forces a field hockey player to adapt a special posture. To dribble the ball players must flex their lower limbs slightly in all joints, bend the lumbar spine forward in the sagittal plane and to the right in the frontal plane, and set the right arm in external rotation and the left arm in internal rotation. Shots and passes in field hockey can be performed in a number of different ways: drives, flicks, scoops, pushes and slap shots. In this study only two of them are analyzed: drives and drag flicks. A drive in field hockey is similar to a golf swing. It demands, however, further flexion of both the lumbar spine and the lower limb joints due to the length of the stick. By rotating the trunk in the transverse plane, the player takes a backswing with the arms and then makes a shot by swinging the arms forward and rotating the trunk to the left. Performing a drag flick is more demanding for the body (Kawałek & Ogurkowska 2014) [2].

The international hockey is a highly competitive game. Winning and losing is a matter of application of skills and hard work. It has been observed that the national team despite the great hard work has not been able to consistently maintain the top position in international hockey. There is a need to improve the basic and special skills. No one study was conducted on scoop skill, so that's way I'm selecting the biomechanical Analysis of Scoop in Hockey. This study was conducted to understand the biomechanics involved in the process of scoop which is essential and is necessary to develop and improve the quality of hockey in our country.

Statement of the Problem

The Problem entitled as "Relationship of kinematical analysis and performance of scoop in hockey".

Methodology and Procedure:

Selection of Subjects

Total five female Hockey players were selected as a sample that had represented at Inter University level from Punjabi University Patiala. The age of the samples were ranged from 21 to 25 years.

Selection of Variables

- Angle elbow joint at the time of scoop
- Angle of knee joint at the time of scoop
- Linear acceleration of hockey stick at the time of scoop

Criterion Measure

The criterion measure for this study was based on the performance of the female hockey players. Total ten attempts were given to each subject. The performance of each scoop was measured and recorded accurately.

The selected biomechanical variables such as angle of elbow joint at the time of scoop, angle of knee joint at the time of scoop, linear acceleration of the hockey stick at the time of scoop.

Filming protocol

Motion capture technique was used in this study. To recorded the video of the five female hockey players, while they performing the scoop digital video camera (50 fps) was used by a professional photographer. After obtaining the recorded video, the video was analyzed through quintic coaching v-17 software approved by Human kinetics. First video will digitized through quintic coaching v-17 software.

Motion capture technique/Digital videography was used to analysis the kinematic variables of female hockey players. Digital video camera CASIO EX-FH 100 (50 fps) was used for videography of female hockey players performance.

Administration of the test

Five female hockey players who had represented at interuniversity level were selected as a sample. All the selected subjects were asked to perform the scoop with their full potential and accurate technique. The players were well directed, informed and prepared for the study. Five chances were given to every hockey players. They were asked to perform the scoop in the natural way as they actually perform. It was ascertained that subjects possess reasonable level of technique. Players were video graphed with systematic filming method as required. Motion capture technique was used in this study. To record the video of the female hockey players, while them performing the scoop, digital video camera (50 fps) was used by a professional photographer. The performance of the subject was recorded with stroboscopic effect from while they perform scoop Digital Video camera was placed 5 meter away at the perpendicular to the plane of motion.

Statistical technique

To find out the relationship of selected kinematical variable with performance of hockey players in Karl Pearson product moment coefficient correlation statistical technique test was used with the help of SPSS software. The level of significance set at 0.05.

Results

Table 1: Relationship between angle of elbow joint hockey player with performance

Trials	Variables	Mean	Standard Deviation	Correlation (R) Values
50	Angle of elbow joint	155.513	5.414	
50	Performance	2.780	2.112	.951*

'r' 0.05 (48)=.273

*=significant at .05 level of significance

Table & figure 1 showes that the mean value of angle of elbow joint of hockey player was 155.513, whereas the standard deviation (SD) of angle of elbow joint of hockey player was 5.414 respectively. At the time of calculation of the relationship between angle of elbow joint with performance of hockey player the r value was .951. The data does suggest that there was significant relationship between angle of elbow joint with performance of hockey player.

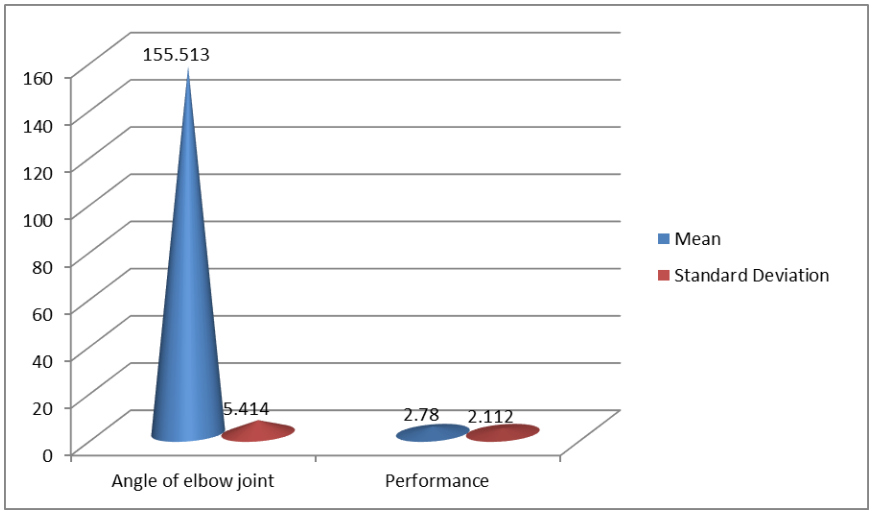

Fig 1: Mean and Standard Deviation Values of Hockey Player Angle of Elbow Joint and Performance

Table 2: Relationship between Angle of Knee Joint Hockey Player With Performance

Trials	Variables	Mean	Standard Deviation	Correlation (r) Values
50	Angle of knee joint	146.043	8.314	.955*
50	Performance	2.780	2.112	

'r' 0.05 (48)=.273
*=significant at .05 level of significance

Table & figure 2 showes that the mean value of angle of knee joint of hockey player was 146.043, whereas the standard deviation (SD) of angle of knee joint of hockey player was 8.314 respectively. At the time of calculation of the relationship between angle of knee joint with performance of hockey player the r value was .955. The data does suggest that there was significant relationship between angle of knee joint with performance of hockey player.

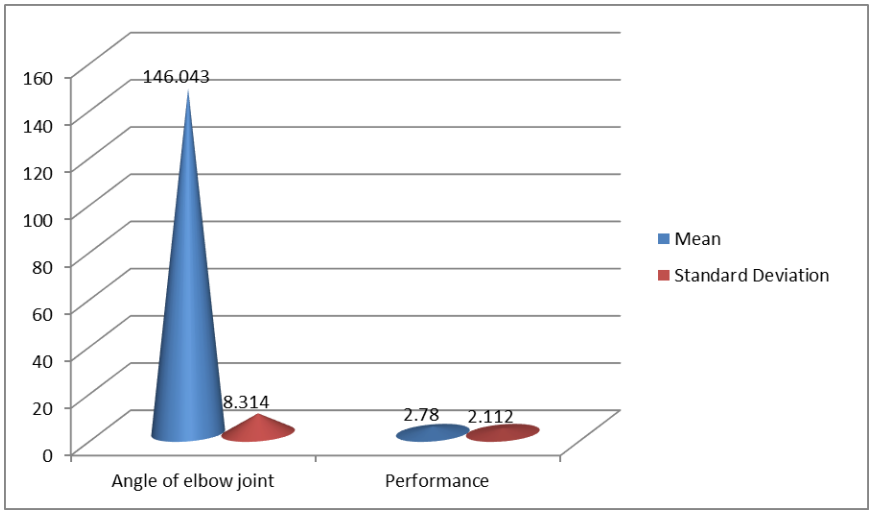

Fig 2: Mean and Standard Deviation Values of Hockey Player Angle of Knee Joint and Performance

Table 3: Relationship between Hockey Stick Linear Acceleration in Scoop with Performance

Trials	Variables	Mean	Standard Deviation	Correlation (r) Values
50	Linear acceleration of hockey stick	34.856	22.843	-.029
50	Performance	2.780	2.112	

'r' 0.05 (48)=.273
*=significant at .05 level of significance

Table & figure 3 showes that the mean value of hockey stick linear acceleration of hockey player was 34.856, whereas the standard deviation (SD) of hockey stick linear acceleration of hockey player was 22.843 respectively. At the time of calculation of the relationship of hockey stick linear acceleration with performance of hockey player the r value was -.029. The data does suggest that there was insignificant relationship between hockey stick acceleration velocity of hockey player with performance of hockey player.

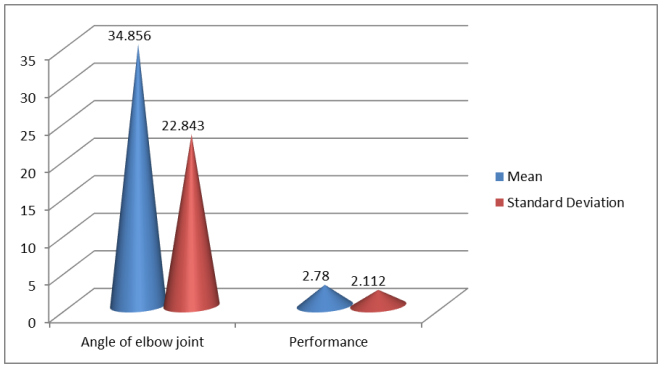

Fig 3: Mean and Standard Deviation Values of Hockey Player of Hockey Stick linear Acceleration and Performance

Discussion and conclusion of finding

According to the finding of the study table 1 shows that there was significant relationship between elbow angle with scoop performance of hockey players. According to the analysis of the study table 2 shows that there was significant relationship between knee angle with scoop performance of hockey players. On the behalf of results table 3 shows that there was insignificant relationship between linear acceleration of hockey stick with scoop performance of hockey players.

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