

# Association between Hand Grip Strength and Shoulder Power in Intercollegiate Cricket Players

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**ABSTRACT:** The aim of the study was to find correlation between grip strength and shoulder power of intercollegiate cricket players. A total sample of 75 intercollegiate cricket players were taken among which 38 players were in age group 17yrs, 19players in age group 18yrs, and 18 players in age group 19 yrs. A calibrated hydraulic hand Dynamometer with adjustable grip was used to measure grip strength of dominant and non-dominant hand. Shoulder power was measured by medicine ball put test for dominant hand. Statistical analysis was done using SPSS 16. The results showed that there is positive correlation (moderate to strong) between grip strength and shoulder power. Thus during training program, focus should be given equally on improvement of both shoulder power and grip strength. As there is positive correlation between grip strength and shoulder power that grip strength can be used as a predictor of shoulder power.

**KEYWORDS:** Grip strength, shoulder power, hand dynamometer, medicine ball put test.

## I INTRODUCTION

Cricket is a physically demanding sport comprised of several specialism requiring different skills and type of fitness .Cricket is the game of endurance as well as strength. Cricket as sport requires excellent eye to hand coordination, upper extremity power, hand grip strength and the coordinate movements of the hips, shoulders, arms and wrists. It entails batting, bowling, fielding, wicket keeping, running etc. For batting, throwing ball during fielding and bowling use of forearm strength is essential [1]. In fact, entire upper extremity strength is very important. Hand grip strength, forearm strength and shoulder power are essential components contributing to upper extremity strength. Thus this study focuses on hand grip strength and shoulder power.

The power of hand grip is a result of forceful flexion of all finger joints with maximum voluntary force that subject is able to exert under normal bio kinetic conditions [2, 3]. Grip strength is evaluated as a component of hand function. It is one of the best indicator of overall strength of limb [3]. It is often used as an indicator of overall physical strength [4, 5], hand and forearm muscle performances [6] and as a functional index of nutritional status [7, 8], and physical performance [9,10]. Grip strength is the integrated performances of muscles that can be produced in one muscular contraction [6,12] . It is widely accepted that grip strength provides an objective index of the functional integrity of the upper extremity. A Reliable and valid evaluation of hand strength can provide an objective index of general upper body strength (De S et. al. 2011). Hand dynamometer is the most valid and reliable tool to measure grip strength. Thus in this study hand dynamometer is used as an outcome measure for evaluation of grip strength. [2,11]

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Shoulder power is very essential for a cricket players to hit the ball while batting, throwing ball, bowling etc. Different activities needed to be done by cricketers involves combination of both hand grip strength and shoulder power requirement. Strength is one of the most important ingredient of playing success. Many sports require athletes to have high levels of muscular strength.[13] Assessment of strength is therefore recognized by coaches as necessary for evaluation of athletes potential. There are many test for measuring shoulder power, amongst which medicine ball put test is the most commonly used valid and reliable test to measure shoulder power in sports.[14,16] Thus in this study medicine ball put test is used as an outcome measure for assessing shoulder power.

There are studies individually done on grip strength and shoulder power in different sports like hockey, handball, softball etc. but few focusing on cricket. There are few studies on grip strength and shoulder power in cricket players, but still very few on correlation between grip strength and shoulder power. Thus the study aimed at finding grip strength, shoulder power and finally assessing relation between grip strength and shoulder power in intercollegiate cricket players.

## II. RELATED WORK

The authors Koley, S et al [1], have done study on association of hand grip strength with some anthropometric variables in Indian Cricket Players and softball players, Richards, L et al Parvatikar, V.B et al [3,36] have done studies on how positions of forearm, elbow, shoulder affects grip strength, Walaa M [38] have done study on different testing positions on hand grip strength, Mathiowetz v et al, Bohannon et al and R. W, Crosby CA et al [15,2,31] have done study on pinch and grip strength normative values for adults, author Terry J Housh et al [34] Age-Related Increases in Shoulder Strength of High School Wrestlers. Very few studies have been done on comparison of grip strength and shoulder power which includes study done by Amandeep Singh et al [16] did study on Comparative study between hand grip and shoulder girdle strength among inter college Cricket, Baseball and Softball player. Bülent Ağbuğa Ferman Konukman Ilker Yilmaz [37] did study on Prediction of Upper Body Strength By Using Grip Strength Test in Division 2 American football Players grip strength. Lan Horsley [35] did study on correlation between hand grip strength and shoulder strength to rule out shoulder pathology. With this background the present study was taken up in intercollegiate cricket players to find out the association between grip strength and shoulder power.

## III. METHODOLOGY

**Research approach:** cross sectional survey study

**Study setting:** Matunga Gymkhana, Shivaji Park gymkhana.

**Study sample:** 75

**Sampling technique:** Convenience sampling

**Inclusion criteria:**

1. Intercollegiate cricket players in the age group between 17 to 19 years
2. Male players.
3. Right hand dominant players.
4. Players with minimum of 3 years' experience.

**Exclusion criteria:**

1. Intercollegiate cricket players having age below 17 and above 19
2. Female players
3. Left hand dominant players.
4. Players less than 3 years' experience.
5. Players having any injury or other medical problem.

**Ethical approach:** The study was approved by Institutional Ethics and Research committee of D.Y Patil University. Written informed consent was taken from all subjects and their identification information which was collected during has been kept strictly confidential.

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**Procedure:**

Demographic details like age, height, weight were collected and BMI was calculated.

Height, weight, BMI:

Height measurements were taken by using the standard anthropometric rod (HG-72, Nexgen ergonomics, Canada) to the nearest 0.5 cm. Full attentions given make sure that players' body was fully upright and their mandible was parallel to the ground. Taken values recorded as 'cm'. The subject's weights were measured with portable weighing machine to the nearest 0.5 kg. During measurements players were on bare feet and with underwear and measurements recorded as 'kg'. BMI was calculated by the formula of;

$$\text{Body Mass Index} = \text{Weight}/\text{Height}^2.$$

**Hand Grip Strength Test:**

A calibrated Hydraulic Hand Dynamometer with adjustable grip was used. The subjects were seated with their shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm and wrist in neutral position [15]. Subjects were asked to hold dynamometer alternatively in right and then left hand (i.e. dominant and non-dominant hand), at their side without touching rest of the body, and squeeze it forcefully [15, 16]. Three trials were given, and the mean of the three trial was calculated and taken as mean grip strength. Initial instructions with explanation and demonstration was given to the subjects.

**Medicine Ball Put Test:**

This test was used to measure the arm and shoulder girdle strength. The test involved throwing a 2 kg medicine ball in the horizontal direction as far as possible. The participant was asked to hold the medicine ball in one hand close to the point, where the shoulder joins the neck and stand between the two restraining lines to put the ball down the course. Three trials were given and the best of the three was taken as the score of the test. The distance was measured in feet's [16, 17] Initial instructions with explanation and demonstration was given to the subjects. This test was done for dominant hand only.

### IV. RESULTS

Table: 1 Grip Strength on Dominant Hand:

		Num	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Gripstrength Dominant hand	17yrs	38	33.57	6.62	1.07	31.39	35.75	20.66	52.66
	18yrs	19	33.77	6.73	1.54	30.52	37.01	21.33	49.33
	19yrs	18	37.70	5.16	1.21	35.13	40.27	29.34	48.66
	Total	75	34.61	6.49	.74	33.12	36.11	20.66	52.66

Table: 1 Descriptive statistics of dominant hand:- The above table gives the details about number of players, Standard Deviation, mean and range of grip strength in the age group 17, 18 and 19.

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Table: 2 Grip strength on Non Dominant Hand:

	Num	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Grip strength 17 yrs nondominant hand	38	32.40	6.77	1.09	30.17	34.62	20.66	48.70
18yrs	19	31.96	6.22	1.42	28.96	34.96	20.67	43.00
19yrs	18	37.21	5.16	1.21	34.65	39.78	27.33	45.33
Total	75	33.44	6.56	.75	31.93	34.95	20.66	48.70

Table: 2 Descriptive statistics of non-dominant hand:- The above table gives the details about number of players, Standard Deviation, mean and range of grip strength in the age group 17, 18 and 19.

Table: 3 Shoulder Power of the dominant hand:

	Num	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Shoulder power 17yrs	38	30.60	4.62	.75	29.08	32.12	20.00	38.20
18 yrs	19	30.58	5.50	1.26	27.93	33.24	20.00	44.50
19 yrs	18	33.81	4.30	1.01	31.67	35.95	24.90	39.10
Total	75	31.37	4.92	.56	30.23	32.50	20.00	44.50

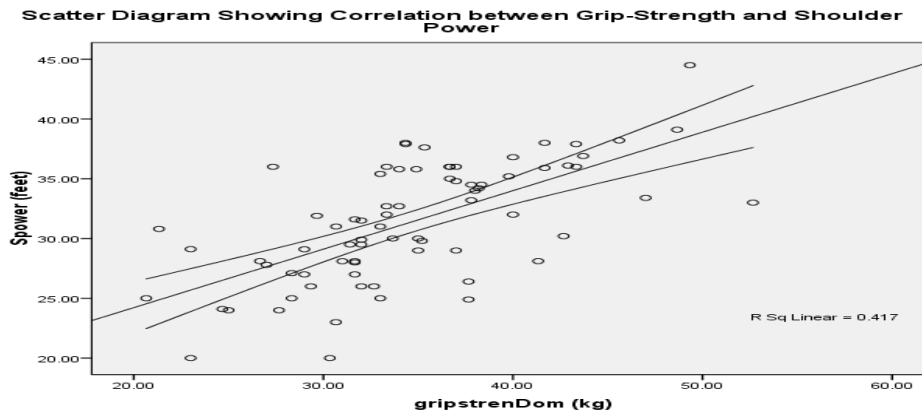
Table: 3 Descriptive statistics of Shoulder power of the dominant hand:- The above table gives the details about number of players, Standard Deviation, mean and range of Shoulder power in the age group 17, 18 and 19.

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Graph: 1 Scatter diagram showing Correlation of grip strength and shoulder power on dominant hand:



Graph: 1 The above graph shows that there is Positive correlation (Moderate to strong) between grip strength and shoulder power of the dominant hand.

## V. DISCUSSION

In this study, a total sample of 75 intercollegiate cricket players who were right hand dominant were taken. The objectives of the study were 1) To find grip strength 2) To find shoulder power 3) To find correlation between grip strength and shoulder power.

According to this study, the mean range for grip strength of dominant hand for age group 17 years lie in range 31.39 - 35.75, for age group 18 years lie in range 30.52-37.01 and for age group of 19 years lie in range 35.13-40.27. The mean range gradually increases from age group 17, 18 and 19 years. This shows that grip strength increases with age.

In this study the mean range for grip strength for non-dominant hand for age group 17 years lie in range 30.17-34.62, for age group 18 years lie in range 28.96-34.96 and for age group of 19 years lie in range 34.65-39.78. The mean range were consistently higher for age group 17, 18 and 19 years. This shows that grip strength increases with age.

The probable reason could few studies suggested that mechanism that underlies age effect involves either neuromuscular factors or an increase in contribution of muscle mass per unit of fat free mass.[18,19] Thus, with age muscle mass increases leading to increase strength. Also, the fiber type distribution characteristics may influence the expression of strength across age [19]. Given that the muscle within an individual can have substantially differ in percentage of fast and slow twitch fibers [20,21,22]. The force capabilities are in part dependent upon the twitch characteristics of muscle fiber [23,24,25]. The age effect may be evident at different speeds of contraction depending upon the fiber type distribution characteristics of muscle involved. Type 2 muscle fibers display faster shortening velocity than type 1 muscle fibers. Higher proportion of type 2 muscle fibers may be therefore beneficial for strength and power sports [31]. Also the tension per cross sectional area unit is greater for type 2 (fast twitch) fibers than type 1 (slow twitch) [23, 27]. Cross sectional area of type 2 fibers increases 30 fold before age 20 [28]. There is a strong correlation between strength and type 2 muscle fibers below age 20[39]. Thus to summarize all, as age increases there is increase in muscle mass, thus increase in number of muscle fibers which leads to increased strength with age. Also the cross section area of type 2 fibers which contribute majorly to strength increases 30 fold before age of 20 years [28] this is also one of the strong reason for increase in strength.

When compared grip strength of dominant hand with non-dominant hand, it was found that dominant hand had higher values of grip strength mean range than the non-dominant hand. This supports the findings of 10% rule. The 10% rule states that the dominant hand possesses a 10% greater grip strength than the non-dominant hand [30]. Most tools and

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daily appliance are designed for the right hand. As a result, the right hand of both right and left handed people is exercised more often than left on a daily basis[31]

Mean range for Shoulder power for dominant hand for age group 17years will lie in range 29.08-32.12, for age group 18 years will lie in range 27.93- 33.24 and for age group of 19 years will lie in range 31.67-35.95. The mean range were consistently higher for age group 17, 18 and 19 years. This shows that shoulder power increases with age. Power depends on ability to generate force as well as extremity velocity and to coordinate movement [32, 33]. Age has statistically independent influence on Strength and power measures [28]. Preservation of power and strength was observed till age 40 [34]. Reduction in strength affects power. Age has direct effect on strength and power. In addition age has indirect effects on strength and power .for e.g., age affects height which in turn affects power. Further height affects weight, activity (caloricexpenditure) affects muscle mass which in turn affects strength and power[28]. There is increase in muscle mass with age and also increase in muscle fibers leading to increases strength in turn increased power.

The study also revealed moderate to strong positive correlation between grip strength and shoulder power. It means that subjects having less grip strength had lesser shoulder power and more grip strength had more shoulder power and vice versa. There are very few studies done on correlation between grip strength and shoulder strength.The result of the study is consistent withLan Horsley et alwho have done study on correlation of grip strength and shoulder strength to rule out shoulder pathology and found that there is positive correlation between both[35]. As there is positive correlation between hand grip and shoulder power,hand grip strength can be used as predictor of shoulder power.

## VI. CONCLUSION

There is positive (moderate to strong) correlation between grip strength and shoulder power in cricket players i.e. reduction in grip strength would lead to reduction in shoulder power and vice versa. Thus during training program of cricket players, equal importance should be given onimprovement both shoulder power and grip strength. Hand grip strength can also be used as predictor and shoulder power.

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