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Influence of anthropometric measurements on motor performance of hockey players

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Abstract
Introduction: In today's age of scientific knowledge man is making rapid progress in all walks of life and it is a true in the area of games and sports. Sports performance is indeed an aspect of complex human performance, which has several dimensions. Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players. To succeed in sport, players need the optimal combination of technical, tactical, physical, physiological, anthropometric and psychological variables. Indeed, many experts in the field of sports sciences such as coaches, managers and scientists believe that the success of this sport can be associated with anthropometric characteristics of players. Anthropometric measures and motor abilities provide important information about normality of body size, health condition, and body shape.
Purpose: To know the influence of anthropometric measurement on motor performance of Hockey players.
Methodology: In order to achieve the purpose of the study forty inter-university Hockey male players were selected as the subjects. During universities coaching camp of Karnatak university, Davangere university, Manglore university and Banglore university from the data pertaining to the anthropometric measurements such as height, weight, arm length, fore arm length, leg length, upper arm girth, fore arm girth, chest girth, thigh girth, calf girth, shoulder width, waist width, knee width and motor performances such as flexibility, reaction time, balance, agility, leg power and tested with 'r' value (correlation) statistical technique to test the hypothesis of the study.
Results: The statistical analysis shows coefficient of correlation in influence of anthropometric measurements on motor performance of hockey players.
Conclusion: In view of the finding and limitation of the study, the physical qualities such as flexibility, reaction time, balance, agility and leg power are positively correlated with anthropometric measurements of hockey players. The result of the study shows that the selected physical qualities contribute in anthropometric measurements of hockey players.

Keywords: flexibility, leg power, agility, reaction time, balance.

Introduction
In today's age of scientific knowledge man is making rapid progress in all walks of life and it is a true in the area of games and sports. Sports performance is indeed an aspect of complex human performance, which has several dimensions. Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players. To succeed in sport, players need the optimal combination of technical, tactical, physical, physiological, anthropometric and psychological variables. Indeed, many experts in the field of sports sciences such as coaches, managers and scientists believe that the success of this sport can be associated with anthropometric characteristics of players. Anthropometric measures and motor abilities provide important information about normality of body size, health condition, and body shape.
The identification of physical characteristics in a sport modality contributes to its success and enables to spot differences among athletes of different modalities, which is of great interest for both sport coaches and scientists. Sports performance is based in a complex and intricate diversity of variables, which include physical both general and specific, conditions, psychological and body factors. The relationship between morphological variables and sports performance is the object of study of anthropometry and is an important element to be analyzed.

Scientists define anthropometric measurements as the study of human body measurements and its different parts and revealing its structural differences. Anthropometric measurements depend on calculating the amounts of external body structures like heights, widths, and circumferences. The importance of anthropometric measurements in physical education can be summarized as the important factor for selection process of players. Anthropometric measurements also contribute to the refining of athletes' physical skills starting with the junior stage until the Olympic level. Therefore, anthropometric and morphological requirements came into seen as a decisive factor in many sports and were also linked to many physical abilities Additionally, Anthropometric measurements became very important in talent identification and a major predictor of success in competitive sport.

2. Methodology

In order to achieve the purpose of the study forty inter-university Hockey male players were selected as the subjects. During universities coaching camp of Karnatak university, Davangere university, Manglore university and Banglore university from the data pertaining to the anthropometric measurements such as height, weight, arm length, fore arm length, leg length, upper arm girth, fore arm girth, chest girth, thigh girth, calf girth, shoulder width, waist width, knee width and motor performances such as flexibility, reaction time, balance, agility and leg power

3. Statistical Analysis

The collected data from anthropometric measurements and physical qualities were put in to statistical analysis coefficient of correlation to find out the influence of anthropometric measurement on motor performance of Hockey players.

4. Results and Discussion

Table 1: Shows the minimum, maximum, mean and standard deviation value of variables selected for the study

Sl. No.	Variables	Minimum	Maximum	Mean	Standard Deviation
1	Flexibility	1.50	26.00	10.13	6.70
2	Reaction time	17.00	28.21	22.22	3.34
3	Balance	0.20	6.58	2.42	1.46
4	Agility	8.23	12.00	10.20	0.96
5	Leg power	1.70	2.30	1.96	0.15
6	Height	157.00	184.00	168.55	7.05
7	Weight	42.00	84.00	59.40	9.31
8	Arm length	67.00	82.00	74.72	3.66
9	Forearm length	43.00	55.00	47.02	2.53
10	Leg length	77.00	99.00	87.55	5.52
11	Upper arm girth	23.00	33.00	27.96	2.61
12	Forearm girth	22.00	29.00	25.52	1.48
13	Chest girth	79.50	105.00	88.87	5.21
14	Thigh girth	42.00	61.00	49.19	4.26
15	Calf girth	30.00	38.00	33.24	2.39
16	Shoulder width	35.00	49.00	40.22	3.09
17	Waist width	25.00	41.00	31.77	4.78
18	Knee width	7.40	12.00	9.32	0.99

The above table shows the, minimum, maximum, mean and standard deviation of selected variables of flexibility 1.50, 26.00, 10.13 and 6.70, reaction time 17.00, 28.21, 22.22 and 3.34, balance .20, 6.58, 2.42 and 1.46, agility 8.23, 12.00, 10.20 and .962, leg power 1.70, 2.30, 1.96 and .15, height 157.00, 184.00, 168.55 and 7.05, weight 42.00, 84.00, 59.40 and 9.31, arm length 67.00, 82.00, 74.72 and 3.66, forearm length 43.00, 55.00, 47.02 and 2.53, leg length 77.00, 99.00, 87.55 and 5.52 upper arm girth 23.00, 33.00, 33.00 and 2.61, fore arm girth 22.00, 29.00, 25.52 and 1.48, chest girth 79.50, 105.00, 88.87, and 5.21, thigh girth 42.00, 61.00, 49.19, and 4.26, calf girth 30.00, 38.00, 33.24 and 2.39, shoulder width 35.00, 49.00, 40.22 and 3.09,waist width 25.00, 41.00, 31.77 and 4.78, and knee width 7.40, 12.00, 9.32 and .99 respectively.

Table 2: Shows the relationship between flexibility and selected anthropometric measurements

Sl. No.	Variables	Correlation co-efficient
1	Flexibility and Height	0.33**
2	Flexibility and Weight	0.26**
3	Flexibility and Arm length	0.02**
4	Flexibility and Forearm length	0.24
5	Flexibility and Leg length	0.28**
6	Flexibility and Upper arm girth	0.36**
7	Flexibility and Forearm girth	0.22**
8	Flexibility and Chest girth	0.15**
9	Flexibility and Thigh girth	0.16
10	Flexibility and Calf girth	0.14*
11	Flexibility and Shoulder width	0.21**
12	Flexibility and Waist width	0.24*
13	Flexibility and Knee width	0.00**

The above table shows the relationship of selected anthropometric measurements on flexibility of hockey male players. There is significant relationship between flexibility and height (r = 0.39), weight (r = 0.26), arm length (r = 0.02), leg length (r = 0.28), upper arm girth (r = 0.36), forearm girth (r = 0.22), chest girth (r = 0.15), calf girth (r = 0.14), shoulder width (r = 0.21), waist width (r = 0.24), knee width (r = 0.00). But there is no significant relationship between forearm length (r = 0.24), thigh girth (r = 0.16).

Table 3: Shows the relationship between reaction time and selected anthropometric measurements

Sl. No.	Variables	Correlation co-efficient
1	Reaction time and Height	0.47**
2	Reaction time and Weight	0.30**
3	Reaction time and Arm length	0.26
4	Reaction time and Forearm length	0.03**
5	Reaction time and Leg length	0.15**
6	Reaction time and Upper arm girth	0.01*
7	Reaction time and Forearm girth	0.27**
8	Reaction time and Chest girth	0.20**
9	Reaction time and Thigh girth	0.43**
10	Reaction time and Calf girth	0.25*
11	Reaction time and Shoulder width	0.02*
12	Reaction time and Waist width	0.20
13	Reaction time and Knee width	0.35**

The above table shows the relationship of selected anthropometric measurements on reaction time of hockey male players. There is significant relationship between reaction time and height (r = 0.47), weight (r = 0.30), forearm length (r = 0.03), leg length (r = 0.15), upper arm girth (r = 0.01), forearm girth (r = 0.27), chest girth (r = 0.20), girth (r = 0.43), calf girth (r = 0.25), shoulder width (r = 0.20), knee width (r = 0.35). But there is no significant relationship between and arm length (r = 0.28), waist width (r = 0.20) and reaction time.

Table 4: Shows the relationship between balance and selected anthropometric measurements

Sl. No.	Variables	Correlation co-efficient
1	Balance and Height	0.15
2	Balance and Weight	0.22**
3	Balance and Arm length	0.04**
4	Balance and Forearm length	0.03**
5	Balance and Leg length	0.23**
6	Balance and Upper arm girth	0.25**
7	Balance and Forearm girth	0.09**
8	Balance and Chest girth	0.14**
9	Balance and Thigh girth	0.31**
10	Balance and Calf girth	0.33**
11	Balance and Shoulder width	0.24**
12	Balance and Waist width	0.43**
13	Balance and Knee width	0.06

The above table shows the relationship of selected anthropometric measurements on balance of hockey male players. There is significant relationship between balance and weight (r = 0.22), arm length (r = 0.04), forearm length (r = 0.03), leg length (r = 0.23), upper arm girth (r = 0.25), forearm girth (r = 0.09), chest girth (r = 0.14), thigh girth (r = 0.31), calf girth (r = 0.33), shoulder width (r = 0.24), waist width (r = 0.43). But there is no significant relationship between height (r = 0.15), knee width (r = 0.06) and balance.

Table 5: Shows the relationship between agility and selected anthropometric measurements

Sl. No.	Variables	Correlation co-efficient
1	Agility and Height	0.39**
2	Agility and Weight	0.27
3	Agility and Arm length	0.10**
4	Agility and Forearm length	0.29**
5	Agility and Leg length	0.42**
6	Agility and Upper arm girth	0.45**
7	Agility and Forearm girth	0.18**
8	Agility and Chest girth	0.19**
9	Agility and Thigh girth	0.12**
10	Agility and Calf girth	0.07**
11	Agility and Shoulder width	0.40**
12	Agility and Waist width	0.55**
13	Agility and Knee width	0.52**

The above table shows the relationship of selected anthropometric measurements on agility of hockey male players. There is significant relationship between agility and height (r = 0.39), arm length (r = 0.10), forearm length (r = 0.22), leg length (r = 0.42), upper arm girth (r = 0.45), forearm girth (r = 0.18), chest girth (r = 0.19), thigh girth (r = 0.12), calf girth (r = 0.07), shoulder width (r = 0.40), waist width (r = 0.55), knee width (r = 0.52). But there is no significant relationship between weight (r = 0.26) and agility.

Table 6: Shows the relationship between leg power and selected anthropometric measurements

Sl. No.	Variables	Correlation co-efficient
1	Leg power and Height	0.06**
2	Leg power and Weight	0.00**
3	Leg power and Arm length	0.06
4	Leg power and Forearm length	0.14**
5	Leg power and Leg length	0.14**
6	Leg power and Upper arm girth	0.04*
7	Leg power and Forearm girth	0.14**
8	Leg power and Chest girth	0.07**
9	Leg power and Thigh girth	0.01**
10	Leg power and Calf girth	0.20*
11	Leg power and Shoulder width	0.07*
12	Leg power and Waist width	0.20
13	Leg power and Knee width	0.27**

The above table shows the relationship of selected anthropometric measurements on leg power of hockey male players. There is significant relationship between leg power and height (r = 0.06), weight (r = 0.00), forearm length (r = 0.14), leg length (r = 0.14), upper arm girth (r = 0.04), forearm girth (r = 0.14), chest girth (r = 0.04), thigh girth (r = 0.01), calf girth (r = 0.20), shoulder width (r = 0.07), knee width (r = 0.27). But there is no significant relationship between arm length (r = 0.06), waist width (r = 0.20) and leg power.

5. Conclusion

In view of the finding and limitation of the study, the following conclusion were drawn. There is significant relationship between flexibility and height, weight, arm length, leg length, upper arm girth, forearm girth, chest girth, calf girth, shoulder width, waist width, knee width. But there is no significant relationship between flexibility and forearm length, thigh girth. There is significant relationship between reaction time and height, weight, forearm length, leg length, upper arm girth, forearm girth, chest girth, girth, calf girth, shoulder width, knee width. But there is no significant relationship between and arm length, waist width and reaction time. There is significant relationship between balance and weight, arm length, forearm length, leg length, upper arm girth, forearm girth, chest girth, thigh girth, calf girth, shoulder width, waist width. But there is no significant relationship between height, knee width and balance. There is significant relationship between agility and height, arm length, forearm length, leg length, upper arm girth, forearm girth, chest girth, thigh girth, calf girth, shoulder width, waist width, knee width. But there is no significant relationship between weight and agility. There is significant relationship between leg power and height, weight, forearm length, leg length, upper arm girth, forearm girth, chest girth, thigh girth, calf girth, shoulder width, knee width. But there is no significant relationship between arm length, waist width and leg power.

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