The Relation between Hand Grip Strength with Hand – Anthropometric Variable in Inter-University Level Softball and Hockey Players

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Abstract – The purpose of this study was to compare hand grip strength with hand anthropometric variables of inter-university level Softball and Hockey players. The study included 30 inter university female Softball (15) and Hockey (15) players aged 18–25 years. Methods: A total of 11 anthropometric variables and 2 strength variables (Grip strength left, Grip strength right) were selected for the study.The data were collected using standard anthropometric equipment (Gulic tape, sliding caliper, skin fold caliper, and grip dynamometer) which were supplied by reputed Indian and foreign companies and used in the sports science laboratory of Lakshmibai National College of Physical Education. Results: All the two groups showed significant differences on their arm measurements and grip strength variables. The findings of the present study indicated that the grip strength of softball players showed the closest relationship with the arm measurements compared to hockey players. Conclusion: It may be concluded that the grip strength of University level women softball players had significant relationship with most of their arm measurements.

Key Words- Grip Strength and Anthropometry

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INTRODUCTION

Softball and hockey are physically demanding sports comprised of several specialism requiring different skills and types of fitness. These sports require excellent eye-to-hand coordination, upper extremity power, hand grip strength and the coordinated movements of the hips, shoulders, arms and wrists. Softball is a direct descendant of baseball. It requires speed, strength and endurance (Terbizan, Waldera, Seljevold & Schwigert, 1996). It is a game where the handgrip plays a crucial role. The main basic aspects of the game swing velocity and pitch speed are greatly influenced by the grip strength of the player (Giardina, Leslie, Raridon & Zimmer, 1997). Softball players require a significant amount of upper body muscle balance due to the specificity of underarm activity. Many athletes and coaches believe that the forearm plays a significant role both in hitting and throwing the ball (Brylinskyl & Melanie, 1992). Hand grip strength is the result of forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal bio kinetic conditions (Richards et al., 1996; Bohannon, 1997). Grip strength determines the handedness of an Individual. It is often used as an indicator of the overall physical strength (Foo, 2007). Many studies describe upper extremity characteristics of baseball players (Barnes & Tullos, 1978; King et al., 1969; Torg et al.,1972; Tullos et al., 1972) and reports

related to morphological/anthropometric characteristics and hand grip strength of softball players are available (Werner et al.,2006; Koley & Kumaar, 2011). The grip strength is measured in several sports disciplines and its importance to success is clearly identified. The most common method of assessment for grip strength is the use of a handheld dynamometer (Ramkumar & Chittibabu, 2012). The estimation of hand grip strength is of immense importance in sports like wrestling, tennis, badminton, cricket, handball, basketball, baseball and softball, where sufficient degree of grip strength is necessary to be successful. The word anthropometry is derived from the Greek word ` anthros` meaning man, and metre, meaning to measure. Earlier anthropometry was used mainly for racial, Differentiation and personal identification. Anthropometric measurements vary from individual to Individual. The measurement of structure of the body is called Anthropometry. It consists of measuring external environment of the human body. Due to the high correlation between anthropometric measurements like linear measurement, circumferences, diameters body composition variables etc. and physical performance, the recent trend is to include these variables in the areas related to the strength of the athlete. Anthropometric measurements have revealed correlation between body structure, physical characteristics and sports capabilities. This knowleAdge of mathematical

correlation permits sports physicians to evaluate and to predict performance potentialities on the basis of physical characteristics and specific requirements of the game. Some literature related to the morphological and anthropometric characteristics and handgrip strength of softball players are available (Brylinskyl & Melanie, 1992; Giardina, Leslie, Raridon & Zimmer, 1997; Tsunawake, Tahara, Moji, Muraki, Minowa & Yukawa, 2003; Werner, Deryk, Guido & Brunet, 2006). But, the information related to the correlations of hand-anthropometry and grip strength in softball and hockey players is scanty. Thus, the purpose of this study was to compare hand grip strength and anthropometric variables of inter-university level Softball and hockey players.

MATERIALS & METHODS

Subjects:

A sample of thirty (N =30) women inter-university level players. The player s' age ranged from 18 to 25 years. Which includes fifteen each softball and cricket players, who participated in inter- university competitions of University of Kerala was selected. All the participants were informed about the aim and methodology of the study and they volunteered to participate in this study. Purposive sampling technique was used to select the subjects.

METHODOLOGY:

Anthropometric measurements

A.   Anthropometric measurement.

- Length measurements: 1. Acromiale-dactylion (Arm length) 2. Acromiale-Radiale (upper arm length) 3.Radiale-stylion Radiale (Fore arm length) 4. midstylion-dactylion (Hand length)

- Arm girth: 5. Wrist 6. Fore arm 7. Arm relaxed 8. Arm flexed and tensed

- Bredth: 9. Biepicondylar humerus

- Skin fold measurements: 10. Biceps skin fold measurement. 11. Triceps skin fold measurement.

B.   Strength variables: 1. Left Grip strength. 2. Right grip strength.

Statistical analyses:

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. Pearson product moment correlation was applied to establish the correlation of right and left hand grip strength with the variables measured. Data was analysed using SPSS and MS EXEL 2010.

.05 level of probability was used to indicate statistical significance.

RESULTS

Table 1 Descriptive statistics of hand grip strength and various anthropometric variables in Softball and hockey players.

Variables	Group	Left hand				Right hand			
		Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum
AL	Softball	69.15	3.63	60.5	76.5	69.15	3.63	60.5	76.5
	Hockey	70.94	2.98	66.5	76.5	71.06	3.08	66.5	76.5
UAL	Softball	28.75	1.26	27	31	28.73	1.27	27	31
	Hockey	29.32	1.61	26.5	32.5	29.36	1.61	26.5	32.5
FAL	Softball	23.67	0.91	22	25.5	23.74	0.94	22	25.5
	Hockey	23.94	1.36	22	26.7	23.88	1.27	22	26.7
HL	Softball	17.41	0.68	16.3	18.6	17.36	0.62	16.3	18.6
	Hockey	17.58	0.68	16.7	19.3	17.58	0.65	16.7	19.3
WG	Softball	14.19	1.1	11.6	15.5	14.29	1.12	11.7	16.3
	Hockey	13.88	2.68	5.1	17.5	14.06	2.71	5.2	17.5
FAG	Softball	21.99	1.34	19	24.5	22.26	1.24	19.5	24.5
	Hockey	22.19	0.86	20.3	23.8	22.57	0.74	21.5	24
ARG	Softball	24.36	2.7	19.5	30.5	25.02	2.64	21	30
	Hockey	24.19	1.75	22	29.1	24.67	2.11	22.3	31.4
AFG	Softball	25.81	2.53	21.5	31	26.25	2.49	22.6	32
	Hockey	26.44	1.88	24	31.5	26.97	1.94	24	32
BH	Softball	5.53	0.34	5	6.2	5.59	0.31	5.1	6.2
	Hockey	5.68	0.21	5.2	6	5.8	0.26	5.4	6.3
BSF	Softball	5.88	1.61	2.8	8.6	4.89	1.03	2.6	6.4
	Hockey	5.53	1.03	4.2	8	5.02	0.77	3.8	6.2
TSF	Softball	12.5	3.7	7	21.2	13.96	4.03	7.3	20.4
	Hockey	11.44	2.78	7	17	12.74	3.27	8	18.4
GS	Softball	20.03	3.19	15.6	26.3	20.72	4.34	15.4	30.3
	Hockey	26.66	3.47	19.3	31	28.72	3.94	20.6	34.6

* Significant at 0.05 level

AL = Arm Length, UAL = Upper arm Length, FAL = Forearm length, HL = Hand Length, WG = Wrist Girth, FAG = Fore arm Girth, ARG = Arm relaxed Girth, AFG = Arm flexed Girth, BH = Biepicondylar humerus, BSF = Biceps Skin fold, TSF = Triceps Skin fold.

Table 2

Correlation coefficients of left handgrip strength with hand anthropometric variables in inter-university level Softball and hockey players.

S. No.	Variables	Left hand grip strength			
		Softball		Hockey	
		R	P	r	P
1	AL	0.474	0.074	0.124	0.672
2	UAL	0.337	0.220	0.262	0.346
3	FAL	0.129	0.647	0.001	0.999
4	HL	0.351	0.199	0.234	0.401
5	WG	0.680*	0.005	0.196	0.483
6	FAG	0.497	0.059	0.019	0.947
7	ARG	0.524*	0.045	0.240	0.388
8	AFG	0.615*	0.015	0.157	0.576
9	BH	0.317	0.250	0.030	0.916
10	BSF	0.379	0.163	0.367	0.178
11	TSF	0.362	0.186	0.157	0.576

AL = Arm Length, UAL = Upper arm Length, FAL = Forearm length, HL = Hand Length, WG = Wrist Girth, FAG = Fore arm Girth, ARG = Arm relaxed Girth, AFG = Arm flexed Girth, BH = Biepicondylar

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humerus, BSF = Biceps Skin fold, TSF = Triceps Skin fold.

Table 3

Correlation coefficients of right handgrip strength with hand anthropometric variables in inter-university level Softball and hockey players

S. No.	Variables	Right hand grip strength			
		Softball		Hockey	
		R	P	r	P
1	AL	0.453	0.090	0.256	0.357
2	UAL	0.397	0.143	0.387	0.155
3	FAL	0.230	0.410	0.186	0.508
4	HL	0.296	0.284	0.410	0.129
5	WG	0.535*	0.040	0.536*	0.039
6	FAG	0.473	0.075	0.055	0.846
7	ARG	0.717*	0.003	0.616*	0.015
8	AFG	0.727*	0.002	0.470	0.077
9	BH	0.731*	0.002	0.206	0.462
10	BSF	0.607*	0.017	0.019	0.945
11	TSF	0.556*	0.032	0.128	0.65

AL = Arm Length, UAL = Upper arm Length, FAL = Forearm length, HL = Hand Length, WG = Wrist Girth, FAG = Fore arm Girth, ARG = Arm relaxed Girth, AFG = Arm flexed Girth, BH = Biepicondylar humerus, BSF = Biceps Skin fold, TSF = Triceps Skin fold.

DISCUSSION

Softball and hockey are the popular sport and are also an international sport. Anthropometric dimensions and morphological characteristics play an important role in determining the success of an athlete (Keogh, 1999). Quite naturally, the interest in Anthropometric characteristics and body composition of athletes from different competitive sports has increased tremendously over the last decades. All ball games require comprehensive abilities including physical, technical, mental and tactical (Terbizan, Waldera,Seljevod & Schwigert,1996; Werner, Deryk, Guido & Brunt, 2006).

In the present study, Significant relationships were observed between left grip strength to and wrist girth(r=0.680, p < .05), arm relaxed girth (r =0.524, p < .05) and arm flexed and tensed- girth (r =0.615, p < .05) of softball players.

No significant relationships were observed between left grip strength of hockey players.

Significant relationship were observed between right grip strength and wrist girth (r =0.535, p < .05), Arm relaxed girth (r =0.717, p < .05), arm flexed and tensed girth (r =0.727, p < .05), biepicondylar humerus (r =0.731, p< .05), biceps Skin fold (r - 0.607, p < .05) and triceps Skin fold (r =0.556, < .05) of softball players.

Significant relationships were observed between right grip strength to wrist girth (r=0.536, p< .05) and Arm relaxed girth (r=0.616, p < .05) of hockey players.

In the present study the two groups showed significant differences on their arm measurements and grip strength variables. Thus the hypothesis formulated in the beginning of the study is accepted. Previous studies have been reported that handgrip strength had strong correlation with various anthropometric characteristics (Benefice & Malina, 1996; Koley & Kaur, 2009; koley & Yadav, 2009; Koley, Kaur & Sandhu, 2009; Kaley, Singh & Sandhu, 2010)

The grip strength of softball players showed the closest relationship with the arm measurements compared to hockey players. In the present study, small sample size was a limitation which would be taken into account in our future studies.

CONCLUSIONS

It was concluded that the grip strength of the softball players had significant relationship with most of their arm measurements.

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