

ORIGINAL ARTICLE

IJPHY

PREVALENCE OF MULTIDIRECTIONAL SHOULDER INSTABILITY
IN SHOT PUT THROWERS¹Sangeeta A. Yadav²Prasannajeet P. Nikam

ABSTRACT

Objective: The objective of this study was to find out whether there was any shoulder instability prevailing in the shot put throwers due to the rotational activities achieved in the respective sport.

Methods: A total of 76 shot put throwers were recruited for the study. The multidirectional instability of the shoulder joint was tested by performing special tests.

Results: The study revealed that out of 76 shot put throwers, 49 individuals were found to be having shoulder instability, and 27 individuals were not having shoulder instability. This was confirmed by using a special test like the Sulcus sign and Rowe test followed by statistical analysis. The individuals diagnosed with multidirectional instability showed Sulcus sign and Rowe test positive, of which 30 individuals showed both the test positive and 19 individuals showed only Rowe test positive.

Conclusion: About 64.47% of individuals were diagnosed with multidirectional instability in the shot put throwers while the rest 35.52% of individuals showed no signs of instability.

Keywords: Multidirectional shoulder instability, Shoulder joint, Instability, Shot put throwers, Special test, Sulcus sign, Rowe test.

Received 05th November 2019, accepted 29th January 2020, published 09th February 2020



www.ijphy.org

10.15621/ijphy/2020/v7i1/193675

CORRESPONDING AUTHOR

²Prasannajeet P. Nikam

Assistant Professor, Department of Sports,
Faculty of Physiotherapy, Krishna Institute of
Medical Sciences Deemed to be University,
Karad- 415110, Satara, Maharashtra, India.
E-mail id: prasannastaarc@gmail.com

¹Final Year BPT, Faculty of Physiotherapy, Krishna
Institute of Medical Sciences Deemed to be University,
Karad- 415110, Satara, Maharashtra, India.
E-mail id: sangeetayadav199627@gmail.com

This article is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.
Copyright © 2020 Author(s) retain the copyright of this article.



INTRODUCTION

Multidirectional shoulder instability was considered differently from unidirectional instability by Neer in 1980. It was introduced by the global Laxity of the glenohumeral joint [1]. Multidirectional instability of the shoulder joint is instability in two or more directions. A physical examination and proper patient history based on clinical findings are usually required for diagnosing the condition [2,3]. The shoulder joint is a complex type of ball and socket joint; it's an unstable joint which is having a large range of motion and surrounded by soft tissue for stability. The glenohumeral joint has three rotatory and three translatory degrees of freedom, i.e., extension, flexion, abduction, adduction, lateral rotation, and medial rotation [4]. The shoulder joint consists of a glenoid cavity, humeral head, acromion, dynamic and static stabilizers, i.e., glenoid labrum, coracoacromial ligaments, glenohumeral ligaments, muscles of the rotator cuff, scapulothoracic muscles, long head of biceps and deltoid muscle. The glenohumeral joint is encircled by capsule. The capsule tightens as the humerus is abducted and laterally rotated. The capsule is reinforced by superior, middle, and inferior glenohumeral ligaments and coracohumeral ligament. Several bursae are associated with the glenohumeral joint, of which subacromial and subdeltoid bursae are the most important bursae [4].

A single traumatic event may cause injury; the most common injury is the repetitive overuse injuries, which leads to failure of one or more structures of the shoulder complex [5]. Similarly, multidirectional shoulder instability presents one of three different patterns of instability, i.e., posteroinferior dislocation with anterior subluxation, anteroinferior dislocation with posterior subluxation and subacromial-posteroinferior dislocation [1,6]. During internal rotation, external rotation, abduction, and adduction of the arm, various regions of the capsule-ligamentous system constrain the humeral head by preventing excessive rotation, tightening and loosening and translation of the joint [7].

Any dysfunction in the components of the following structures can lead to shoulder injuries. The diagnosis is made with the help of the patient's history related to any trauma as described to the physician. As there is a large number of shoulder injuries and it is difficult to diagnose those injuries only based on history; hence various special tests have been described which have been used for the diagnostic purpose to examine specific injuries relating to the shoulder joint [8].

In track fields, throwing events are the most common sports like, e.g., javelin throw, baseball, shot put throw e.t.c. This throwing event needs a large amount of force and energy [9]. The shot-putter during a throwing event attempts to perform the largest external mechanical power generated by the muscle forces following the impulses to move the body and to project the implement as far as possible [10]. A shot is put (pushed) and not thrown. [11] Shot put is a metal ball with a mass of 7.26kg for men's

and 4 kg for women's completion [12, 13]. Shot put was also known as "stone throw" in the early decades. The force used in the shot put throw begins from the ground transferred up from the lower extremity to the core and torso, across the scapula, shoulder, and elbow and to the hand [14]. Following phases follow the technique used in shot put:

(A1) Initial stance or the first double support phase: Here, preliminary swing preparation for a throw takes place - the competitor faces away from the direction of the throw.

(A2) Entering the turn phase: This phase is initiated at the end of the first phase, and it continues along with the single support phase on the left foot.

(A3) Flight phase: Here, the transition occurs from the left to the right foot near the center of the circle and the end of the flight phase is at the same time the start of the second single support phase.

(A4): When the right foot is placed on the ground second single support phase starts and ends when the left foot touches the front part of the circle.

(A5, A6, A7) Second double support phase: Here, the final release action of the shot put is performed [15].

Jill Caplan, MD, Terrill P. Julien, BS, et al. 2007 [16] studied the prevalence of the multidirectional instability of shoulder in elite female gymnasts. It was observed that about nine female gymnasts were diagnosed with anterior shoulder dislocation, two female gymnasts were diagnosed with posterior shoulder dislocation, while ten female gymnasts were diagnosed with anterior shoulder subluxation and ten female gymnasts were diagnosed with posterior shoulder subluxation. Another study by Leslie Beassely, Deborah A. Farniar, et al. 2000 [1] the multidirectional shoulder instability was also seen in females, and it showed that only seven individuals were diagnosed with multidirectional shoulder instability whereas compared to the males 42 individuals were diagnosed with multidirectional shoulder instability which shows males are more prone with multidirectional shoulder instability rather than females. Hence the objective of this study was to see the prevalence of the multidirectional shoulder instability in shot-put throwers also to identify the instability of shoulder joint in overhead throwing sport i.e. in the shot put and also to find out a number of subjects having multidirectional shoulder instability in the shot put throwers. Also, this study is conducted with the ultimate aim of identifying individuals with pre-existing multidirectional shoulder instability secondary to their particular sporting activity, i.e., shot put throwing.

MATERIALS AND METHODOLOGY

Ethical clearance was obtained from the institutional ethical committee (protocol number 0497/20182019). A total of 76 subjects were approached for this study, there were 57 males and 19 females and all the subjects were screened by inclusion and exclusion criteria. The inclusion criteria includes age group of 18-45 years, both male and female were included in this study and individuals with the

history of shoulder instability while the exclusion criteria includes participants not willing to participate, individuals with history of acute trauma, individuals with congenital musculoskeletal problems the one with any of the following criteria were excluded. The procedure was explained and later, demographic data and consent forms were taken from the subjects. Then the subjects were assessed by the special tests i.e. sulcus sign and Rowe test. In Sulcus sign [17], the patient will stand with the arm and the shoulder relaxed. The therapist will place one hand on the shoulder, with the other therapist will grasp the patient's forearm below the elbow and will pull the arm distally. The patient will complain about the pain or ache during the activity. After the Sulcus sign, the Rowe test [17] was performed here; the patient will stand in forward flexed 45° at the waist and the arm will be pointing down on the floor and will be relaxed. The therapist will place one hand on the shoulder; the index finger and middle finger will be placed over the anterior side of the humeral head and the thumb on the posterior side of the humeral head. Then the therapist will pull the arm down slightly. For anterior instability, the humeral head is pushed forward with the thumb and the arm is extended 20° to 30° from the vertical position. To check posterior instability, the humeral head will be pushed posteriorly with the index and the middle fingers and the arm is flexed 20° to 30° from the vertical position. And for inferior instability, more traction is applied to the arm and the sulcus sign is observed. Study design: It was an observational study. Outcome measure: The outcome measure was Special tests: Sulcus sign [17] and Rowe test [17].



Figure 1: Sulcus sign

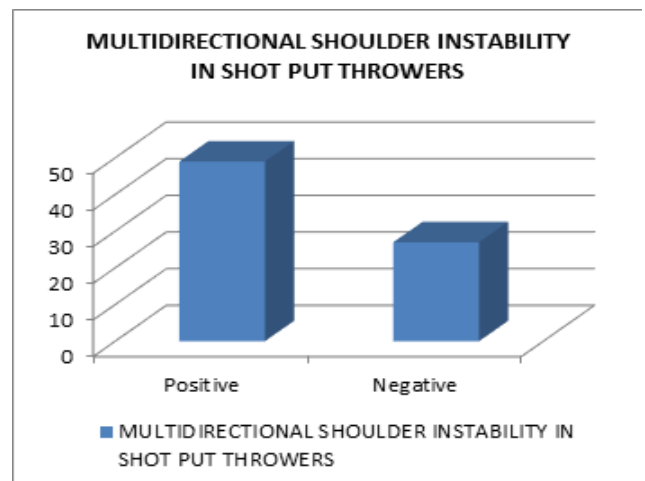


Figure 2: Rowe test

RESULTS

Table 1: Prevalence of multidirectional shoulder instability in shot put throwers

MULTIDIRECTIONAL SHOULDER INSTABILITY IN SHOT PUT THROWERS	TOTAL
Positive	49
Negative	27

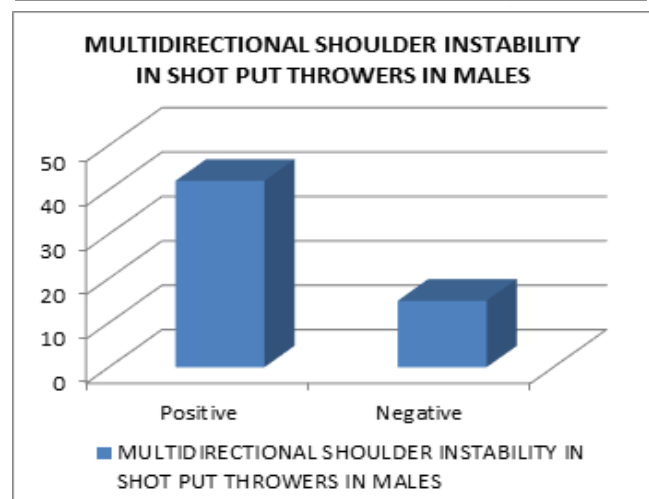


Graph 1: Prevalence of multidirectional shoulder instability in the shot put throwers.

Graph 1 shows that out of 76 individuals, 49 subjects had multidirectional shoulder instability, and 27 subjects did not show any signs of multidirectional shoulder instability.

Table 2: Prevalence of multidirectional shoulder instability in the shot put throwers in males.

MULTIDIRECTIONAL SHOULDER INSTABILITY IN SHOT PUT THROWERS IN MALES	TOTAL
Positive	42
Negative	15

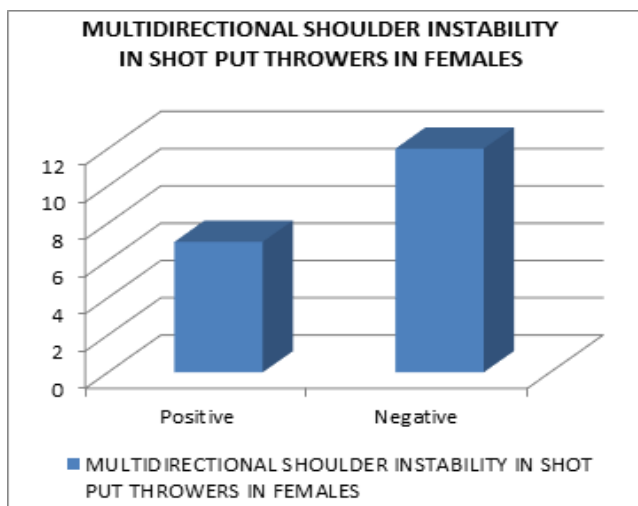


Graph 2: Prevalence of multidirectional shoulder instability in the shot put throwers in males.

Graph 2 shows that out of 57 males, 42 males had multidirectional shoulder instability, while 15 males did not show any signs of multidirectional shoulder instability.

Table 3: Prevalence of multidirectional shoulder instability in the shot put throwers in females.

MULTIDIRECTIONAL SHOULDER INSTABILITY IN SHOT PUT THROWERS IN FEMALES	TOTAL
Positive	7
Negative	12

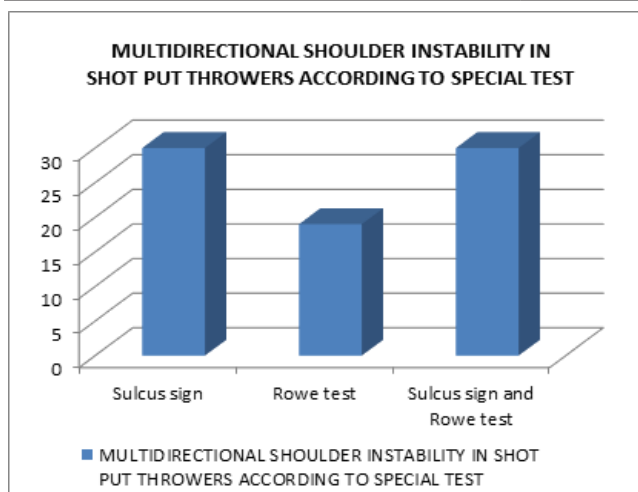


Graph 3: Prevalence of multidirectional shoulder instability in the shot put throwers in females.

The graph shows that out of 19 females, seven females had multidirectional shoulder instability, while 12 females did not show any signs of multidirectional shoulder instability.

Table 4: Prevalence of multidirectional shoulder instability in the shot put throwers according to special tests.

MULTIDIRECTIONAL SHOULDER INSTABILITY IN SHOT PUT THROWERS ACCORDING TO SPECIAL TEST	TOTAL
Sulcus sign	30
Rowe test	19
Sulcus sign and Rowe test	30



Graph 4: Prevalence of multidirectional shoulder instability in the shot put throwers according to special tests

Graph 4 shows that out 49 individuals who were diagnosed with multidirectional shoulder instability, 30 subjects showed sulcus sign positive, while 19 subjects showed Rowe test positive, and 30 subjects showed both sulcus sign and Rowe test positive.

DISCUSSION

In previous studies; Buss DD, Lynch GP, et al. 2004 [18], it was observed that out of 30 individuals enrolled with

sports like ice hockey, football, wrestlers, basketball, downhill skier and gymnast 63% of subjects showed anterior shoulder dislocation and 36% subjects showed signs of subluxation, out of these 30 subjects 24 were males and 6 were females. Later non-operative management was done; 16 subjects showed no changes and had to undergo surgical stabilization. Another study by Gross ML, Brenner SL, et al. 1993 [19], it was observed that 23 subjects were included for the study, 20 subjects showed anterior shoulder dislocation, 10 subjects had left side and remaining ten subjects had right side anterior shoulder dislocation. Out of 23 subjects, 16 were men and 4 were women and they underwent conservative management.

Like so, in one more study of Kiss J, Damrel D, et al. 2001 [20], it was observed that in 84 subjects there were two groups, 62 subjects in group A had no previous surgical treatment, and in group B 22 subjects had undergone surgical treatment and were under the rehabilitation program. According to the gender and age, 38 subjects had no/ mild signs of multidirectional instability; nine subjects showed moderate signs of multidirectional instability and 15 subjects showed severe/ total multidirectional instability. This study showed that 59 subjects had multidirectional instability out of 62 subjects. Later non-operative management was taken and home exercises were given. Thus, in our study, it showed that out of 76 individuals, 57 males and 19 females have participated. In the Male category out of 57 individuals, multidirectional shoulder instability showed positive in 73.68% individuals and the remaining 19.73% of individuals did not show any signs of multidirectional shoulder instability. In the Female category out of 19 individuals, multidirectional shoulder instability showed positive in 9.21% individuals and the remaining 15.78% female individuals did not show any signs of multidirectional shoulder instability.

This study concludes that among the age group of 18 to 45 years, about only 12% of individuals showed signs of multidirectional shoulder instability at the age group of 18 to 21 years and about 21% of individuals showed signs of multidirectional shoulder instability at the age group of 34 to 37 year. This shows that individuals from the age group of 18-21 years show less number and are less prone to multidirectional instability, whereas individuals from the age group of 34-37 years show more number and are prone to multidirectional shoulder instability. Thus this concludes that multidirectional shoulder instability is more prone in the above age group of 34 years. This concludes that the study can be conducted with different age groups and out of 76 individuals with different age groups, 49 individuals were diagnosed with multidirectional shoulder instability, of which 30 individuals were confirmed with diagnosis of multidirectional shoulder instability by using special tests.

The special test performed is very helpful for confirming the diagnosing, in the case of Sulcus sign about 30 individuals out of 76 individuals showed positive signs of multidirectional shoulder instability. While in Rowe test about 19 individuals showed positive signs of

multidirectional shoulder instability out of 76 individuals and in both Sulcus sign and Rowe test about 30 individuals out of 76 individuals were diagnosed with a positive sign of multidirectional shoulder instability. Thus after analyzing the data, it was found that about 64.47% of 76 subjects playing shot put throwers were diagnosed with multidirectional instability of shoulder, of which 42 subjects were males and were diagnosed with multidirectional shoulder instability while seven subjects were females and were diagnosed with multidirectional shoulder instability and 35.52% individuals did not have multidirectional shoulder instability.

As compared to previous studies, it showed that multidirectional shoulder instability is commonly diagnosed in the individuals doing rotational activities in respective sporting like gymnasts, baseball, wrestling, basketball, etc. Also, it showed that males are more prone to shoulder instability as compared to females. As there were no previous studies of multidirectional shoulder instability in the shot put throwers hence, this study was conducted with the ultimate aim of identifying the individuals with pre-existing multidirectional shoulder instability secondary to their respective sporting activity, i.e., shot put throwing.

CONCLUSION

Thus this study concludes that about 64.47% of individuals were diagnosed with multidirectional instability in the shot put throwers, and therefore, it shows that multidirectional shoulder instability in the shot put throwers is commonly present due to the rotational activities in the respective sports.

REFERENCES

- [1] Beasley L, Faryniarz DA, Hannafin JA. Multidirectional instability of the shoulder in the female athlete. *Clinics in sports medicine*. 2000 Apr 1;19(2):331-49.
- [2] Bahu MJ, Trentacosta N, Vorys GC, Covey AS, Ahmad CS. Multidirectional instability: evaluation and treatment options. *Clinics in sports medicine*. 2008 Oct 1;27(4):671-89.
- [3] Provencher MT, Romeo AA. Posterior and multidirectional instability of the shoulder: challenges associated with diagnosis and management. *Instructional course lectures*. 2008;57:133-52.
- [4] Paula M. Ludewig and John D. Borstad. The shoulder Complex. Pamela K. Levangie, Cynthia C. Norkin. *Joint Structures and Function*. 5th Ed.2011; pg. 245
- [5] Braun S, Kokmeyer D, Millett PJ. Shoulder injuries in the throwing athlete. *JBJS*. 2009 Apr 1;91(4):966-78.
- [6] Darlow B. Neuromuscular retraining for multidirectional instability of the shoulder--a case study. *New Zealand Journal of Physiotherapy*. 2006 Jul 1;34(2).
- [7] Flatow EL, Warner JJ. Instability of the shoulder: Complex problems and failed repairs: Part 1. Relevant biomechanics, multidirectional instability, and severe loss of glenoid and humeral bone. *Journal of Bone and Joint Surgery*. 1998;80(1):122.
- [8] Tennent TD, Beach WR, Meyers JF. A review of the special tests associated with shoulder examination: part I: the Rotator Cuff tests. *The American journal of sports medicine*. 2003 Jan;31(1):154-60.
- [9] Meron A, Saint-Phard D. Track and field throwing sports: injuries and prevention. *Current sports medicine reports*. 2017 Nov 1;16(6):391-6.
- [10] Linthorne NP. Optimum release angle in the shot put. *Journal of Sports Sciences*. 2001 Jan 1;19(5):359-72.
- [11] Jensen CR, Schultz GW. *Applied kinesiology: the scientific study of human performance*. McGraw-Hill Companies; 1977.
- [12] Young M, Li L. Athletics: determination of critical parameters among elite female shot putters. *Sports Biomechanics*. 2005 Jul 1;4(2):131-48.
- [13] Zatsiorsky VM, Lanka GE, Shalmanov AA. Biomechanical analysis of shot putting technique. *Exercise and sport sciences reviews*. 1981 Jan 1;9(1):353.
- [14] Bartlett RM, Best RJ. The biomechanics of javelin throwing: a review. *Journal of sports sciences*. 1988 Mar 1;6(1):1-38.
- [15] Čoh M, Štuhec S, Supej M. Comparative biomechanical analysis of the rotational shot put technique. *Collegium antropologicum*. 2008 May 8;32(1):249-56.
- [16] Caplan J, Julien TP, Michelson J, Neviasser RJ. Multidirectional instability of the shoulder in elite female gymnasts. *AMERICAN JOURNAL OF ORTHOPEDICS-BELLE MEAD-*. 2007 Dec;36(12):660.
- [17] Magee D. *Orthopedic physical assessment*. Saunders. 6th Ed.2016; pg.314,315
- [18] Buss DD, Lynch GP, Meyer CP, Huber SM, Freehill MQ. Nonoperative management for in-season athletes with anterior shoulder instability. *The American journal of sports medicine*. 2004 Sep;32(6):1430-3.
- [19] Gross ML, Brenner SL, Esformes I, Sonzogni JJ. Anterior shoulder instability in weight lifters. *The American journal of sports medicine*. 1993 Jul;21(4):599-603.
- [20] Kiss J, Damrel D, Mackie A, Neumann L, Wallace WA. Non-operative treatment of multidirectional shoulder instability. *International orthopaedics*. 2001 Feb 1;24(6):354-7.