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Research Papers

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## Anthropometric measurements and body composition of hockey players with respect to their playing positions

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### Abstract

*The objective of the present study was to compare anthropometric measurements and body composition of hockey players with respect to their playing position. Two hundred and ten junior national hockey players seventy each from half line, back line and forward line was selected different state of india. Anthropometric measurements including height, weight, diameter, breadth, girth, and skinfold thickness was taken from entire subjects. Body composition was measure with the help of Matiegka's method (1921). To find out significant difference statistical method one way ANOVA was performed. Results found that, hockey players playing in different position found to be differ on some anthropometric measurements and body composition.*

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### INTRODUCTION:-

Amongst most of the sports that is being played these days Hockey is one of the favorite of all. In the general sense it is a kind of sport in which two teams compete by trying to maneuver the ball into the opponent's nest using a hockey stick. However, games like hockey have been played in almost every populated region in the globe from Ancient Greece to North America. Hockey has also been played in the ancient times in both foot and in horseback. This type of hockey is played on gravel or natural grass with a small hard ball. Nowadays it is played on a special type of artificial surface known as the Astroturf.

The body composition and energy turnover are highly inter-related and closely linked with the functional capacity of the organism. Therefore, evaluation of one's body composition is useful for understanding the functional aspect of the sportsman. The use of this science is immense utility in so far as sportsmen are concerned.

Moreover, the incidence of beginning age obesity is increasing considerably in industrialized countries and affluent classes in many other countries. The cause of obesity is the way of the life. Further in participation of exercise of game the obese proves less active than a normal person. The physical activity and athletic training can also change body composition. The economy of work performance depends on ratio of these components. The changes in body composition during increasing age depend partly on one's genetic development and partly no functional aerobic capacity. The aerobic working capacity is relatively higher at younger ages, which decrease with decreasing lean body mass, with increasing age.

The body composition studies have been conducted very extensively on the athletes. The examination of body fat and skin-folds at selected sites is most important in them. It has been found that the athletes who were lean or less fatty but

heavy because of a well-developed musculature were superior in performance in certain competitive sports. On the other hand he athletes who had substantial amount of adipose tissue have permanently increased energy demands owing to the inert weight of fat, thus making the work more difficult to perform in such activities where the body has to be projected as in jumping movements, or propelled against activity over long distance and in distance running.

Anthropometric measurements are dimensions of the structure of the human body taken at specific sites to give measures of girth and width. They include the body size and body proportions. Measurements of body size include such descriptive information's as height, weight, and surface area. When the measures of body proportions describe relationship between height, weight, among lengths, widths and girths of various body segments it has been observed that top athletes in some sports tend to have those proportions that biologically aid the performance. Human performance is a composition of many variables such as structure of the body, the specific measurements of the limbs, circumferences, breadth and body build. Since motor performance is an outcome of various variables, there may be a direct relationship between certain specific measurements and motor performance. The type of individual's structure is an essential factor in his motor performance. Evidence of this is quite common observe the well proportionate physique of boxers and gymnasts, the super structure of great basketball players, the muscularity of top class football players, the wiriness of champion distance runners and the massive built of shot put and discus throwers. Therefore, anthropometric measurements of an individual player play a dominant role in high level sports performance. It was hypothesized that the hockey players playing in different positions will found significantly differ on body composition and anthropometric measurements.

#### METHOD:

##### Participants:

210 junior national hockey players were selected from different state of India. The average age of selected hockey players is 17.10 years. All the selected players was represent national level hockey tournament from their respective states. For this investigation subject was selected according to their playing positions. 70 each players was selected from half line, back line and forward line position. All the subjects were

selected from random basis.

Measures:

To conduct the study following anthropometric measurements was taken from the body which are required to calculate body composition i.e. bone mass, fat mass and muscle mass. The anthropometric measurements and their units are presented in table number 1.

Variables	Measurement Unit	Variables	Measurement Unit
Height	Centimeters	Abdominal Skinfold	Millimeter
Weight	Kilogram	Subscapular skinfold	Millimeter
Humerus Diameter	Centimeters	Tricep Skinfold	Millimeter
Femur Diameter	Centimeters	Bicep skinfold	Millimeter
Wrist Breadth	Centimeters	Calf skinfold	Millimeter
Ankle Breadth	Centimeters	Forearm skinfold	Millimeter
Bicep girth	Centimeters	Thigh skinfold	Millimeter
Forearm girth	Centimeters	Bone mass	Kilogram
Thigh girth	Centimeters	Muscle mass	Kilogram
Calf girth	Centimeters	Fat mass	Kilogram

After the taken of above mentioned anthropometric measurements bone mass, fat mass and muscle mass was calculated using Matiegka's method (1921) for that purpose following equations are used:-

$$1. \text{ Weight of bones or Ossa} = O2 \times L \times K1$$

Where L is the height of the subject, K1= 1.2 (constant) and O=sum of humorous bicondylar, femur bicondylar, wrist and ankle breadth.

$$2. \text{ Weight of fat or derma} = d \times S \times k2$$

Where d= 1/2 (sum of biceps, forearm, thigh, calf, thorax and abdomen skinfold).

$$S = \text{surface area in cm}^2$$

$$K2 = 0.13 \text{ (constant)}$$

$$3. \text{ Weight of muscle mass } M = r^2 \times L \times K3$$

Where L = Height, r = sum of upper arm, forearm, thigh and calf radius, K3 = 6.5 (constant.)

The corrected radius can be calculated as follows.

$$\text{Circumference} = 2 \times (22/7) \times r \text{ or } r = c/2 (22/7)$$

$$\text{Corrected } r = [(c/2, 22/7) - 1/2 \text{ skinfolds}]$$

The unit of skin fold is same as for circumference or radius while subtracting it.

The mean and standard deviation of above mentioned anthropometric measurements and body compositions has been presented in table number 2, 3 and 4.

Positions	N	Height	Weight	Diameter		Breadth	
				Humerus	Femur	Wrist	Ankle
Back	70	168.87±6.98	55.34±9.94	6.71±0.63	6.71±0.63	5.67±0.41	6.91±0.46
Half Line	70	168.69±7.71	52.67±7.21	6.44±0.45	6.44±0.45	5.50±0.40	6.56±0.69
Forwards	70	169.27±6.50	53.44±7.11	6.73±0.49	6.73±0.49	5.47±0.34	6.75±0.65

Table No. 3 Mean physical characteristics of the subjects

Position	N	Skinfold						
		Bicep	Forearm	Thigh	Calf	Abdominal	Tricep	Subscapular
Back	70	5.88±4.64	4.20±3.98	14.34±6.05	11.88±5.99	11.14±5.91	6.69±3.10	7.01±2.59
Half Line	70	3.69±2.72	1.97±1.10	8.88±3.10	6.86±2.92	8.11±2.89	4.89±1.53	5.75±1.46
Forwards	70	5.49±3.93	3.96±3.07	10.52±4.17	9.35±4.46	10.28±3.97	3.43±1.11	4.83±1.44

Table No.4 Mean physical characteristics of the subjects

Position	N	Girth				Mass		
		Calf	Bicep	Forearm	Thigh	Bone	Muscle	Fat
Back	70	31.71±3.60	26.85±2.91	23.90±3.48	46.99±4.59	9.89±1.26	24.49±4.72	5.56±1.58
Half Line	70	31.74±2.81	25.71±2.28	23.27±1.34	47.06±3.89	8.97±1.34	25.61±3.76	4.56±0.81
Forwards	70	32.13±3.50	26.44±2.21	23.50±2.07	47.93±4.67	9.55±1.01	25.63±4.36	4.07±0.80

**RESULT AND DISCUSSIONS:**

Hockey players playing in different positions i.e. half line, back line and forward line were compared with each other upon anthropometric measurements and body compositions using statistical technique one way ANOVA ('F' test). The obtained results have been presented in table number 5.

Table no. 5 F ratio values of mean anthropometric measurements of hockey players

Variables	Playing Positions			
	Back	Half Line	Forwards	F ratio
Height	168.87±6.98	168.69±7.71	169.27±6.50	0.12
Weight	55.34±9.94	52.67±7.21	53.44±7.11	1.95
Humerus Diameter	6.71±0.63	6.44±0.45	6.73±0.49	6.44
Femur Diameter	6.71±0.63	6.44±0.45	6.73±0.49	11.53
Wrist Breadth	5.67±0.41	5.50±0.40	5.47±0.34	5.17
Ankle Breadth	6.91±0.46	6.56±0.69	6.75±0.65	5.65
Bicep skinfold	5.88±4.64	3.69±2.72	5.49±3.93	4.80
Forearm skinfold	4.20±3.98	1.97±1.10	3.96±3.07	10.49
Thigh skinfold	14.34±6.05	8.88±3.10	10.52±4.17	25.86
Calf Skinfold	11.88±5.99	6.86±2.92	9.35±4.46	20.52
Abdominal skinfold	11.14±5.91	8.11±2.89	10.28±3.97	8.62
Subscapular Skinfold	7.01±2.59	5.75±1.46	4.83±1.44	23.06
Tricep skinfold	6.69±3.10	4.89±1.53	3.43±1.11	42.21
Bicep girth	26.85±2.91	25.71±2.28	26.44±2.21	3.77
Calf girth	31.71±3.60	31.74±2.81	32.13±3.50	0.34
Forearm girth	23.90±3.48	23.27±1.34	23.50±2.07	1.15
Thigh girth	46.99±4.59	47.06±3.89	47.93±4.67	0.98
Bone mass	9.89±1.26	8.97±1.34	9.55±1.01	10.06
Muscle mass	24.49±4.72	25.61±3.76	25.63±4.36	1.60
Fat mass	5.56±1.58	4.56±0.81	4.07±0.80	31.84

The result presented in above mentioned table indicated that hockey players playing in different positions have not shown any significant difference upon height and weight. Junior national hockey players found to be significantly differ on humerus and femur diameters with the 'F' ratio 6.44 and 11.53 respectively. Back line hockey players have shown their superiority on wrist and ankle breadth compared to half line and forward line players. ('F' 5.17 and 5.65).

On the skinfold diameter forward line hockey players have shown low fat upon subscapular and tricep skinfold than the back line and half line players. Half line players have shown low skinfold thickness on biceps, forearm, thigh, calf and abdominal than the forward line and back line players.

Back line hockey players have shown superiority on bicep girth compared to other two groups, but no significant difference has been observed upon calf girth, forearm girth and thigh girth.

Half line players have shown low amount of bone mass compared to back line and forward line players 'F' value 10.60 which is significant beyond .01 level indicates that there were significant difference on bone mass. There was no difference has been observed on muscle mass when all the three groups was compared with each other. The 'F' ratio 1.60 which is insignificant gives the strength to above mentioned statement. Forward line players have found to be lean and thin than the half and back line players. Forward line players have shown low fat mass than the other groups. The 'F' ratio 31.84 which is significant at .01 level give the support to this statement.

Nature of game of hockey players playing in different positions was not a same in every match. Forward line players need to cover maximum distance all over ground. Thus they run more than the half line and back line players. Forward line players must have better speed and agility than the half and back line players. Back line players must have more strength in leg and forearms for the tackle and clearance of the ball. Therefore, back line players not running so much compared to forward line players in matches. The nature of work of half line players, they support both the forward line and half line players according to need.

As mentioned above all the three positions in field hockey have different nature of game. Thus they required physical fitness and body compositions according to their positions. Thus when compared all the three groups on the basis of anthropometric measurements and body compositions they shown significant difference on anthropometric measurements and body compositions.

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