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RESEARCH ARTICLE

RELATIONSHIP BETWEEN HANDGRIP STRENGTH WITH SELECTED HAND ANTHROPOMETRIC VARIABLES AMONG UNIVERSITY MALE HANDBALL PLAYERS

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ABSTRACT

The purpose of the study was to evaluate the relationship between hand grip strength with hand anthropometric measurements in university male handball players. One hundred and forty four (144) male handball players, selected from south west zone inter university handball tournament for the year 2010- 2011, organized by S.R.T.M. University, Nanded, Maharastra. In this study data was collected from teams who reached quarterfinals and Annamalai university team. These selected subjects, who practice handball regularly and take part in competition and their age range between 18 to 28 years. The variables selected in this study were hand anthropometric measurements (hand width, hand length, hand shape index) and hand grip strength. Vernier caliper, Gulick tape, measuring scale and Grip dynamometer was used for data collection. Pearson correlation coefficient test revealed that right hand grip strength showed significant relationship with weight, hand width, hand length and shape index. However left hand grip strength showed significant relationship with weight, hand width and hand length ($p < 0.05$). It is concluded that right hand grip strength showed positive correlation with hand anthropometric measurements than left.

INTRODUCTION

Handball is an ideal synthesis of the three fundamental athletic disciplines of running, jumping and throwing. Therefore it is not only a purely competitive sport but also a fine sport to be taken up with advantage by many for purposes of training and health. The player must be able to start quickly, he must be a persevering runner, he must be able to skillfully deceive his opponent, he must be able to swiftly pick up the ball or catch it in the air, he must pass the ball with precision to his teammates and he must be able to execute all sorts of throws; in short, his body, his arms and his legs will have to be harmoniously trained. As the name of the game suggests, hands play the most important role; hands being naturally the important members of the body, the growing popularity of handball is easily explained. Many kinds of throws to score a goal are possible; the player is inspired to use his hands as a means of carrying out his ideas. The game is, of course, also faster than other ball games. It demands a never failing concentration and the capability of adapting oneself again and again to continuously changing situations, so that a team could not play an indoor handball match without substitutes. Unlike the other ball games where the ball is played by using one's hands.

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Handball is a hard game, personal contact is not avoided, throws are not soft and supple, but extremely fast and rough and it is a hard but a fair game. Handgrip strength is the maximal power of forceful voluntary flexion of all fingers under normal biokinetic conditions (Gandhi, Koley and Sandhu 2010). Handgrip strength determines the muscular strength of an individual (Ling, *et al.,* 2010; Fool, 2007). It is an important indication of general health and is regarded as one of the most reliable clinical methods for estimating strength (Nachon, *et al.,* 2002; Hager-Ross and Schieber, 2000). Handgrip strength is important for catching and throwing the ball in different team sports. Also, when the fingers are longer and hand surface variables greater than required for grasping an object (ball), fingers will less widely spread, and grasping an object will become more efficient and less fatiguing (Nag, Nag and Desai, 2003). The purpose of the study was to evaluate the relationship between hand grip strength with hand anthropometric measurements in university male handball players.

METHODS

Subjects

In this study the investigator selected one hundred and forty four (144) male handball players, selected from south west zone inter university handball tournament for the year 2010-2011, organized by S.R.T.M. University, Nanded, Maharastra.

In this study data was collected from teams who reached quarterfinals and Annamalai university team. These selected subjects, who practice handball regularly and take part in competition and their age range between 18 to 28 years.

Variables and test

The variables selected in this study were hand anthropometric measurements (hand width, hand length, hand shape index) and hand grip strength. Vernier caliper, Gulick tape, measuring scale and Grip dynamometer was used for data collection.

Tests

a) Weight

The subject, in minimal clothing, stands in the centre of the scale platform. Body mass should be recorded to the nearest tenth of a kilogram, if possible. A correction is made for clothing so that nude weight is used in subsequent calculations. Avoid measuring body mass shortly after a meal.

b) Height

The subject is standing straight, against an upright wall with a stadiometer or against an anthropometer, touching the wall or the anthropometer with back, buttocks and both heels. The head is oriented in the Frankfort Plane (i.e. the lower border of the eye socket and the upper border of the ear opening should be on a horizontal line). The subject is instructed to stretch upward and take and hold a full breath. The measurer should lower the Broca plane or the ruler until it touches the vertex firmly, but without exerting extreme pressure.

Hand Length (Wrist to Tip of 3nd Finger)

The subject place his hand on a table with the fingers together and thumb abducted. The measurement is taken with a sliding caliper from the stylion landmark identified above to the tip of the middle finger.

Hand Width

This is measured as the width of the hand from metacarpal II to metacarpal V. Have the subject place his hand on a table with fingers together and thumb out to the side. With a sliding caliper measure the width of the hand at the knuckles.

Hand Shape index

Hand Shape index was estimated using formula proposed by Kulaksiz and Gozil, 2002. [Hand shape index: Hand width x 100/Hand length]

Handgrip Strength Test

The objective of this test is to measure the maximum isometric strength of the hand and forearm muscles. Handgrip strength is important for any sport in which the hands are used for catching, throwing or lifting. The subject holds the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (heel of palm), while the handle should rest on middle of four fingers. When ready the subject squeezes the dynamometer with maximum isometric effort, which is maintained for about 5 seconds. No other body movement is allowed. The subject should be strongly encouraged to give a maximum effort. The best result from three trials for each hand is recorded, with at least 15 seconds recovery between each effort. Record the final resistance on the hand grip dynamometer in terms of kilogram (kg).

Statistical Techniques

The results were expressed as mean ± SD; therefore, descriptive statistics (mean and standard deviation) were calculated for each variable. Pearson correlation coefficient test was used to evaluate the correlation between variables. This statistical work was done with help of SPSS 11.5 and outputs reproduced as it is.

RESULTS

Descriptive statistics of height, weight, hand anthropometric measurements and handgrip strength of university male handball players are given in Table 1. Table 2 shows the correlation matrix of hand grip strength with selected hand anthropometric variables among university male handball players. The correlation was calculated for 144 players who took part in the study. This shows that right hand grip strength showed significant relationship with weight, hand width, hand length and shape index. However left hand grip strength showed significant relationship with weight, hand width and hand length.

Table 1. Descriptive statistics of anthropometric variables and handgrip strength in Indian males

Variables	Mean	Standard Deviation	Minimum	Maximum
Height	1.7551	0.029	1.72	1.81
Weight	66.6250	3.988	62.19	74.50
BMI	21.58	0.763	20.36	22.68
Right hand palm width	8.6011	0.237	8.22	8.96
Left hand palm width	8.5667	0.258	8.12	8.99
Right hand palm length	19.8233	0.307	19.48	20.39
Left hand palm length	19.8756	0.275	19.53	20.30
Right hand shape index	43.4422	0.959	41.67	44.80
Left hand shape index	43.1467	1.013	41.08	44.50
Right hand grip strength	71.6300	7.873	56.78	83.03
Left hand grip strength	67.6200	7.452	58.44	77.28

Table 2. Correlation matrix of hand grip strength with selected hand anthropometric variables among university male handball players

Variables	WT	BMI	RHW	LHW	RHL	LHL	RHSI	LHSI	RGRIP	LGRIP
HT	.650*	.035	.450*	.525*	.675*	.706*	-.178*	-.154	.044	.024
WT	1	.780*	.575*	.588*	.521*	.574*	.085	.047	.227*	.527*
BMI		1	.379*	.330*	.137	.185*	.246*	.166*	.256*	.429*
RHW			1	.872*	.443*	.485*	.574*	.444*	.347*	.350*
LHW				1	.466*	.537*	.425*	.528*	.241*	.407*
RHL					1	.876*	-.479*	-.381*	.306*	.281*
LHL						1	-.326*	-.432*	.259*	.309*
RHSI							1	.782*	.249*	.081
LHSI								1	.200*	.117
RGRIP									1	.427*

* Significant at 0.05 level of confidence

The obtained correlation coefficient value (r) is greater than the required table value 144 df is 0.1626 which is significant at 0.05 level of confidence.

DISCUSSION

It was reported earlier that physical performance had a strong association with body strength, shape, size, form and structure of an individual (Malina *et al*., 1987; Ross and Rösblad 2002). The findings of the present study follows the same direction (Table 2) highlighting a highly significant positive correlation between all the anthropometric variables measured and right and left handgrip strength in male handball players. Chatterjee and Chowdhuri (1991) concluded in the same direction that right and left handgrip strength was positively correlated with age, height, weight and body surface area. It is also reported that handgrip strength determines the muscular strength of an individual (Foo 2007). So, an increase in handgrip strength determines the physical strength of an individual. Visnapuu and Jürimäe (2007) indicated that hand perimeters are the most important hand anthropometric variables in relation to handgrip strength in handball players. In the present study, hand anthropometric measurements had a significant correlation with handgrip strength.

These results indicate that in those sports where a hand is an important tool, training can be influenced by some anthropometric variables and hand dimensions as well as general anthropometric parameters that are related to maximal handgrip strength. It also reported that throwing velocity is one of the most important factors for scoring in team handball (Marques *et al*., 2007). Tillaar and Ettema (2004) reported a positive correlation between isometric handgrip strength and ball throwing velocity for female, as well as male team handball players. In this study hand anthropometric parameters showed a high positive correlation with handgrip strength of the hand. Right hand shape index showed correlation in with right handgrip strength but it is in other way in left. Hand shape, especially in this method, may not be a useful variable for comparing athletes, who have griping tasks.

Conclusion

It is concluded that right hand grip strength showed positive correlation with hand anthropometric measurements than left. The data presented in the present study carry immense practical application and should be useful in future investigation on player selection, talent identification in handball and training program development for the players.

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