



# CROSS-SECTIONAL SURVEY OF MUSCULOSKELETAL PAIN IN SHOT-PUT PLAYERS USING NORDIC MUSCULOSKELETAL QUESTIONNAIRE.

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**Abstract:** Shot-put is an athletic sport in which a spherical weight is thrown from the shoulder. These players are highly susceptible to injuries due to the weight of the ball thrown from the shoulder. **Objective:** To study the site of musculoskeletal pain in shotput players. **Methods:** A cross-sectional study was conducted on 50 shot-put players practicing in the sports academies in Thane district. Convenient sampling method was used on the subjects. Both male and female players who only played shot-put having age group of 15-30 years with minimum 1 year of experience of playing the game participated in the study. The study was conducted using Nordic Musculoskeletal Questionnaire. **Result:** The most painful sites are shoulder joint (50%) and wrist joint (18%), whereas the least painful is ankle joint (2%). **Conclusion:** In this study, according to the results and discussion it is concluded that the players are experiencing musculoskeletal pain maximum in shoulder joint (50%) and minimal in ankle joint (1%).

**Index Terms** - Shot-put players, Thane district, Nordic Musculoskeletal Questionnaire, Musculoskeletal site of pain, Shoulder.

## I. INTRODUCTION

Shot put is an athletic sport in which a spherical weight is thrown, or put, from the shoulder.

It is one of the four traditional throwing events in track and field games. The shot is a metal ball, which weights 7.26kg/16lb for men and 4kg/8.8lb for women. The aim of the game is to put it as far as possible from a 2.135-meter diameter circle and has a curved 10-centimetre high toe-board at the front. <sup>(9)</sup>.

The shoulder joint, a type of ball and socket joint, is an unstable joint having a large range of motion and is surrounded by soft tissues 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.

The trajectory of the put is determined by three factors: speed of release, angle of release, height of release, it also includes the horizontal displacement <sup>(3)</sup>.

The shot is put from the shoulder using one hand and is held near to the chin throughout the preliminary movement. The game includes two main techniques of throwing the shot: linear glide and rotatory glide. Throughout the throwing motion, the athlete must remain within in the preliminary movement that the athlete

makes to move across the throwing circle, but the delivery phase is similar in both techniques. During the delivery phase, the player exerts force on the shot with explosive straightening of the legs, coupled with a raising and rotation of the trunk, followed by extension of the arm in the direction of the throw. The player must project the shot with optimum combination of release speed, release angle and release height, to achieve the greatest possible flight distance. <sup>(3)</sup>

Throwing event needs a large amount of force and energy <sup>(4)</sup>. The athlete attempts to produce a larger amount of external mechanical power generated by the muscle to move the body and to project the shot as far as possible <sup>(5)</sup>. The force used in the shotput throw begins from the ground which is transferred up from the lower extremity to the core and trunk, across the scapula, shoulder, and elbow and at last to the hand. <sup>(1)</sup>

The Nordic musculoskeletal questionnaire was opted for this study as it is a standardized instrument to assess musculoskeletal complaints. This questionnaire has been used to assess the severity and impact of musculoskeletal symptoms.

## II. NEED OF STUDY

Shot-put is a game which requires a rotational movement to be created in the body to throw the put. It consists of throwing a heavy metal ball. Shot-put players are prone to develop musculoskeletal pain due to the movement required for throwing.

There are no studies available on painful musculoskeletal sites in shot-put players practicing in Thane district. Hence it is the utmost need to find out the prevalence of musculoskeletal pain in shot-put players so that timely interventions can be provided and further musculoskeletal damage can be prevented.

## III. AIM

To study the prevalence of musculoskeletal pain in shotput players.

## IV. OBJECTIVE

To study the site of musculoskeletal pain in shotput players.

## V. METHODOLOGY

- **Study Design-** Cross-sectional survey study
- **Study Set-up-** Sports academies in Thane District
- **Sampling Design-** Convenient sampling
- **Sample Size-** 50
- **Inclusion Criteria-**
  - Both female and male shot-put players
  - Population between 15-30 years
  - With at least 1 year of experience
- **Exclusion criteria-**
  - Players not giving a consent.
  - Any dysfunction including neurological, orthopedic, medical condition not related to sports
  - Players indulged in other sports as well
- **Outcome measure-**
  - Nordic Musculoskeletal Questionnaire

## VI. PROCEDURE

The focus of the study was to find out site of musculoskeletal pain in shot-put players practicing in sport academies in Thane district.

Approval was obtained from the Institutional Ethics Committee of TMV's Lokmanya Tilak College of Physiotherapy, Kharghar. Before starting the procedure, permission was taken from 6 sports academies in Thane district.

Informed written consent was obtained from the sports academies in thane district.

Data was collected between September 2023- January 2024. Dates were chosen according to the availability of the players in each academy. A prior appointment was taken before collecting the samples.

The purpose and the procedure of the study was clearly explained to the participants and an informed consent was taken.

Players were asked to fill assessment form which included: Demographic data, years of experience, number of days of practice per week and hours of practice per session. Demographic data included age, gender, weight, height, BMI and dominance.

Players were then explained about the Nordic Musculoskeletal Questionnaire and asked to fill it. They were asked to mark the most painful site while throwing the shot.

50 responses were collected from 6 sports academies in Thane district

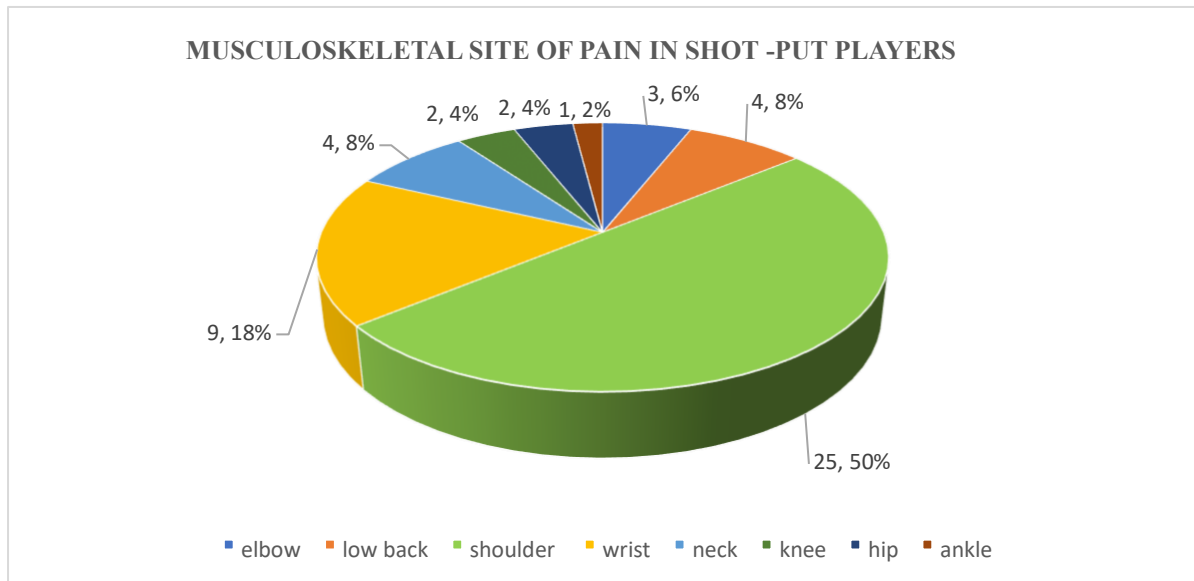
Questionnaires were collected and analyzed.

## VII. DATA ANALYSIS AND RESULTS

Descriptive statistics was used to summarize the data collected in simple numerical form using MS Excel. The data collected was statistically analyzed and presented in the form of pie charts and bar diagrams. Total of 50 responses were collected from shot-put players in thane district.

**Table 1: Musculoskeletal site of pain in shot-put players**

Site of pain	Frequency (%) (n=50)
Elbow	3 (6%)
Low Back	4 (8%)
Shoulder	25 (50%)
Wrist	9 (18%)
Neck	4 (8%)
Knee	2 (4%)
Hip	2 (4%)
Ankle	1 (2%)

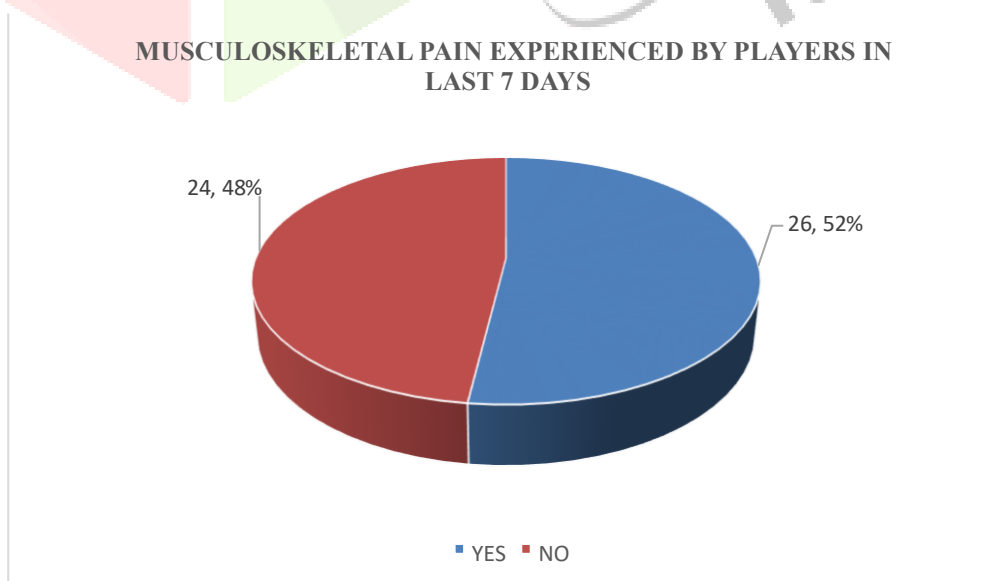


**Figure 1: Musculoskeletal site of pain in shot-put players**

**Figure 1:** Illustrates most painful sites are shoulder joint (50%) and wrist joint (18%), whereas the least painful is ankle joint (2%).

**Table 2: Musculoskeletal pain experienced by players in last 7 days**

Pain experienced	Frequency (%) (n=50)
YES	26 (52%)
NO	24 (48%)

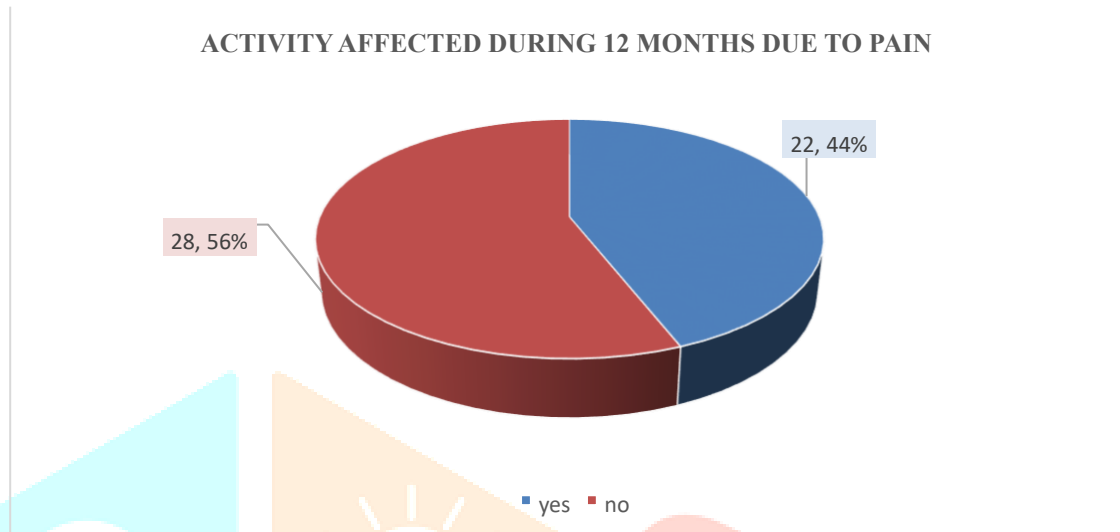


**Figure 2: Musculoskeletal pain experienced by players in last 7 days**

**Figure 2:** Illustrates 26 (52%) players out of 50 experienced musculoskeletal pain in last 7 days.

**Table 3: Activity of shot-put players affected during 12 months due to pain**

Activity of players affected	Frequency (%) (n=50)
Yes	22 (44%)
No	28 (56%)

**Figure 3: Activity of shot-put players affected during 12 months due to pain**

**Figure 3:** Illustrates 22 (44%) players out of 50 complained of the activity getting affected during 12 months due to pain.

## VIII. DISCUSSION

This study focuses on the musculoskeletal pain in shot put players. It basically tells us which musculoskeletal site is the most painful in shot put players due to the technique required for throwing. The study was conducted on 50 shot put players from different sport academies in thane district using Nordic Musculoskeletal Questionnaire, of which 32 were males and 18 were females with a ratio of 2:1. The population in this study ranges between the age of 15-30 years, where the Mean  $\pm$  Standard Deviation of age of participants was 21( $\pm$ 4.04) years, who played shot-put for an average of 4.5( $\pm$ 3.21) years. The average days of practice per week were 2.7( $\pm$ 1.11) with an average of 1.4( $\pm$ 0.44) hours per day.

Among the 50 participants, it was found that prevalence of musculoskeletal pain was highest in the shoulder [50% (n=25)] and wrist [18%(n=9)], and least in ankle [2%(n=1)] (figure.1). In the study 26 players out of 50 complained of musculoskeletal pain in last 7 days (figure.2) and 22 (44%) players out 50 complained of their activity getting affected due to pain in the past 12 months (figure.3).

In the last study done by Yadav SA, Nikam PP. Prevalence of Multidirectional Shoulder Instability in Shot Put Throwers. International Journal of Physiotherapy. 2020 Feb 9:54-8., it stated that 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.

(10) The phases of a shotput throw consist of:

- (a) Preparation phase,
- (b) flight phase,
- (c) transition phase,
- (d) completion phase <sup>(20)</sup>

Preparation phase is the initial phase where the player is at the back of the circle. It ends at the “heel-off” position, where the front foot or rear foot is off the ground <sup>(20)</sup>. Muscles during this phase work concentrically at the glenohumeral joint, these muscles are: Anterior deltoid and pectoralis major. Upper trapezius, serratus anterior and lower trapezius work to produce upward rotation of the scapula <sup>(12)</sup>.

Flight phase begins from the heel-off of the front foot and ends at the touch down of the front foot. This phase is also known as the glide phase <sup>(20)</sup>.

The last is the delivery phase, where the thrower releases the shot. The delivery phase remains same for all the techniques.

The delivery phase has been divided into 2 phases:

1. Transition phase- this phase begins with the touch down position of rear foot and ends at the power position, where both feet are positioned and are in contact with the ground <sup>(20)</sup>. During this phase a substantial amount of kinetic energy is transmitted to the shoulder, from the lower extremities and trunk rotation. During this phase the scapula and shoulder muscles are highly activated to sustain movements of the shoulder joint, especially the external rotation as in the start of this phase shoulder is in maximum external rotation. <sup>(15) (14)</sup>.
2. Completion phase- this begins with the front foot in touch down position and ends when the shot is released by the thrower <sup>(20)</sup>. Maximum shoulder internal rotation is achieved during this phase. The high forces generated in this phase makes the posterior muscles susceptible to tensile overload, rotator cuff tears, labrum and bicep pathologies, capsule injuries, and internal impingement <sup>(12)</sup>. Maximal humeral internal rotation and elbow extension is achieved.

<sup>(11)</sup>

Biceps Brachii and supraspinatus are initiated and prevent anterior instability of shoulder joint. Over time the excessive utilization of the biceps brachii could lead to a superior labrum anterior to posterior (SLAP) tear. <sup>(12)</sup>

In my population shot-put players with a minimum of 5 years of experience could have musculoskeletal pain in shoulder due to the biomechanics involved while throwing the put. It has been noticed that players with maximum years of experience have been experiencing pain in the shoulder since past 12 months and also their activity has got affected due to pain. Thus, it concludes that long hours of practice, years of experience and most importantly weight of the put, that is 4kg for women and 7 kg for men, has contributed to the musculoskeletal pain experienced by shotput players.

## IX. CONCLUSION

In this study, according to the results and discussion it is concluded that the players are experiencing musculoskeletal pain maximum in shoulder (50%) and minimal in ankle (1%).

## X. LIMITATION

- In this study participation of male players was more than that of female players.
- Pain was self-reported, so it differed from participant to participant and hence it was subjective.
- There was unequal distribution of players in each academy.

## XI. CLINICAL IMPLICATION

- This study will be a baseline for further researchers to study on how to overcome the site of pain in throwing game players.
- It will help further researchers to set rehabilitation interventions and protocols to overcome musculoskeletal pain in shot put players.

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