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Original Research Article

Correlation of various anthropometric parameters and nondominant hand grip strength in cricket and football players

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Abstract

Background: Handgrip strength is a reliable predictor of muscular strength and proper hand functioning.

Aims and Objectives: To Correlation of various anthropometric parameters and nondominant handgrip in cricket and football players.

Material and Methods: The present study was carried out in the sports physiology laboratory of the department of physiology Duration of the study from December 2012 to November 2014. A test study is undertaken to do a comparative study of anthropometric parameters and nondominant handgrip strength in cricket and football players.

Results: There is a positive correlation between weight, height, MUAC, BMI, % of body fat, % of lean body mass, mid-upper arm circumference, mid-upper arm area, corrected mid-upper arm muscle area, mid-upper arm fat area with nondominant handgrip strength in Cricket and Football players. There is a negative correlation between arm fat indexes, tricep skinfold thickness with nondominant handgrip strength in cricket and Football players.

Conclusion: It may be concluded that nondominant handgrip strength had strong positive correlations with all the anthropometric parameters.

Keywords: Anthropometry, Nondominant, Handgrip Strength.

Introduction

Grip strength is also used as a measure of overall physical strength [1], hand and forearm muscle performance, and physical performance as a feature index of nutritional status [2]. The strength of the handgrip is the result of a deep flexion of all finger joints with maximum voluntary force that can be exerted by the subject under normal biokinetic conditions using multiple hand and forearm muscles.The maximal force of forceful flexion of the fingers under bio-kinetic conditions is known to be handgrip strength. A reliable measurement tool [3] is used to evaluate a person's muscular strength. It is especially vulnerable to musculoskeletal problems such as upper limb disorders or injuries due to the misleading ability of the hand in various physical or athletic activities [4]. Studies have been conducted by various researchers to show the relationship between handgrip intensity and human anthropometric measurements, such as height, weight, length of limbs, etc. There is

no doubt that the significance of these anthropometric measurements in athletic activities is significant in sport ergonomics, and multiple studies have been carried out to examine the effect of these anthropometric measurements on handgrip strength across different populations.
We have planned to find out the correlation of handgrip strength and anthropometric parameters and we have focused on the effect of non-dominance on handgrip strength.

Materials and Methods

Study design:

The present study was carried out in the sports physiology laboratory of the department of physiology Duration of the study from December 2012 to November 2014 and it is not a follow up the type of study. The present study was approved by the Institution Ethical Committee of the college.

Source of data:

The data was collected from the players of Football and Cricket Academy of district level. A test study with 60 subjects (30 cricket players and 30 football players) is undertaken to do a comparative study of nondominant handgrip strength and anthropometric parameters in crickets and football players.

Inclusion criteria:

- Subjects with age group between 15-25 years.
- Subjects practicing daily for 2-3 hrs for 6 days a week.

Exclusion criteria:

- The subject age group below 15 years and above 25 years.
- Subjects who were not regularly practicing.

Method of Collection of Data

Subjects were tested verbally and visually to rule out any history of past and present damage to the right hand or medical condition that could influence the strength of the handgrip and anthropometric parameters. Medical history has been asked to evaluate topics that fall under the exclusion criterion. Readings were recorded in the data collection form, which included demographic data from all participants, including name, age, gender, hand dominance, ht, and wt, prior to the start of the test.

Anthropometric Measurements:

Three anthropometric variables were calculated using standard methods, i.e. height (HT), weight (WT) and body mass index (BMI), two hand anthropometric variables, i.e. right and left-hand width and length, four arm anthropometric variables, i.e. upper arm length, lower arm length, upper arm length, upper arm circumference, and non-dominant left handgrip strength.

Handgrip strength measurement:

The grip strength of both the right and left hands was measured in standing position with the shoulder attached and neutrally rotated and the elbow incomplete extension using a standard adjustable digital handgrip dynamometer. Without aid, the dynamometer was kept free of charge, not touching the trunk of the subject. The position of the hand remained constant without a downward trend. Three times on both sides of the hands, the subjects were asked to put maximum force on the dynamometer. The maximum value was recorded in kilogrammes.

Before each measurement, the anthropometric devices and the handgrip dynamometer were modified.

Statistical Analysis:

Normal descriptive statistics (mean ± standard deviation) were determined for explicitly measured and derived variables. The details showed a normal distribution, which helped us to use parametric statistics. For comparisons between players and controls, an independent t-test was used for all the variables measured. To assess the correlations of non-dominant handgrip strength with other variables in players, Pearson's correlation coefficients have been used. The data were analysed using SPSS (Statistics Package for Social Science) version 17.0.0. A 5 percent probability level was used to show statistical significance.

Results

Table 1: Correlation of various anthropometric parameters and nondominant hand grip strength in cricket and football players

Variables	Cricket players				Football players			
	N	Correlation coefficient (r)	t test	p value	N	Correlation coefficient (r)	t test	p value
Height	30	0.07	0.36	(p > 0.05)	30	0.10	0.55	
weight	30	0.35	1.99	(p > 0.05)	30	0.20	1.08	
BMI	30	0.29	1.58	(p > 0.05)	30	0.16	0.84	
% of body fat	30	-0.27	-1.50	(p > 0.05)	30	-0.05	-0.26	
% of Lean body mass	30	0.27	1.50	(p > 0.05)	30	0.05	0.26	
MUAC	30	0.45	2.70	p < 0.01	30	0.33	1.87	p> 0.05
MUAA	30	0.13	0.68	p< 0.01	30	0.38	2.17	p> 0.05
CMUAMA	30	0.56	3.60	p < 0.01	30	0.09	0.46	p> 0.05
MUAFA	30	0.05	0.28	p> 0.05	30	0.43	2.51	p < 0.05
Arm fat index	30	- 0.47	-2.80	p < 0.01	30	-0.02	-0.13	p > 0.05
Tricep skin fold thickness (Ts)	30	-0.37	-2.09	p<0.01	30	-0.06	-0.34	p >0.05

There is low positive correlation observed between height, weight, BMI, % of body fat, % of Lean body mass and non dominant hand grip strength in Cricket players and Football players which is statistically non-significant ($p > 0.05$).

There is highly significant positive correlation observed between MUAC, CMUAMA and non-dominant handgrip strength in Cricket players ($p < 0.01$).

There is low positive correlation observed between MUAC, CMUAMA and non-dominant handgrip strength in Football players which is statistically non significant ($p > 0.05$).

There is significant positive correlation observed between MUAA, CMUAMA and non-dominant handgrip strength in football players ($p < 0.05$).

There is low positive correlation observed between MUAA, CMUAMA and non-dominant handgrip strength in cricket players which is statistically non significant ($p >0.05$).

There is highly significant negative correlation observed between Arm fat index, Ts and non dominant handgrip strength in Cricket players ($p <0.01$).

There is low negative correlation observed between Arm fat index, Ts and non dominant handgrip strength in Football players which is statistically not significant ($p > 0.05$).

Discussion

Height

Our findings show that the non-dominant hand grip strength continued to increase with an increase in height for both cricketers and football players. For non dominant hands, in cricketers r= 0.07, t= 0.36, in football players r= 0.10, t= 0.55 (Table 1).Similar result with our finding i.e. positive correlation between height and hand grip strength is shown by other authors like Koley S (2009, for rt hand, r= 0.383 and for lt hand, r= 0.35) in Indian cricket players [5], Fallahi AA (2011, r= 0.603) [6], Koley S and Pal AS (2009, r= 0.872) in Indian population [7], Koley S and Gandhi M (2008) [8], Moy F (2011, r=0.346) [9] in Malaysia population, Sampoli S (2007) [10], Neimpoog S (2007) [11], Pietrese S (2002) [12], Kamarul T (2006) [13].Dissimilar result with our finding shown by Jurimae T (2009) [14]. His study shows that there is low negative correlation in between height and hand grip strength.In earlier times, proper exercise to increase height may be required, which can lead to an improvement in the strength of the hand grip. More grip strength causes better performance at all times.

Weight

Our findings show that the non-dominant hand grip strength continued to increase with an increase in both cricketers and football players. For non dominant hand grip strength, in cricketers r= 0.35, t= 1.99, in football players r= 0.20, t= 1.08. (Table 1).
Similar result with our finding i.e. positive correlation between weight and hand grip strength is shown by other authors like S koley (2009, for rt hand r= 0.498 and for lt hand 0.472) [5] in Indian cricket players, Fallahi AA (2011. r=0.516) [6], Koley and Pal AS (2009, r= 0.853) [7]in Indian population, Moy F (2011, r= 0.298) in Malaysia population [9]. Koley S and M Gandhi (2008) [8], Sampoli S (2007) [10], Neimpoog S (2007) [11], Pietrese S (2002) [12], Kamarul T (2006) [13], Günther CM (2008) [15].More weight would result in more hands being measured. When testing hand grip strength, more contraction force can be exerted on the dynamometer. This may be the reason for the positive weight and strength of the hand grip relation.

BMI

Our findings show that the non-dominant hand grip strength continued to increase with an increase in BMI in both cricketers and football players. For NDM hands, in cricketers r= 0.29, t= 1.58 and in football players r= 0.16, t =0.84 (Table 1).Similar result with our finding i.e. HGS is positively correlated with BMI is shown by other authors like S Koley (2009, for rt hand r= 0.401 and for lt hand r=0.374) in Indian cricket players [5]. Fallahi AA (2011, r= 0.061) [6], Moy F (2011, r= 0.150) [9] in Malaysia population, Koyle S, Pal AS (2009) [7], Koley S and M Gandhi (2008) [8], Samproli S (2007) [10], Pieterse S (2002) [12], Günther CM (2008) [15].Disimilar result with our finding i.e. HGS is negatively correlated with BMI is shown by Westrop M (2011) [1]. Kamarul T (2006) [13] shows that there is no correlation between BMI and HGS.BMI should be maintained within the normal range to be useful for the improvement of HGS. It will lead to better outcomes for cricket and football players.

% of body fat

Our findings show that non-dominant hand grip strength continued to decline with a rise in percent of body fat in both cricketers and football players. For NDM hands, in cricketers r= -0.27, t= -1.50, in football players r= -0.05, t= -0.26 (Table 1).Dissimilar result with our finding i.e. hand grip strength is positively correlated with is % of body fat is shown by other authors like Koley S (2009, for rt hand r= 0.401 and for lt hand 0.374 in Indian cricket players [5], Fallahi AA (2011, r= 0.079) [6]. Neimpoog S (2007) [11] states that no correlation between hand grip strength and body fat %.In order to maintain adequate grip strength, the percentage of body fat should be held within the normal range. Better hand grip strength leads to stronger outcomes for cricket and football players.

% of lean body mass

Our findings indicate that the non-dominant hand grip strength continued to increase with an increase in percent of the lean body mass in both cricketers and football players. For non dominant hands, in cricketers r= 0.27, t= 1.50, in football players r= 0.05, t= 0.26 (Table 1).Similar result with our finding i.e. hand grip strength is positively correlated with % of lean body mass is shown by Fallahi AA (2011, r = 0.536) [6].Dissimilar result with our finding i.e. hand grip strength is negatively correlated with is % of lean body mass is shown by author Koley S (2009, for rt hand r= -0.400 and for lt hand r= -0.372) [5].In order to achieve adequate grip strength, a percentage of the lean body mass should be retained within the normal range. Better hand grip strength leads to stronger outcomes for cricket and football players.

MUAC

Our findings show that the non-dominant hand grip strength continued to increase with an increase in MUAC in both cricketers and football players. For NDM hands, in cricketers r= 0.45, t= 2.70, for football players r= 0.33, t= 1.87 (Table 1). Similar result with our finding i.e. HGS is positively correlated with MUAC is shown by Koley S (2009, for rt hand r= 0.513 and for lt hand r= 0.547) in Indian cricket players [5].The MUAC should be increased with special training and specific exercises. As the MUAC increases, the hand grip strength can be strengthened. Greater hand grip power will have better outcomes for both cricket and football players.

MUAA

Our findings show that the non-dominant hand grip strength continued to increase with an increase in the mid upper arm area (MUAA) for both cricketers and football players. For non dominant hand, in cricketers r= 0.13, t= 0.68, in football players r= 0.38, t= 2.17 (Table 1). Similar result with our finding i.e. mid upper arm area is positively correlated with hand grip strength, in Indian cricket players shown by author like Koley S (2009, for rt hand r= -0.493 and for lt hand r= -0.481) [5].This may lead to positive co-relation of mid upper arm area and hand grip strength in our cricket and football player.

CMUAMA

Our findings show that the non-dominant hand grip strength continued to increase with an increase in the corrected mid upper arm muscle area (CMUAMA) for both cricketers and football players. For non dominant hands, in cricketers r= 0.56, t= 3.60, in football players r= 0.090, t= 0.46 (Table 1).Similar result with our finding i.e. arm muscle area is positively correlated with hand grip strength in Indian cricket players is shown by other authors like Koley S (2009, for rt hand r= 0.506 and for lt hand r= 0.539) [5],

Pieterse S (2002) [12].This reason may lead to positive co-relation of CMUAMA and hand grip strength in our cricket and football player.

MUAFA

Our findings show that the non-dominant hand grip strength continued to increase with an increase in the corrected mid upper arm fat area (MUAFA) for both cricketers and football players. For NDM hands, in cricketers r= 0.05, t=0.28, in football players r= 0.43, t= 2 (Table 1).Similar result with our finding i.e. arm fat area is positively correlated with HGS in Indian cricket players is shown by Koley S (2009, for rt hand r= 0.326 and for lt hand r= 0.292) [5].

MUAFA should be maintained within the normal range to obtain sufficient grip strength.

Better grip strength leads to better cricket and better results of football players.

Arm fat index (AFI)

Our findings show that non-dominant hand grip strength remained low with a rise in arm fat index (AFI) for both cricketers and football players. For NDM hands, cricketers r= -0.47, t= -2.80 and for football players r= -002.10, t= -013) (Table 1).Dissimilar result with our findings i.e. arm fat index is positively correlated with HGS in Indian cricket players is shown by author Koley S (2009, for rt hand r= 0.083 and for lt hand r= 0.014) [5].In order to obtain sufficient grip strength, the fat index of the arm should be kept within the normal range. Better hand grip strength leads to stronger outcomes for cricket and football players.

Triceps skin fold thickness

Our findings indicate that the non-dominant hand grip strength continued to decrease with an increase in tricep skin fold thickness in both cricketers and football players. For NDM hands, in cricketers r= -0.37, t= -0.29, in football players r= -0.06.10, t= -0.34 (Table 1).Dissimilar result with our finding i.e. tricep skin fold thickness is positively correlated with hand grip strength in Indian cricket players, is observed by other author like Koley S (2009, for rt hand r= 0.278 and for lt hand r= 0.210) [5]. In order to maintain proper grip strength, tricep skin fold thickness should be maintained within the normal range. Better hand grip strength leads to stronger outcomes for cricket and football players.

CONCLUSION

Both anthropometric parameters and hand grip strength should be measured on a regular basis by the coach. The physical health metric needs to be improved to increase the efficiency of players. Body fat training and hand grip strength training should be performed at junior level to build up the body mass to overcome the asymmetrical strain put on the body by the nature of the game. Hand grip training programs at various levels, such as school, college, university, state, should be planned. This helps us to offer a specific sport prescription to a player when selecting a sport. From this study, it can be inferred that handgrip strength values are higher in individuals involved in hand sports. Most anthropometric variables also had some strong correlations.

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