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## ANALYSIS OF KINANTHROPOMETRIC CHARACTERISTICS AND PUSH-IN BALL SPEED IN HOCKEY

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### Abstract

The aim of the present study was to analyse the selected kinanthropometric characteristics and push-in ball speed in hockey. To achieve the purpose of this study 24 male Hockey players were selected purposively those who represented university from Tamil Nadu state, India. The subjects had past playing experience of at least four years in hockey. The age of the subjects ranged from 18 – 28 years. Written informed consent was obtained from players. The ethical clearance for this project was obtained from the Human Research Ethics Committee of the Bharathidasan University. The selected kinanthropometric variables namely height, weight, arm length, leg length, humerus breadth, femur breadth, arm girth relax and calf girth were assessed by using standard ISAK testing protocol. To obtain ball speed, a high speed Casio EX 10 camera operating at shutter speed of 1/8000, with a frame rate of 240 frames per second was used. The collected data was statistically analysed by using descriptive statistics and pearson's correlation coefficients. The result reveals that the university hockey players, the arm length and arm girth relax has significant relationship with push-in ball speed.

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### INTRODUCTION

Hockey is an intermittent endurance sport involving short sprinting as well as movement with and without ball (Manna et al. 2009). In current scenario the game Field Hockey requires lots of Physiological and Physical demands to compete in Olympics. Physical characteristics and body composition have been known to be fundamental to excellence in athletic performance (Mathur 1985), (Mandeep Singh 2010). Today it has been widely accepted by the experts that top performance in sports is achieved if an athlete possesses the basic anthropometric characteristics suitable for the event. Therefore, the athletes in a particular sport must possess such typical characteristics which are of advantage to their performance. Body composition

also makes an important contribution to an individual's level of physical fitness for performance, particularly in such sports that require one to carry one's body weight over a distance, which is facilitated by a large proportion of active tissue (muscle) in relation to a small proportion of fat tissue (Jain 2004). Anthropometric measurements relevant to human movement gained formal recognition as a discipline ISAK in 1986. Anthropometrists of all continents have participated in several major multidisciplinary studies that are being or have been conducted to assess the physical characteristics of people. Kinanthropometry has been defined as the quantitative interface between human structure and function (Ross, Drinkwater, Bailey, Marshall, Leahy, 1980). This interface is examined through the measurement and analysis of age, body, size, shape,

proportion, composition and maturation as they relate to gross body function. The athletes in a particular sport must possess such typical characteristics which are of advantage to their performance. As far as the field hockey is concerned, interrelationship of kinanthropometric characteristics and ball speed in penalty corner push-in remained less reported, especially in Indian context. To fulfil the lacuna of knowledge, the present study was planned with the hypothesis that there would be significant relationship between kinanthropometric characteristics and push-in ball speed.

## METHODS

### Participants

To achieve the purpose of this study 24 male Hockey players were selected purposively those who represented university from Tamil Nadu state India. The subjects had past playing experience of at least four years in hockey. The age of the subject ranged from 18 – 28 years. Written informed consent was obtained from players. The ethical clearance for this project was obtained from the Human Research Ethics Committee of the Bharathidasan University.

### Protocol

Using ISAK accredited methods, a profile of 9 measurements such as height, weight, arm length, leg length, humerus breadth, femur breadth, arm girth relax and calf girth was collected from each player. The selected kinanthropometry measurement were taken by trained and qualified level one anthropometrist of ISAK. The equipment used for taking measurement included Stadiometer, weighing scale, small sliding calliper and anthropometric tape. The height and weight were measured with stadiometer and weighing scale respectively. The arm length was measured from acromiale to datyilion is made from the point of the shoulder to the tip of the mettle finger. The linear distance between the mostlateral aspect of the lateral humeral epicondyle and the most medial aspect of the medial humeral epicondyle, was measured with the small sliding calliper to measure elbow diameter. The knee diameter was measured between the most lateral aspect of the lateral femoral epicondyle and the most medial aspect of the medial femoral epicondyle. Arm girth was measured in the level of the Mid – acromiale radiale, the subject standing relaxed with the arms hanging by the sides, slightly abducted to allow the tape to be passed around the arm.

To obtain ball speed, a high speed Casio EX 10 camera operating at shutter speed of 1/8000, with a frame rate of 240 frames per second was used. The camera was placed on a tripod at the height of 1.2

meter on the right angle i.e. transverse to the trajectory of the ball of the push in performance. Each player was recorded performing the push-in until three accurate trials i.e. within 0.70 m each side of the trapper were performed. The accurate trial with the greatest ball speed was deemed as the best push-in trial for each player. The best push-in trial was analysed through the Max traq software.

## STATISTICAL ANALYSIS

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.

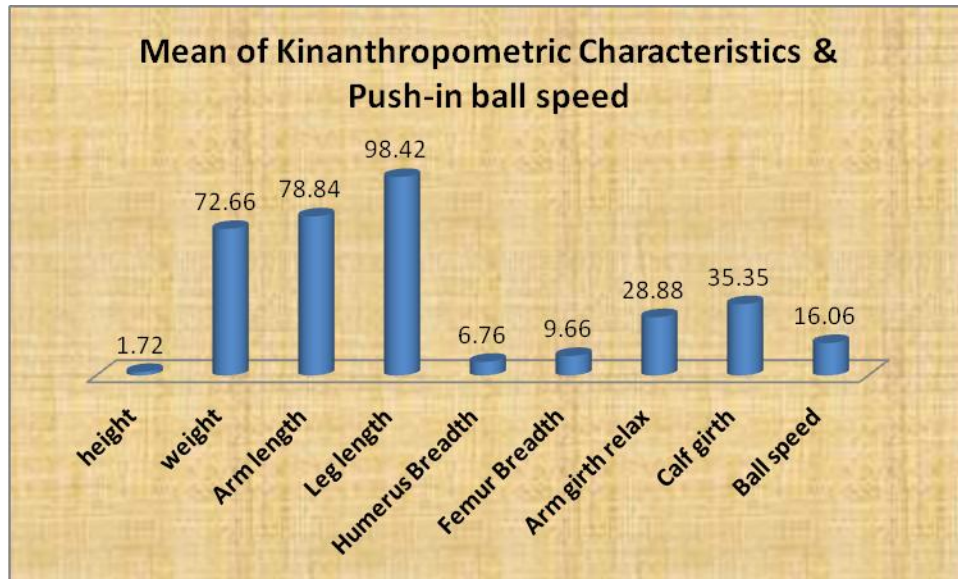
## RESULT AND DISCUSSION

The descriptive statistics for kinanthropometric characteristics & push-in ball speed for all players are presented in the table below

**TABLE – I**  
**DESCRIPTIVE STATISTICS OF**  
**KINANTHROPOMETRIC CHARACTERISTICS**  
**AND PUSH-IN BALL SPEED OF UNIVERSITY**  
**HOCKEY PLAYERS**

| Variables            | N  | Minimum | Maximum | Mean  | SD (±) |
|----------------------|----|---------|---------|-------|--------|
| Height (mts)         | 24 | 1.64    | 1.85    | 1.72  | 0.05   |
| Weight (kg)          | 24 | 60.00   | 87.00   | 72.66 | 8.66   |
| Arm length (cm)      | 24 | 70.53   | 85.40   | 78.84 | 4.37   |
| Leg length (cm)      | 24 | 88.40   | 107.80  | 98.42 | 4.70   |
| Humerus Breadth (cm) | 24 | 6.30    | 7.40    | 6.76  | 0.33   |
| Femur Breadth (cm)   | 24 | 9.10    | 10.20   | 9.66  | 0.34   |
| Arm girth relax (mm) | 24 | 23.00   | 32.20   | 28.88 | 2.56   |
| Calf girth (mm)      | 24 | 30.40   | 39.20   | 35.35 | 2.80   |
| Ball speed (m/s)     | 24 | 14.99   | 17.88   | 16.06 | 0.94   |

The table 1 explains the mean and standard deviation of kinanthropometric characteristics and push-in ball speed of university hockey players.



**FIGURE: I MEAN VALUES OF ANTHROPOMETRIC CHARACTERISTICS ON UNIVERSITY HOCKEY PLAYERS**

**TABLE – II  
INTER-RELATIONSHIP OF SELECTED KINANTHROPOMETRIC VARIABLES AND PUSH-IN BALL SPEED AMONG MALE HOCKEY PLAYERS**

| Variables    | Ht | Wt    | A.L    | L.L    | H.B   | F.B    | A.G.R  | C.G    | B.S    |
|--------------|----|-------|--------|--------|-------|--------|--------|--------|--------|
| <b>Ht</b>    | 1  | .497* | .768** | .887** | -.099 | .241   | .194   | .113   | .357   |
| <b>Wt</b>    |    | 1     | .330   | .230   | -.051 | .691** | .735** | .736** | -.120  |
| <b>A.L</b>   |    |       | 1      | .780** | .252  | .267   | -.116  | .137   | .537** |
| <b>L.L</b>   |    |       |        | 1      | .078  | .228   | -.042  | -.044  | .455*  |
| <b>H.B</b>   |    |       |        |        | 1     | .495*  | -.311  | .259   | .227   |
| <b>F.B</b>   |    |       |        |        |       | 1      | .516** | .799** | -.017  |
| <b>A.G.R</b> |    |       |        |        |       |        | 1      | .648** | -.492* |
| <b>C.G</b>   |    |       |        |        |       |        |        | 1      | -.208  |
| <b>B.S</b>   |    |       |        |        |       |        |        |        | 1      |

\*Significant at 0.05 level \*\* significant at the 0.01 level

Ht. – Height, Wt.-Weight, A.L – Arm length, L.L – Leg length, H.B – Humerus breadth, F.B – Femur breadth, A.G.R- Arm girth relax, C.G – Calf girth, 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 arm length, leg length and arm girth relax has significant correlation with ball speed. The other inter-relationship between the selected variables height and leg length having highest correlation followed by femur breadth & calf girth, arm length & leg length,

height & arm length, weight & calf girth, weight & arm girth relax, weight & femur breadth, arm girth relax and calf girth.

It is reported that a battery of anthropometric and morphological tests can distinguish between players of different ability in the same sport (Keogh 1999) and in field Hockey (Singh et al. 2010). The finding reveals that the arm length, leg length and arm girth relax has

significant correlated with ball speed which is not agreement with other literature (Manna 2009). The other study reported that the taller soccer players are most suitable for the central defense and central attack (Reilly, Bangsbo, & Franks, 2000). Compared to previous research the defenders has long arm span and arm length when compare to midfielders and attackers, it helps to tackle the ball from the opponent easily and to block the through pass, the hypothesis of the other literature stated that field hockey players will have longer upper limb length (Francis 2011).

### CONCLUSIONS

From the present study it is concluded that, the arm length and arm girth relax has significant relationship with push-in ball speed.

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