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Original Articles

Correlation of Hand Grip Strength with Upper Limb Anthropometry of Bangladeshi Male Cricket Batsman

Moushumi Taher Asha[1], Shahnawaz Akter[2], Md. Zamilur Rahman[3], Shamim Ara[4], Md. Rafiqul Alam[5], ABM Omar Faruque[6]

Abstract

Context: *The estimation of hand grip strength is of immense importance in sports where a sufficient degree of power grip is necessary for success. In fact, many sports require a sustained level of hand prehensile force to maximize control and performance as well as reduce the possibility of injuries. The present study was undertaken to measure the correlation of hand grip strength with upper limb anthropometry of Bangladeshi male cricket batsman. The result may be used as a base-line for other professions as well for further research in our country.*

Materials & Methods: *A cross sectional analytical type of study was conducted at department of Anatomy, Dhaka Medical College, Dhaka from July 2015 to June 2016 on fifty (50) adult Bangladeshi male sprinters (Group A) and fifty (50) adult Bangladeshi male cricket batsman (Group B). Sample collection was done by convenient purposive sampling technique. History of any injury of upper limb during playing was excluded to construct standard measurement. Total upper limb length was measured with the help of steel measuring tape. Hand grip strength Dynamometer was used to measure the hand grip strength.*

Results: *The mean right and left hand grip strength was significantly higher ($P<0.05$) in the cricket batsman (group B) than in the sprinters (group A). The mean right hand grip strength was significantly higher ($P<0.05$) than the left hand grip strength in both cricket batsman (group B) and sprinters (group A). Right and left hand grip strength showed significant positive correlation with measured total upper limb length. But no significant difference in measured total upper limb length between the cricket batsman and sprinters was observed.*

Conclusion: *The present study showed that right and left hand grip strength of the cricket batsman (group B) was significantly higher than the sprinters (group A). Both right and left hand grip strength showed significant positive correlation with measured total upper limb length.*

Keywords: *Hand grip strength, hand grip dynamometer.*

[1]Assistant Professor, Department of Anatomy, Bashundhara Ad-din Medical College, Dhaka.
[2]Assistant Professor, Department of Anatomy, Mark's Medical College, Dhaka.
[3]Assistant Professor, Department of Anatomy, Bashundhara Ad-din Medical College, Dhaka.
[4]Professor and Head of the Department of Anatomy, Holy Family Red Crescent Medical College, Dhaka.
[5]Professor, Department of Anatomy, Dhaka Medical College, Dhaka.
[6]Professor and Head, Department of Anatomy, Bashundhara Ad-din Medical College, Dhaka.
Correspondence: Dr. Moushumi Taher Asha
Email: mtaherasha1982@gmail.com

Introduction

Hand grip strength is a physiological variable. The human upper limb is built for prehension and manipulation and the range of movements available at the joints of the upper limb enhances the skill in performing tasks, especially with the hands.[1] In hand grip, the fingers are flexed around an object, with counter pressure from the thumb.[2] The fingers and the thumb need the palm of the hand as a flat base on which the object grasped can be held. Hand grip strength is essential for many of the sports events like cricket, basketball,

baseball, hockey and in many household activities such as carrying laundry, turning a door knob and vacuuming.[3] The power grip is the forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal biokinetic conditions.[4] There are three subcategories of the power grip such as cylindrical grip, spherical grip and conoid grip. The cylindrical grip is used for handles that lie at right angles to the forearm such as cricket bat, handbreak of a car. The skin of the palmar surface of the fingers and the palm curves around the handle and thumb lies in opposition over the fingertips. Where a tool or object such as hammer is being used with a line with the forearm, the fingers flex around the handle in a graded way with the maximum degress of flexion in the little finger and least in the index finger. The thumb lies either over the fingertips or along the handle of the tool being grasped. The wrist is ulnar deviated and the maximum area of skin of the palm, thenar and hypothenar eminences is in contact with the handle of the tool.[5] Grip strength measurement is an objective index of the functional integrity of the upper limb.[6] The estimation of hand grip strength is of immence importance in sports where a sufficient degree of power grip is necessary for success.[7] Power grip strength can be obtainable after certain period, it depends on types of grip and other physical exercise, e.g. judo athletes need at least seven years strength training to get their desired grip strength.[8] It has been reported that there is significant decrease of hand grip strength at the end of playing due to muscular fatigueness.[9]

Now a days anthropometric dimensions and morphological characteristics play an important role in determining the success of an athlete. It has been well established that specific physical characteristics or anthropometric profiles indicate whether the player would be suitable for competition at highest level in a specific sport.[10] Cricket is a physically demanding sport comprised of several specialism requiring skills and type of fitness.[6] It is a game of endurance as well as strength. Batsman uses cylindrical power grip to hold a cricket bat. Batsman also required hand to hand coordination, upper limb power, power grip strength and the coordinate movements of shoulders, arms, and wrist. For batting upper limb strength is essential.[11] Grip strength, forearm strength and shoulder power are essential components contributing to upper limb strength. Stronger upper limb give more power in shots. Measurement of grip strength is an important part in muscular strength assessment by providing a quick estimation of cricketer's upper limb strength.[12] Grip training plays an important role for the batsman to increase hand grip strength. So the importance of studying correlation of hand grip strength with anthropometric variables of upper limb carry immense practical application in anthropometry. So far it is known, there is no available literature on correlation of hand grip strength with anthropometric variables of the male cricket batsman in our country. So the present study will carry great importance since Bangladesh cricket is developing day by day.

Materials & Methods

Convenient purposive sampling was done. Upper limb bones get completely ossified usually by the age of 20 years. Hence the present study was conducted on population ranging from 26-35 years of age. Right hand dominant batsman were selected. Height of both group A and B was selected ranging from 168 cm (5 feet 6 inch) to 176 cm (5 feet 9 inch). The group B required repeated use of power grip throughout the practice and playing period where as the group A was not required so. History of any injury of upper limb during playing was excluded from this research. 50 adult Bangladeshi male sprinters (group A) was selected from Bangladesh Athletic Federation and 50 adult Bangladeshi male cricket batsman (group B) was selected from different cricket foundation and club at Dhaka, e.g: Kalabagan Foundation, Abahani Club, Udayan Academy.

Hand grip strength dynamometer (Camry, USA) was used to measure the grip strength. The subject sat on a chair with the elbow flexed at 90^{o} and forearm in semi-prone position, lying on an arm-rest. He was requested to squeeze the dynamometer three times with each hand. To overcome fatigue of hand muscles, the subject was given one minute resting period between each

squeeze. Mean value of three squeezes were taken into account. Hand grip strength was measured in kg. Total upper limb length was measured by steel measuring tape. The subject was asked to stand on the floor in erect posture facing forward with arms hanging loosely down at the side, parallel to the body. At first the acromion process which is the most prominent posterolateral bony prominence of the shoulder joint was identified on palpation and was marked by a point. Second point was given on the tip of the middle finger. Then total upper limb length was measured from the acromion to the tip of the middle finger in cm. Paired Student's t test, unpaired student's t test and Pearson's correlation coefficient test were done for statistical analysis of the result.

Ethical clearances: This work was approved by the Ethical Review Committee (ERC) of Dhaka Medical College.

Fig-1: *Photograph showing measurement of hand grip strength by digital hand grip dynamometer*

Fig-2: *Photograph showing measurement of total upper limb length by steel measuring tape*

Results

Results are shown in Table-I, Table-II, Fig-3, Fig-4 and Fig-5 (i, ii, iii, iv)

Table I

Comparison of grip strength between group A and group B

Group	Grip strength (kg)		*P value*
	Right hand (Mean±SD)	Left hand (Mean±SD)	
A (n=50)	39.77±1.24 (37.16-41.89)	38.53±1.19 (36.13-41.25)	0.001
B (n=50)	43.05 ± 1.52 (38.93-45.87)	41.46 ± 1.23 (38.50-44.21)	0.001
P value	0.001*	0.001*	

Figures in parentheses indicate range. SD= Standard Deviation .Comparison between values of right and left hand of same group was done by Paired Student's 't' test. Comparison between group A and group B was done by Unpaired student's 't' test. ns= not significant, *= significant. Group A (Adult Bangladeshi male sprinters), Group B (Adult Bangladeshi male cricket batsman)

Table –II

Comparison of measured total upper limb length between group A and group B

Group	Measured Total Upper Limb Length in cm		
	Right (Mean±SD)	Left (Mean±SD)	*P value*
A	83.08±1.55	83.08±1.55	0.091 ns
(n=50)	(79.66-84.88)	(79.65-84.87)	
B	82.76 ± 2.13	82.76 ± 2.13	0.090 ns
(n=50)	(73.10-85.99)	(73.11-85.99)	
P value	0.393 ns	0.393 ns	

Figures in parentheses indicate range. SD= Standard Deviation .Comparison between values of right and left upper limb of same group was done by Paired Student's 't' test. Comparison between group A and group B was done by Unpaired student's 't' test. ns= not significant, *= significant. Group A (Adult Bangladeshi male sprinters); Group B (Adult Bangladeshi male cricket batsman.

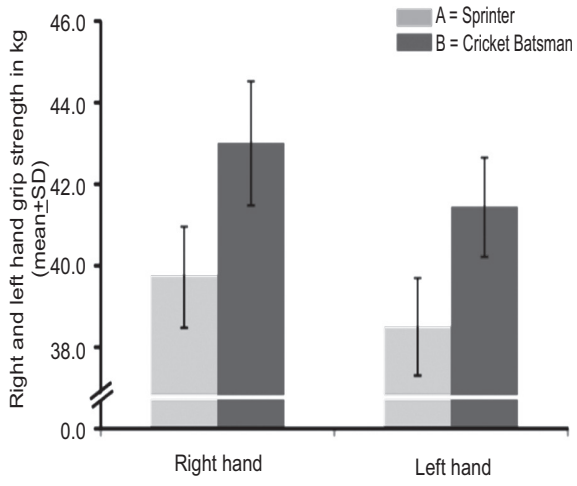

Fig-3: *Comparison of right and left hand grip strength between group A and group B*

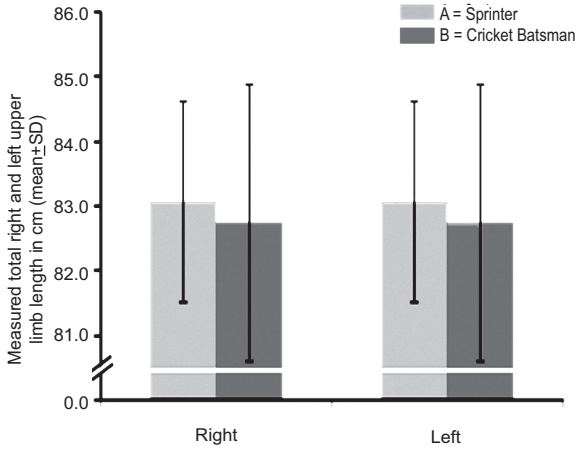

Fig-4: *Comparison of measured total right and left upper limb length between group A and group B*

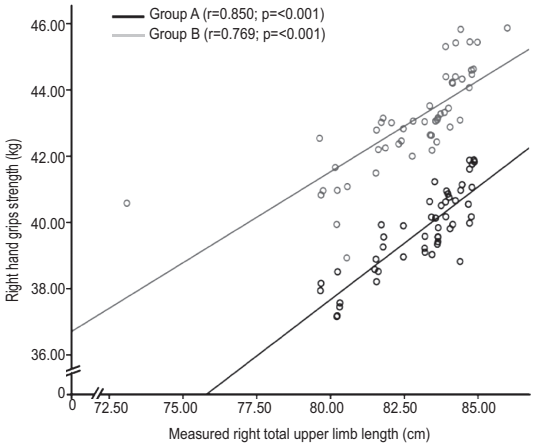

Fig-5: *Correlation of right hand grip strength with measured right total upper limb length*

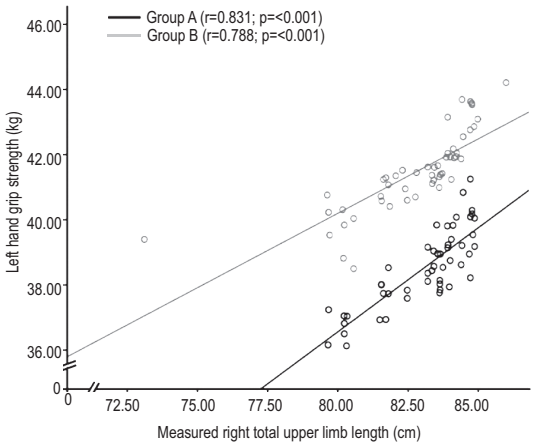

Fig-6: *Correlation of left hand grip strength with measured left total upper limb length*

Discussion

Hand grip strength measurement is an objective index of the functional integrity of the upper limb. The present study was carried out on 50 adult Bangladeshi male sprinters (Group A) and 50 adult Bangladeshi male cricket batsman (Group B). Male cricket batsman were selected for the present study on the basis of observations that they constantly use power grip to hold the bat and play powerful shot. The sprinters do not uses power grip during practice and playing period. Due to inclusion of different study subject results are quite different. Koley and Yadav[11] conducted a study on 103 male cricketers 17-21 years of age from Amritsar, Punjab, India which included both batsman and bowler; whereas the present study only concentrated on Bangladeshi male cricket batsman. Use of pinch grip takes priority for bowlers but for batsman power grip plays vital role. Batsman usually use cylindrical power grip for their practice and playing where handball players use spherical power grip. Grip training are different between bowlers and batsman. Difference of age group was also noticed.

The mean right and left hand grip strength of group A and B in the present study was 39.77±1.24 kg, 38.53±1.19 kg and 43.05±1.52 kg, 41.46±1.23 kg respectively. Significant difference (P<0.001) was observed between mean grip strength of right and left hand in both group A and B where the mean grip strength was higher in the right hand. Significant difference (P<0.001) was observed between group A and group B in the mean grip strength in both hand where the mean grip strength was higher in the group B than the group A. Chittababu[13] found 71.63±7.87 kg and 67.62±7.45 kg mean hand grip strength of right and left hand respectively in male handball players which was significantly higher (P<0.001) than group B of the present study. Koley and Yadav[11] reported 35.86 ±7.07 kg and 35.41±6.68 kg mean hand grip strength in right and left hand respectively which was significantly lower (P<0.001) than group B of the present study. The mean right and left mean measured total upper limb length of group A and B in the present study was 83.08±1.55 cm, 83.08±1.55 cm and 82.76±2.13 cm, 82.76±2.13 cm respectively. No significant difference (P>0.05) was observed between group A and group B in the mean measured total upper limb length of both limb. In this study right (r=+0.769, P<0.001) and left (r=+0.788, P<0.001) hand grip strength showed significant positive correlation with right total upper limb length. In relation to the left total upper limb length showed significant positive correlation with both right (r=+0.770, P<0.001) and left (r=+0.788, P<0.001) hand grip strength. In contrary to these Koley and Yadav[11] reported 77.28 ±10.64 cm mean right total upper limb length which was significantly lower (P=0.0004) than group B of the present study findings. The researchers also showed non-significant positive correlation in both right hand grip strength (r=+0.134, P>0.05) and left hand grip strength (r=+0.073, P>0.05) with right total upper limb length.

Conclusion

In this study, significant positive correlation was found between grip strength of right and left hand and measured total upper limb length. The mean right and left hand grip strength was significantly higher in the cricket batsman than in the sprinters. The mean right hand grip strength was significantly higher than the left hand grip strength in both cricket batsman and sprinters. The results show that hand grip strength increases with regular grip exercise and training

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