



Educational Technology

Elixir Edu. Tech. 59 (2013) 15512-15517

Elixir
ISSN: 2229-712X

Position – wise anthropometric profile of field hockey players

S. Viswanath* and R. Kalidasan

Department of Physical Education, Bharathidasan University, Tiruchirappalli.

ARTICLE INFO

Article history:

Received: 7 April 2013;

Received in revised form:

5 June 2013;

Accepted: 6 June 2013;

Keywords

Field Hockey,
Anthropometry.

ABSTRACT

The aim of the present study was to analysis the differences in anthropometric characteristics among various playing positions in Hockey. In Hockey the players were classified according to their playing position. These playing position were attackers, Midfielders and Defenders. Fifteen players each from attackers (A), Midfielders (B) and Defenders (D) were chosen as subject for this study. The data were collected during South Zone Inter- University Hockey Tournament held at Bharathiar University Coimbatore, Tamil Nadu, India. The subjects were randomly selected from various provinces. Body height, body mass, arm span, arm length, palm length, palm span, triceps, subscapular, Biceps, Iliac crest, lateral abdomen, Abdomen, Front thigh, Medial calf, Elbow diameter, knee diameter, arm girth relax, arm girth flex, fore arm girth, waist girth, gluteus girth, thigh girth and calf girth were selected as a anthropometrical variables for this study. The collected data was statistically analysed by using analysis of variance. The scheffe's test was used as a post hoc test to determine which of the paired mean differ significantly. The result reveals that there was significant differences between the playing position on the following variables namely body height, body weight, palm span, palm length, sub scapularis, triceps, biceps, lateral abdomen, abdomen, iliac crest, front thigh, mid calf, elbow diameter, arm girth relax. Arm girth flex, fore arm girth, waist girth, gluteus girth, thigh girth, & calf girth is high in Midfielders. Defenders have greater value in the arm length, arm span and knee diameter followed by mid fielders and attackers.

© 2013 Elixir All rights reserved.

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. 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. As far as the field hockey is concerned, very few references literature can be found in the positional wise analysis. The present study, therefore, aims to evaluate the anthropometric measurement of hockey players in three different positions such as attackers, mid fielders and defenders. The purpose of the study was to analysis the position – wise anthropometric profile of field hockey players.

Materials and methods

Samples

To achieve the purpose of this study the Hockey players were classified according to their playing position. These playing positions were attackers, mid fielders and defenders. For this study 45 male Hockey players were selected. Fifteen players each from attackers (A), mid fielders (M) and defenders (D) were chosen as subject for this study. The data were collected during South Zone Inter- University Hockey Tournament held at Bharathiar University Coimbatore, Tamil Nadu, India. The subjects were randomly selected from different provinces.

Anthropometric Variables and Testing Methods

The investigators reviewed the available scientific literature pertaining in the game of Hockey and Anthropometric from books, journals, periodicals and research articles. Resulting from the review of literature and discussion with the experts and considering the feasibility criteria of the study. The following anthropometrical variables namely Body height, body mass, arm span, arm length, palm length, palm span, Triceps, subscapular, Biceps, Iliac crest, Lateral abdomen, abdominal, Front thigh,

Tele:

E-mail addresses: poorni.dec@gmail.com, karthick.kiot@gmail.com

© 2013 Elixir All rights reserved

Medial calf, Elbow diameter, knee diameter, arm girth relax, arm girth flex, fore arm girth, waist girth, Gluteal girth, Thigh girth and Calf girth were selected variables for this study. To make study more scientific, the reliability of the instruments and data was established. All measurements were taken by the investigators. One of the investigators was trained and qualified level two anthropometrist of International Society for the Advancement of Kinanthropometry (ISAK). The standardized testing protocol was used to collect the relevant data and test description is presented hereunder in a nutshell.

Statistical Analysis

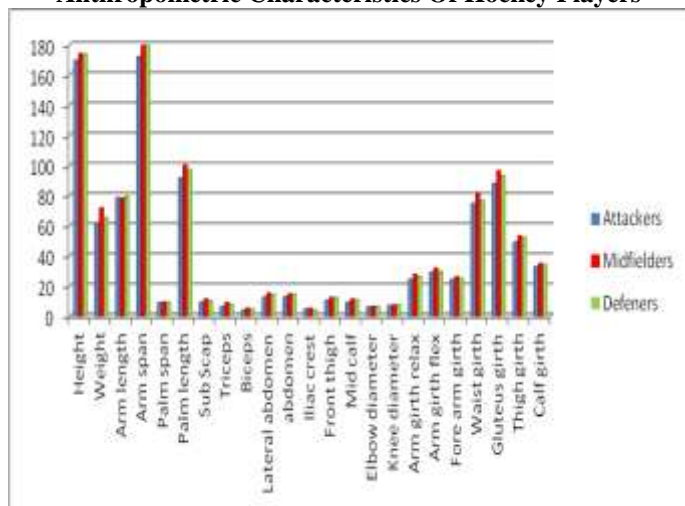
To test the significance of the mean difference among the players of various position namely attackers, mid fielders and defenders on criterion measures of selected anthropometrical variables, one – way analysis of variance was used. In case of significance of mean difference observed on the criterion measures, to find out which pair of group is high among the others scheffe's post – hoc test was applied.

Result and Discussion

The descriptive statistics for anthropometric characteristics for all players are presented in the table below

The general observation of players with reference to the position played confirm that the midfield player are better in some parameters like body height, body weight, palm span, palm length, sub scapularis, triceps, biceps, lateral abdomen, abdomen, iliac crest, front thigh, mid calf, elbow diameter, arm girth relax. Arm girth flex, fore arm girth, waist girth, gluteus girth, thigh girth, & calf girth followed by defenders and attackers. Defenders have greater value in the arm length, arm span and knee diameter followed by mid fielders and attackers.

Figure: I Mean Values Of Different Playing Position On Anthropometric Characteristics Of Hockey Players



It was evident from the above table –II variability exist among the Hockey players of different playing position at which they play.

The result of one-way analysis of variance on anthropometric characteristics among the three groups namely attacker, mid fielder & defender were presented. From the table it can be seen that the calculated F value of body mass (F = 5.67), palm length (F = 10.68), sub scapularis (F = 4.66), triceps (F = 5.29), biceps (F = 4.22), lateral abdomen (F = 3.25), iliac crest (F = 4.91), arm girth relax (F = 6.11), arm girth flex (F = 6.73), fore arm girth (F = 5.29), waist girth (F = 5.38), gluteus girth (F = 11.71), and thigh girth (F = 5.14) among the three group were greater than the table value of 3.22 indicating that it was significant (P<0.05) for the degree of freedom (2,42) at 0.05

level of confidence. Since the F value was significant, the scheffe's post hoc test was further computed to find out which pair of group was high among the others and the results are tabulated in the table no.III.

From the table – III, in body mass there was a significant mean difference observed between attackers and mid fielders (10.20), rest of the comparison showed no significant mean difference. In palm length there was a significant mean difference observed between attacker and mid fielders (8.66), and defenders and attackers (5.86) but no significant mean difference was observed between midfielders and defenders (2.80). In sub scapularis there was a significant mean difference observed between attackers and mid fielders (2.03), but no significant mean difference was observed between midfielders and defenders & defenders and attackers. In triceps there was a significant mean difference observed between attackers and midfielders (2.60), but no significant mean difference was observed between midfielders & defenders and defenders and attackers. In biceps there was a significant mean difference observed between attackers & midfielders (1.25) but no significant mean difference was observed between midfielders & defenders and defenders & attackers. In lateral abdomen there was a significant mean difference observed between attackers & midfielders (2.66) but no significant mean difference was observed between midfielders & defenders and defenders & attackers. In iliac crest there was a significant mean difference observed between midfielders & defenders (1.05) but no significant mean difference was observed between attackers & midfielders and defenders & attackers. In arm girth relax there was a significant mean difference observed between attackers & midfielders (3.26) but no significant mean difference was observed between midfielders & defenders and defenders & attackers.

In arm girth flex there was a significant mean difference observed between attacker and mid fielders (2.66), and midfielders & defenders (2.13) but no significant mean difference was observed between defenders & attackers. In forearm girth there was a significant mean difference observed between attackers & midfielders (1.66) but no significant mean difference was observed between midfielders & defenders and defenders & attackers. In waist girth there was a significant mean difference observed between attackers & midfielders (6.46) but no significant mean difference was observed between midfielders & defenders and defenders & attackers. In gluteus girth there was a significant mean difference observed between attacker and mid fielders (8.40), and defenders and attackers (5.00) but no significant mean difference was observed between midfielders and defenders. In thigh girth there was a significant mean difference observed between attackers & midfielders (4.00) but no significant mean difference was observed between midfielders & defenders and defenders & attackers.

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 mid fielders are remarkably the tallest in the team and they present greater body segments than all other playing positions followed by defenders are comparatively taller than attackers which is an agreement with other literature (Manna 2009).Mid fielders participate in the central defense in the field, aiming to block the opponents shoot and support the defenders in saving the goal and mid fielders will support the attackers for scoring the goals.

S.NO	VARIABLES	EQUIPMENT NEEDED	TEST DESCRIPTION	MEASURING UNITS
1	Body Height	Stadiometer	The stretch stature method requires the subject to stand with the heels together and the heels, buttocks and upper part of the back touching the scale. The head, when placed in the frankfort plane, need not be touching the scale.	Meter
2	Body mass	Electronic weighing machine	The player just stands on the weighing machine with minimal movement with hands by their side. Shoes and excess clothing should be removed.	Kilogram
3	Arm span	Anthropometric tape	Facing away from the wall, with back and buttocks touching the arms are stretched out horizontally. Measure from one furthestmost finger tips to the others.	Meter
4	Arm length	Segmometer	The arm length measurement from acromiale to datylion is made from the point of the shoulder to the tip of the mettle finger.	Centimetre
5	Palm length	Segmometer	Palm length was measured from the midstylium to dactylium.	Centimetre
6	Palm span	Segmometer	Palm span was measured from the tip of the thumb to the tip of the little finger with all fingers are outstretched as far as possible.	Centimetre
7	Triceps	Skinfold calliper	Triceps was measured parallel to the long axis of the arm at the triceps, when the shoulder is relaxed with the shoulder joint externally rotated to the mids-prone position and elbow extended by the side of the body	Millimetre
8	Subscapular	Skinfold calliper	Subscapular was measured obliquely downward at subscapular skinfold site & determined by the natural fold lines of the skin.	Millimetre
9	Biceps	Skinfold calliper	Biceps was measured parallel to the long axis of the arm at the biceps, when the shoulder is relaxed with the shoulder joint externally rotated to the mids-prone position and elbow extended by the side of the body	Millimetre
10	Iliac crest	Skinfold calliper	Iliac crest was measured horizontal at the iliac crest, the right arm should be either abducted or placed across the trunk, the line of the skin fold generally runs slightly downward posterior – anterior.	Millimetre
11	Lateral abdomen	Skinfold calliper	Lateral abdomen was measured obliquely and medially downward at the supraspinale skinfold site. The skin fold runs medially downward and anteriorly at about a 45° angle	Millimetre
12	Abdominal	Skinfold calliper	Abdominal was measured vertically, at this site that the initial grasp should be firm for the thickness of the subcutaneous layer of tissue.	Millimetre
13	Front thigh	Skinfold calliper	Front thigh was measured parallel to long axis of thigh, the lateral side of the thigh was grasped & measured	Millimetre
14	Medial calf	Skinfold calliper	Medial calf was measured vertically by keeping the right foot on the box. The right knee is bent at about 90°.	Millimetre
15	Elbow diameter	Small sliding calliper	The linear distance between the mostlateral aspect of the lateral humeral epicondyle and the most medial aspect of the medial humeral epicondyle, with the small sliding calliper gripped correctly to palpate the epicondyles of the humerus.	Centimetre
16	Knee diameter	Small sliding calliper	The linear distance between the most lateral aspect of the lateral femoral epicondyle and the most medial aspect of the medial femoral epicondyle	Centimetre
17	Arm girth relax	Anthropometric tape	The circumference of the arm at 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	Centimetre
18	Arm girth flex	Anthropometric tape	The circumference of the arm perpendicular to the long axis of the arm at the level of the peak of the contracted Biceps brachii, when the arm is raised anteriorly to the horizontal. The subjects right arm is raised anteriorly to the horizontal with the forearm supinated and flexed at about 45 - 90° to the arm.	Centimetre
19	Fore arm girth	Anthropometric tape	Forearm girth was measured at the distal to the humeral epicondyles. The subjects holds te palm in supinated position by using cross hand technique for the measurement	Centimetre
20	Waist girth	Anthropometric tape	Waist girth was measured at its narrowest point between the lower coastal (10 th rib) border and the top of the iliac crest perpendicular to the long axis of the trunk. The subject should breath normally and the measurement is taken at the end of a normal expiration (end tidal).	Centimetre
21	Gluteus girth	Anthropometric tape	The circumference of the buttocks at the levelof their greatest posterior protuberance, perpendicular to the long axis of the trunk	Centimetre
22	Thigh girth	Anthropometric tape	The circumference of the thigh 1 cm distal to the gluteal fold site, perpendicular to the long axis, the subject stand on a box or stool for this measure .	Centimetre
23	Calf girth	Anthropometric tape	The circumference of the leg at the level of the medial calf skinfold site, the subject asked to stand at the elevated position for the measurement	Centimetre

Table – I Mean and standard deviation of different playing position on anthropometric characteristics of hockey players

S.No	Variables	Units	Attackers		Mid fielders		Defenders	
			Mean	SD(\pm)	Mean	SD(\pm)	Mean	SD(\pm)
1	Height	In Centimetres	169.40	6.57	173.86	5.42	173.53	8.13
2	Weight	In Kilogram	61.40	9.14	71.60	8.73	65.26	7.11
3	Arm length	In Centimetres	78.46	4.37	78.06	4.58	79.60	4.50
4	Arm span	In Centimetres	171.86	16.50	179.20	9.00	179.40	9.71
5	Palm span	In Centimetres	8.83	.44	9.13	.58	9.02	.57
6	Palm length	In Centimetres	91.33	4.57	100.00	5.27	97.20	5.79
7	Sub Scap	In Millimetres	9.12	2.04	11.16	1.65	10.10	1.74
8	Triceps	In Millimetres	6.24	1.86	8.85	2.42	7.60	2.25
9	Biceps	In Millimetres	3.81	.99	5.06	1.35	4.46	1.16
10	Lateral abdomen	In Millimetres	12.33	2.88	14.99	3.20	14.35	2.83
11	Abdomen	In Millimetres	12.58	2.51	14.57	3.06	14.46	2.68
12	Iliac crest	In Millimetres	4.57	1.05	4.93	.91	3.88	.81
13	Front thigh	In Millimetres	10.33	2.80	12.32	2.34	12.06	2.11
14	Mid calf	In Millimetres	8.98	2.48	11.08	3.52	10.77	2.56
15	Elbow diameter	In Centimeters	6.06	.52	6.33	.57	6.27	.39
16	Knee diameter	In Centimeters	6.91	1.20	7.21	.83	7.57	.59
17	Arm girth relax	In Centimeters	24.20	3.66	27.46	2.13	26.13	1.35
18	Arm girth flex	In Centimeters	28.93	2.57	31.60	2.06	29.46	1.55
19	Fore arm girth	In Centimeters	24.26	1.62	25.93	1.62	24.80	.94
20	Waist girth	In Centimeters	74.66	5.56	81.13	6.47	76.60	4.38
21	Gluteus girth	In Centimeters	87.86	4.29	96.26	5.86	92.86	3.97
22	Thigh girth	In Centimeters	48.73	3.12	52.73	3.39	52.13	4.40
23	Calf girth	In Centimeters	32.53	3.44	34.73	2.49	33.86	2.23

Table – II Analysis of variance of selected anthropometric characteristics of hockey players

S.No	Variables	Group	Sum of Squares	df	Mean Square	F
1	height	Between Groups	185.733	2	92.867	2.01
		Within Groups	1943.067	42	46.263	
2	Weight	Between Groups	795.511	2	397.756	5.67*
		Within Groups	2948.133	42	70.194	
3	Arm length	Between Groups	18.978	2	9.489	.47
		Within Groups	846.267	42	20.149	
4	Arm span	Between Groups	552.844	2	276.422	1.85
		Within Groups	6271.733	42	149.327	
5	Palm span	Between Groups	.694	2	.347	1.19
		Within Groups	12.176	42	.290	
6	Palm length	Between Groups	586.844	2	293.422	10.68*
		Within Groups	1153.733	42	27.470	
7	Sub scap	Between Groups	31.022	2	15.511	4.66*
		Within Groups	139.835	42	3.329	
8	triceps	Between Groups	50.992	2	25.496	5.29*
		Within Groups	202.364	42	4.818	
9	biceps	Between Groups	11.788	2	5.894	4.22*
		Within Groups	58.644	42	1.396	
10	Lateral abdomen	Between Groups	57.828	2	28.914	3.25*
		Within Groups	373.360	42	8.890	
11	abdomen	Between Groups	37.721	2	18.861	2.47
		Within Groups	321.387	42	7.652	
12	Iliac crest	Between Groups	8.599	2	4.300	4.91*
		Within Groups	36.747	42	.875	
13	Front thigh	Between Groups	35.129	2	17.565	2.95
		Within Groups	249.899	42	5.950	
14	Mid calf	Between Groups	38.761	2	19.381	2.31
		Within Groups	352.671	42	8.397	
15	Elbow diameter	Between Groups	.619	2	.310	1.23
		Within Groups	10.579	42	.252	
16	Knee diameter	Between Groups	3.276	2	1.638	1.96
		Within Groups	35.124	42	.836	
17	Arm girth relax	Between Groups	80.933	2	40.467	6.11*
		Within Groups	277.867	42	6.616	
18	Arm girth flex	Between Groups	59.733	2	29.867	6.73*
		Within Groups	186.267	42	4.435	
19	Fore arm girth	Between Groups	21.733	2	10.867	5.29*
		Within Groups	86.267	42	2.054	
20	Waist girth	Between Groups	330.533	2	165.267	5.38*
		Within Groups	1290.667	42	30.730	
21	Gluteus girth	Between Groups	535.600	2	267.800	11.71*
		Within Groups	960.400	42	22.867	
22	Thigh girth	Between Groups	139.600	2	69.800	5.14*
		Within Groups	569.600	42	13.562	
23	Calf girth	Between Groups	46.978	2	23.489	2.40
		Within Groups	298.000	42	7.095	

*Significant at 0.05 level of confidence *F 0.05 (2, 42) = 3.22

Table – III Scheffe's Post – Hoc Test For Mean Differences Between The Attacker, Mid Fielder & Defender Positions Of Anthropometric Characteristic Of Hockey Players

S.No.	Variable	Attacker	Midfielder	Defender	M D	C.I
1	Weight	61.40	71.60	-	10.20	7.67
		-	71.60	65.26	6.33	
		61.40	-	65.26	3.36	
2	Palm length	91.33	100.00	-	8.66	4.80
		-	100.00	97.20	2.80	
		91.33	-	97.20	5.86	
3	Sub Scap	9.12	11.16	-	2.03	1.68
		-	11.16	10.10	1.05	
		9.12	-	10.10	0.98	
4	Triceps	6.24	8.85	-	2.60	2.01
		-	8.85	7.60	1.24	
		6.24	-	7.60	1.36	
5	Biceps	3.81	5.06	-	1.25	1.09
		-	5.06	4.46	0.60	
		3.81	-	4.46	0.65	
6	Lateral abdomen	12.33	14.57	-	2.66	2.61
		-	14.57	14.46	0.64	
		12.33	-	14.46	2.02	
7	Iliac crest	4.57	4.93	-	0.36	0.86
		-	4.93	3.88	1.05	
		4.57	-	3.88	0.69	
8	Arm girth relax	24.20	27.46	-	3.26	2.36
		-	27.46	26.13	1.33	
		24.20	-	26.13	1.93	
9	Arm girth flex	28.93	31.60	-	2.66	1.93
		-	31.60	29.46	2.13	
		28.93	-	29.46	0.53	
10	Fore arm girth	24.26	25.93	-	1.66	1.32
		-	25.93	24.80	1.13	
		24.26	-	24.80	0.53	
11	Waist girth	74.66	81.13	-	6.46	5.05
		-	81.13	76.60	4.53	
		74.66	-	76.60	1.93	
12	Gluteus girth	87.86	96.26	-	8.40	4.37
		-	96.26	92.86	3.40	
		87.86	-	92.86	5.00	
13	Thigh girth	48.73	52.73	-	4.00	3.38
		-	52.73	52.13	0.60	
		48.73	-	52.13	3.40	

And the other study reported that the taller soccer players are most suitable for the central defense and central attack (Reilly, Bangsbo, & Franks, 2000). 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 E. Holway 2011). The attackers are shorter when compare to other position of players, shorter players have low centre of gravity, they have good speed and play at the boundaries, so that they have good balance to achieve the goal.

Conclusions

The results demonstrate that a number of significant differences in anthropometric characteristics exist between playing positions.

1. Midfield players were taller, body weight, with the bigger palm span, palm length, sub scapularies, triceps, Biceps, Lateral abdomen, abdomen, Iliac crest, front thigh, mid calf, elbow diameter, arm girth relax, arm girth flex, fore arm girth, waist girth, gluteus girth, thigh girth and calf girth.

2. Defender are bigger in arm span, arm length and knee diameter among all players

3. Attackers are shortest in nature, with the less anthropometric characteristics among all players.

Reference

Francis, E. Holway, Seara M. (2011). Kinanthropometry of world champion junior male field hockey players. *ApuntsMedEsport*.doi:10.1016/j.apunts.2011.02.009

Jain, M. K. (2004). Body composition: concept for coaches and physical trainers. *Journal of Sports and Sports Sciences*, 27(1), 48-57.

KEOGH J. (2003) Evaluation of anthropometric, physiological and skill-related tests for talent identification in female field hockey. *Journal of Applied Physiology*. 28(3):397-409.

Mandeep Singh, Kanwar Mandeep Singh, Kanwaljeet Singh. (2010). ANTHROPOMETRIC MEASUREMENTS, BODY COMPOSITION AND PHYSICAL PARAMETERS OF INDIAN, PAKISTANI AND SRI LANKAN FIELD HOCKEY PLAYERS. *Serbian Journal of Sports Sciences*, 4(2): 47-52

Manna I, Khanna GL, Dhara PC 2009. Training induced changes on physiological and biochemical variables of young Indian field hockey players. *Biology of Sport*, 26(1): 33-43.

Mathur, D. N, & Salokun, S. O. (1985). Body composition of successful Nigerian female athletes. *Journal of Sports Medicine*, 25, 27-21.

Reilly, T., Bangsbo, J., & Franks, A. (2000). Anthropometric and physiological predispositions for elite soccer. *Journal of Sports Sciences*, 18, 669-683.

Ross, W., D., Drinkwater, D., T., Bailey, D., A., Marshall, G., R., & Leahy, R., M. (1980). Kinanthropometry; Traditions and new perspective. In: M. Ostyn, G. Beunen, J. Simons (eds.) Kinanthropometry II. *International Series on Sports Science*. Vol. 9. University Park Press, Baltimore, pp. 3-27.

Shyamal Koley, Santosh Jha & Jaspal Singh Sandhu. (2012). Study of Back Strength and Its Association with Selected Anthropometric and Physical Fitness Variables in Inter-university Hockey Players. *Anthropologist*, 14(4): 359-363.