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RESEARCH ARTICLE

COMPARISON OF GRIP STRENGTH IN CRICKET PLAYERS WITH AND WITHOUT SHOULDER INJURY

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ABSTRACT

The objective of this study is to evaluate the affection of grip strength in cricketers who are having soft tissue injury of shoulder. Method: A cross sectional survey was carried out on 80 cricketers, between 17-19 years of age. They were divided into two groups out of which group 1 had 40 cricket players without any soft tissue injury of shoulder and group 2 had 40 cricket players who had soft tissue shoulder injury on the dominant side and had resumed playing cricket. The grip strength is evaluated using hydraulic hand dynamometer on dominant and non-dominant hand in both the groups. Results: Grip strength of group 1 players on the dominant hand was 35.58 and the grip strength of players in (group 2) on the dominant hand was 29.78. Grip strength of players in (group 1) on the non-dominant hand was 34.72 and the grip strength of players in (group2) on the non-dominant hand was 29.19A decrease in the grip strength on the dominant and non-dominant hand was found in (group 2) which had cricket players with soft tissue injury of shoulder on the dominant side as compared to group 1. Conclusion: A reduction in grip strength is found on the dominant hand and non-dominant hand, in cricket players who had soft tissue shoulder injury on the dominant side.

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INTRODUCTION

Today elite sports people are expected to train longer, harder, and earlier in life to excel in their chosen sport. The modern cricketer is no exception. The demands placed on the cricketer are further increased because of the repetitive nature of the game, often for long periods of time. Thus the demands of cricket, which in the 1970s was regarded as a sport of "moderate injury risk", have changed, and players are susceptible to a wide variety of injuries at vital stages of the season. Studies of cricket injuries show an increasing incidence, varying from 2.6 to 333/10,000 athlete hours played, with 28.4–71.6% of cricketers sustaining between 1.61 and 1.91 injuries per season. Upper limb injuries accounted for 19.8–34.1% of total injuries. Muscle strains and impact injuries are the most common batting injuries. Younger players tend to be at greatest risk of injury, with bowlers (mean age 16.8 years) showing increased vulnerability to injury because their growth process is not complete (Stretch *et al*., 2003). Cricket batting is an example of a dynamic interceptive action, placed by Whiting (1969) in his second, most complex, and category of ball skills – encompassing task constraints where a ball has to be received and sent away within the same movement. Batting in cricket requires players to select the most appropriate shot from a wide repertoire of attacking and defensive strokes against a variety of different bowlers – fast, spin, seam and swing. Successful interception of the cricket ball by the batsman requires the cricket bat to be manoeuvred into the right place at the right time, so that the ball can be struck with the required force to send it in an appropriate direction. To achieve this goal, research described that skilled players require a combination of unobtrusive footwork, co-ordinated limb movements and precision gripping to deal effectively with the severe task constraints encountered when batting. The grip is a key facet in successful batting as it is the only interface between the batsman and the cricket bat, through which all force and energy must be transmitted. It would appear that variation in grip firmness is needed to place the ball strategically into gaps, in front of or behind fielders; such a task requires the scaling of grip forces (Glazier *et al*., 2002). Hand grip strength has often been used as an indicator of general body health. Reliable and valid evaluation of hand strength can provide an objective index of general upper body strength. The power grip is the result of forceful flexion of all finger joints with the maximum voluntary force that the subject

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is able to exert under the normal bio kinetic conditions. The synergistic action of flexor and extensor muscles and the interplay of muscle groups is an important factor in the strength of the resulting grip. Hand grip strength can also be used as predictor of shoulder power (Sathya *et al*., 2016). Many factors influence the strength of the grip, including muscle strength, fatigue, the time of day, age, nutritional status, restricted motion, and pain. Grip strength is often used in medicine as a specific type of hand strength (De *et al*., 2011). Understanding the impact of shoulder and elbow loading on hand activity or gripping is necessary in order to establish appropriate assessments and clinical evaluations. Grip strength is frequently evaluated in clinical settings as an indicator of disease activity. It is evaluated as a component of hand function. In addition to being an economical measure that is easy to administer, it is one of the best indicators of the overall strength of the limb. Grip strength is the integrated performances of muscles that can be produced in one muscular contraction. It is widely accepted that grip strength provides an objective index of the functional integrity of the upper extremity (Parvatikar *et al*., 2004). Hence, it can be said that a reduction in grip strength can also reduce strength of the upper extremity. Hand grip strength not only is a marker of body lean muscle mass but also may be used in conjunction with serum albumin as a nutrition-monitoring tool in patients. People are generally limited by their strength when exerting force. Strength is a muscle‘s capacity to exert maximal effort or resist maximal opposing force. Grip strength is correlated with the strength of the upper extremity, general strength of the body and some anthropometric measurements (Rantenen *et al*., 1994)and therefore is often adopted in clinical practice as an objective measure of upper extremity function (Budoff *et al*., 2004)

METHODOLOGY

STUDY DESIGN: - Cross sectional survey method

SAMPLE SIZE: - 80

SAMPLING TECHNIQUE: - Convenient sampling

STUDY SETTING:

- Shivaji Park Cricket ground
- Matunga Gymkhana Cricket ground
- D. Y. Patil Sports Academy

STUDY DURATION:- 6months

INCLUSION CRITERIA

- Cricket players between the ages of 17 to 19.
- Cricket players with and without non- operative soft tissue shoulder injury.
- Right hand dominant cricket players.
- Players with minimum of 3 years of playing experience.

EXLUSION CRITERIA

- Cricket players with upper extremity injuries other than soft tissues injuries of shoulder.
- Cricket players with acute shoulder injuries.
- Cricket players more than 19 years of age and less than 17 years of age.
- Left hand dominant players.
- Players less than 3 years of playing experience.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics and Research Committee at D Y Patil University. Written informed consent was taken from all the subjects and their identification information that was collected during study and was kept strictly confidential.

PROCEDURE

Keeping with the objective of Research to be administered amongst the subjects the following was done with reference to review of literature. Demographic details of the subjects such as age, height and weight were collected and BMI was calculated. The subjects were well informed about the need for this study. The cricket players were divided into group 1 and group 2. Group 1 had cricket players without injury, group 2 had cricket players who had non operative soft tissue injury of dominant shoulder more than 6 months and had resumed game. Hand grip strength of the subject was assessed in both the groups by using hydraulic hand held dynamometer with the following position and procedure:-

A calibrated hydraulic hand dynamometer with an adjustable grip was used. The subjects were seated in a chair with back support and with their shoulder adducted and neutrally rotated, elbow flexed at 90^0, forearm and wrist in neutral position. Initially the procedure was explained and demonstration was shown to the subjects. The subjects were then asked to hold the dynamometer alternatively in right and then left hand, at their side without touching the rest of the body, and squeeze it forcefully. Three trials were taken and the mean was calculated of these three trials and was documented as the mean grip strength which was calculated of both the dominant and the non-dominant hand

RESULTS

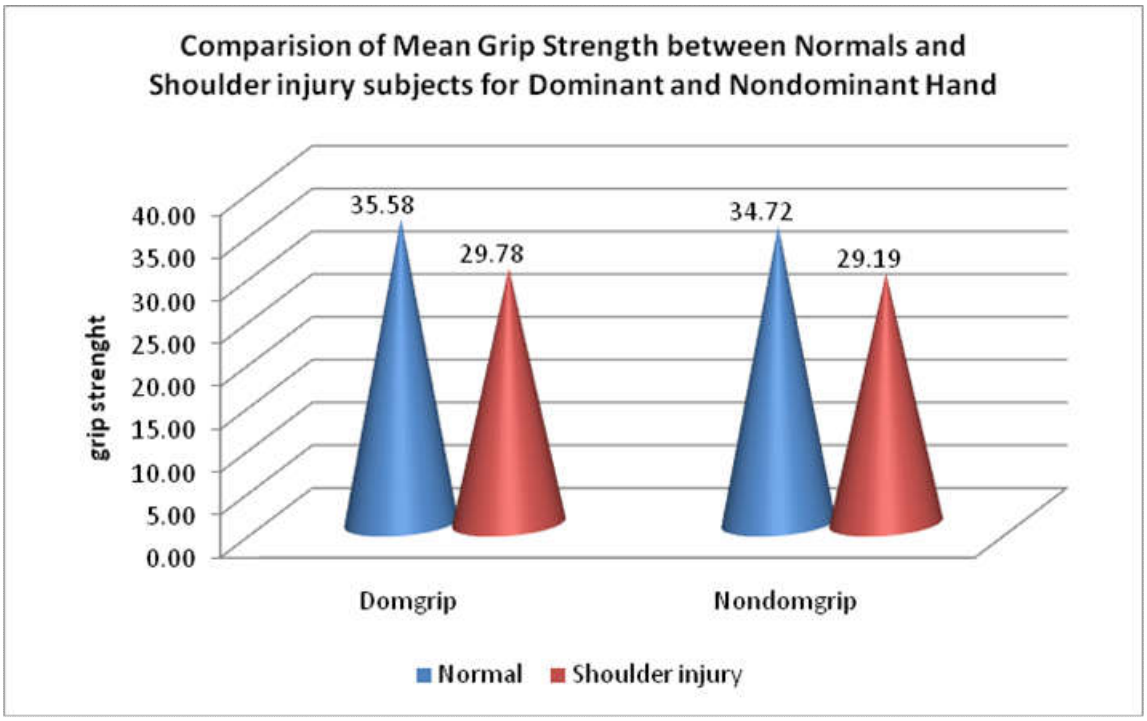
Inference: Table 1 that is group statistics shows BMI, grip strength of dominant and non dominant hand of cricket players with and without soft tissue injury of shoulder.

Table 1. Group Statistics

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
BMI	Without shoulder injury	40	20.1112	3.11194	.49204
	With shoulder Injury	40	20.1520	3.40563	.53848
DOM GRIP	Without shoulder injury	40	35.5833	6.62654	1.04775
	With shoulder Injury	40	29.7833	8.37394	1.32404
NON DOM GRIP	Without shoulder injury	40	34.7210	7.97009	1.26018
	With shoulder Injury	40	29.1922	8.84096	1.39788

Table 2. P value of grip strength of dominant and non dominanthand both the groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
BMI	Equal variances assumed	.345	.559	-.056	78	.956	-.04075	.72943	-1.49293	1.41143
	Equal variances not assumed			-.056	77.374	.956	-.04075	.72943	-1.49311	1.41161
DOM GRIP	Equal variances assumed	1.000	.320	3.435	78	.001	5.80000	1.68845	2.43856	9.16144
	Equal variances not assumed			3.435	74.086	.001	5.80000	1.68845	2.43576	9.16424
NON DOM GRIP	Equal variances assumed	.442	.508	2.938	78	.004	5.52875	1.88205	1.78187	9.27563
	Equal variances not assumed			2.938	77.176	.004	5.52875	1.88205	1.78124	9.27626



Graph 1

Inference: According to Table 2 the levene's test for equality of variances there is no significant difference in grip strength according to the BMI of both groups(group 1 and group 2) since p value is more than 0.05. However, there is a significant difference in grip strength between the two groups when dominant and non-dominant hand grip strength were measured since p value is less than 0.05.

Inference: The above graph shows the comparison of mean of dominant and non dominant hand grip strength between group 1 and group 2. It also shows that mean of the dominant and non dominant hand grip strength in group 2 is less when compared to group 1.

DISCUSSION

This study was done on 80 male inter college cricket players of the age 17, 18 and 19 of Indian population, who have been playing for a minimum of 3 years of cricket. The objectives of this study were to find out a) Assessment of grip strength of cricket players without any previous shoulder injury b) Assessment of grip strength of cricket players with previous shoulder injury c) Comparison of grip strength between cricket players with previous shoulder injury to cricket players without any previous shoulder injury. According to the first objective grip strength was measured of both the dominant and non-dominant hand in cricket players without any previous shoulder injury. According to the dominance of hand the reading for the dominant hand had a lower limit of 22.60 and an upper limit of 48.57 with a mean of 35.58 and a standard deviation of 6.63 and the reading for the non-dominant hand had a lower limit of19.10 and an upper limit of 50.34 with a mean of 34.72 and a standard deviation of 7.97. As per the above readings there is no statistically significant result in the grip strength of the dominant and the non- dominant hand of cricket players Group 1. The hand grip strength may be influenced by different factors including dominance of the hand. The difference of grip strength between dominant and non-dominant has been reported by Schmidt and Toews. According to this study they found that in case of adult male subjects there was no significant difference in grip strength

between right hand and left hand in four different postures except in sitting without elbow rest condition (Schmidt *et al*., 1970). It has been noted that in the case of male subjects there was no significant difference in grip strength between the right and left hand in different body postures except in wrist ulnar deviation (De *et al*., 2011).

According to the second objective the grip strength of dominant hand and non-dominant hand in cricket players with previous history of soft tissue injury of shoulder was measured. The grip strength of dominant hand had a lower limit of 13.37 and an upper limit of 46.20 with a mean of 29.78 and a standard deviation of 8.37 and for the non-dominant hand the grip strength had a lower limit of11.86 and an upper limit of 46.52 with a mean of 29.19 and a standard deviation of 8.84. As per the above statistics it is significant that even with previous dominant shoulder injury players the grip strength of both the dominant hand as well as non-dominant hand is reduced. According to this study it was found that there was no statistically significant difference in both the dominant and non-dominant hand post injury. Kattel *et al* reported the effect of upper extremity posture of maximum grip strength revealed that the shoulder joint angle has influence on grip strength performance (Kattel *et al*., 1996). Health of the rotator cuff has also been correlated to the strength of one's grip. A similar study performed by Budoff, results revealed an increased prevalence of rotator cuff weakness on the ipsilateral side of a hand injury or disorder (Shea *et al*., 2010). According to the third objective a comparison of grip strengths between cricket players without previous shoulder injury (Group 1) to the grip strength of cricket players with previous shoulder injury (Group 2) was measured of both the dominant and non-dominant hand and as per the data, the mean grip strength of both the dominant and non-dominant hand in group1 (35.58 and 34.72 respectively) was more than the mean grip strength of both the dominant and non-dominant hand in group2 (29.78 and 29.19). This study shows that after a chronic soft tissue shoulder injury both the dominant and non-dominant grip strength is reduced in group 2. Ideally, the grip strength should return to normal or near normal after a chronic injury. A reduction in grip strength of the dominant hand could be attributed to the lack of sufficient rehabilitation and specific exercises focusing on improving grip strength post a shoulder injury. This can further cause recurrent injuries of the shoulder as the study done by (Sathya *et al*., 2016), states that there is positive correlation between the hand grip strength and the shoulder power. Thus while training cricket players equal importance should be given to hand grip strength and shoulder power. However, in this study it was found that there is a reduction in grip strength on the non-dominant hand too. Kibler *et al*. reported that individual body segments, or links, are coordinated in their movements by muscle activity and body positions to generate, summate, and transfer force through these segments to the terminal link. This sequencing is usually termed the kinetic chain (Kibler *et al*., 1998). Hence, a reduction in grip strength could be attributed to the poor kinetic chain.

Conclusion

This study shows that importance should also be given on rehabilitation of grip strength along with shoulder strength, of both the dominant and non-dominant hands post a soft tissue shoulder injury in a cricket player, since the sport demands overall strength of the entire upper extremity. Grip strength can be improved by means of finger pulleys, grippers, wrist rollers and other such devices or specific exercises focusing on grip strength.

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