

**THROWING TECHNIQUE AND UPPER EXTREMITY INJURY IN
JAVELIN THROWERS: THE CASE OF FIRST DIVISION SELETED
ATHLETICS CLUBS AND ATHLETE TRUNESH DIBABA ATHLETICS
TRAINING CENTER**

Negash Adem

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This Is To Certify That The Thesis Prepared By Negash Adem Entitled The Influence Of Throwing Technique On Upper Extremity Injury Risk In Javelin Throwers: The Case Of First Division Selected Athletics Clubs And Athlete Trunesh Dibaba Athletics Training Center in partial fulfillment of the degree of masters of science in sport science complies with the regulations of the university and meets the accepted standers with respect to originality and quality.

Signed by examining committee:

Examiner

(Internal)

Signature

Date

(External)

Signature

Date

Advisor

Signature

Date

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ACRONYMS AND ABBREVIATION

AC	Acromioclavicular
ATDATC	Athlete Tirunesh Dibaba athletics training center
ELPA	Ethiopian light and power authority
SC	sternoclavicular
UCL	ulnar collateral ligament

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ABSTRACT

Javelin throwing is a complicated activities and a javelin thrower makes complex multi joint movements that require muscular strength, sophisticated coordination and accurate control. These movements must develop the great force that is necessary to accelerate the javelin to great release speed, while carefully controlling the direction of the release. The generation of great force exerts significance musculoskeletal stress on multiple joint on the upper extremity. These stresses are likely cause of overuse and acute injuries that sustained by javelin throwers.

The overall purpose of this study is to investigate the relationship between javelin throwing technique and upper extremity injuries that sustained by javelin throwers in some selected clubs of Ethiopia like defense, prison police, ELPA and commercial bank athletics clubs from Adiss Ababa and sidama buna, south police athletics clubs from SNNP region and Athlete Trunesh Dibaba Athletics Training Center. For this study the entire population of 40 (22 Male and 18 female) javelin throwers were involved. The method of data collection employed includes self structures questionnaire, interview and observation. Data were was collected both from primary and secondary sources. The quantitative data was analyzed by using simple descriptive method such as percentage and the qualitative data was analyzed through interpretation and conceptual generalization. It was identified that release and recovery phases of javelin throwing technique have significant relationship with the injuries that were javelin throwers sustained. Incorrect technique, early specialization, overuse of muscles, unbalance movement of motion and inadequate warming up are the major Causative factors.

Key words- technique, injury, upper extremity, and javelin throwers.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Track and field events are among the oldest sport still existence throughout the world. Throwing events -discus , javelin , hammer and shot put are categorized as a field event and organizing in ancient Greece, pre-medieval Ireland and Scotland which requires complex physical interaction . (M.L. Coleman,2005)

Javelin throwing technique is complicated and javelin throwers make complex multi joint movement that require muscular strength, sophisticated coordination and accurate control. These movements must develop the great force that are necessary to accelerate the javelin to great released speed , while carefully controlling the direction of the release. (Best , Bartlett &Morris, 1933)

As with other throwing motion the generation great force exerts significant musculoskeletal stress on multiple joints on the upper extremity. These stress are the likely causes of acute and overuse injuries that sustained by javelin throwers (Andrews & Fleisig, 1998)

Javelin throwing technique consists of 5 phases (1) preparation or an approach run where the thrower run forward towards the throwing direction to build up momentum (2) five stride rhythm or crossover step where the run sideway and strength their trunk and throwing shoulder muscle(3) single support phase where the throwers transition from a running to throwing motion.

(4) a delivery phase where the throwers comes to an abrupt stop transfer runway momentum to javelin speed, and release the javelin in an over arm throwing motion and (5) a follow through where the thrower decelerates there throwing motion and regains their balance (figures 1.1 and 1.2) Babbitt; 2001;, Bartlett, 1988; Gorski, 2003 Morisse& Bartlett, 1996). The single support phase was defined as the time between the right foot touchdown & the left foot touchdown . The delivery phase was defined as the time between the left foot touching down

&the release of the javelin. The throwing procedure as defined as the single support phase and the delivery phase together (Bartlett ,1988, Moriss& Bartlett, 1996)

Javelin throwers injury were determined to have sever effects. Acute and overuse injuries that lead to loss of practice time and competition may place a financial and quality of life burden on the javelin throwers and may put the javelin throwers at increased risk for secondary and degenerative injury (Andrews & felisig 1988). Injuries sustained while javelin throwing may be preventable through training programs that modify technique to decrease musculoskeletal stress. There is a gap in the scientific & coaching local literature of the mechanism of javelin throwing injury.

Javelin throwers were found to have high incidence injury. The researcher as a decade throwing event coach has been observed that unlike other throwers most of the javelin throwers in Athlete Trunesh Dibaba Athletics Training Center had sustained throwing related injury in the past ten years. Their injury include ulnar collateral ligament tears, rotary cuff tears , shoulder implement, shoulder dislocation , hummers head injury and vertebral fractures as indicated in the training center clinic.

Despite javelin throwing sport long history in Ethiopia studies were not conducted that related javelin throwing technique to injury sustained by javelin throwers or that identified possible mechanism of injury. There was a lack of basic information on the mechanism of javelin throwing injuring. There was a need, therefore, to investigate the relationship between javelin throw technique and injury sustained by javelin throwers.

The purpose of this study is to identify the cause of injury patterns in the upper extremity and potential target for injury prevention as it pertains to specific javelin throwing or knowledge gap which may lead to further research on the prevention upper extremity injuries sustained during javelin throwing or competition.

1.2.Statement of the Problem

Javelin throw is one of the oldest throwing event in the track and field. Javelin throwers are trained to throw the javelin in order to cover maximum horizontal distance as far as possible, although being trained to avoid injury. Javelin throwers have a high incidence of injury that

significantly affects their performance and their quality of life. It is experienced at some time by every competitors, varying from slight discomfort to symptom sever enough to prevent throwing. In spite of the frequent occurrence it is disabling and discouraging effect, the condition appears to have simulated little interest.

The researcher as a throwing event coach has been observing, javelin throwers sustained injury which have sever effect and leads to a loss of practice and competitions. So far the incident may affect the national team javelin throwers not to fulfill the minima of international competition.

Javelin throwers throwing technique directly affect their performance and may be associated with injury they sustain(Andrews & Fleisig,1998). Several studies have been conducted on javelin throw technique, performance, injury prevention, injury risks and biomechanical analysis. Such as Andrews & Fleisig,1996;Andrewa & Broussard,1995;Bartlett & Morriss,1993&1996; S Copeland,1993;Setayesh k..2017).Thus studies were comprehensive and it remains undetermined the exact javelin throw technical phases that were clearly associated with injury risk factor.

Despite complicated technique for performance and high injury rate, local studies were not conducted that related to javelin throwing technique to injury sustained by javelin throwers or that identified possible mechanism of injury. There was a lack of basic information on the mechanisms of javelin throwers injuries, there was a need, there for the overall purpose of this study is to investigate the relation between javelin throwing technique and injury sustained by javelin throwers.

1.3. Research questions

- What type of javelin throwing injuries and body location occurred on javelin throwers?
- What is the relationship between javelin throwing technique and injuries sustained by javelin throwers?
- What influence has thus javelin throwing technique related injuries on the performance and health of Javelin throwers?

1.4. Significance of the Study

The study provides information on the type, cause and influence of injuries sustained by javelin throwers. This would entail comprehensively surveying javelin throwers to understand what injuries this population sustained, and determining the incidence of body position considered as potential mechanisms of injury in over-arm throwing motions and would bridge the gap in the coaching literature by relating technique to injury sustained. It can help coaches athletes, managers, administrators, officials, health officers and professionals

1.5. Objective of the study

1.5.1. General objective

The primary purpose of this study is to investigate the influence of javelin throwing technique on the risks of injury sustained by javelin throwers`

1.5.2. Specific objective

The specific objective of this study is to:

- Identify the types of injury sustained by javelin throw
- Indicate the relationship between javelin throwing technique and injury sustained by javelin throwers.
- Assess the influence of injury on the performance and health's of javelin throwers

1.6. Delimitation of the study

The study is delimited to javelin throwers of one training center and six selected first division athletics club. So the researcher were restrict himself to Trunesh Debaba Athletics Training Center, and some selected first division Athletics club in Ethiopia and also to make the study designed to focus only on javelin thrower athletes.

1.7. Limitation of the study

The Study having so wide range of Coverage the research was challenged by the limited time resource and other Constraints. It was found upon the collection the questionnaires that some respondents didn't understand certain issues from their response. Some Clubs and Coaches were not willing to Conduct repetitive Observation. So Observation was made only in some selected Practical Sessions Moreover, Local review Litratures Concerning the issue was very few which may limit the Study.

1.8. Definition of Operational Terms

Athletics - sports such as running jumping, throwing etc

Injury: An injury is damage to a bone or soft tissue, such as a ligament, muscle, or tendon.

Javelin: A javelin is the spear-like implement that is thrown by the athlete taking part n a javelin throwing competition.

Performance: In javelin throwing, performance refers to the longest official distance a javelin thrower manages to achieve throughout the competition.

Technique: Technique refers specifically to the combination of actions that make up the javelin throwing procedure. This includes any carrying, backswing or cocking motion made to move the implement away from the throwing direction, as well as any motion made to propel the implement towards the throwing direction.

1.9. Organization of the Study

This study is organized in five chapters. The first chapter present and discusses, the back ground of the study, statement of the problem, objectives of the study, limitation and delimitation respectively and definition of operational words. The second chapter forward review of literatures. Chapter three covered the research design and methodology of the study chapter four cover results and discussion and chapter five is about the research conclusion and recommendation.

CHAPTER TWO

REVIEW OF LITERATURE

2.1. Short history of track and field

A track and field event are among the oldest sport still existence throughout the world. The throwing event - discus, javelin, hammer and shot put are categorized as a field event and are the most technical and complicated events in the sport. Athletes have to control the movement of their bodies and the movement of the throwing implement. Successful athletes should know how the principles of physics, biomechanics and aerodynamics interact in the throws (M.L Coleman 2005)

Throwing sport has a long history. Modern track and field comes from lineage of activates that dates to the ancient Olympic Games. The first recorded example of organized track and field events of sport festival are the ancient Olympic Games at the first Game in 776 BC in Olympia.

The field events were also present at the pan-hellenic Game in Greek around this period and they spread to Rome in Italy around 200 BC. After the period classical antiquity new track and field event began developing parts of northern Europe in the middle age and the stone out and weight throw competition were popular.(throwing sport Wikipedia)

2.2. Origin of the Javelin throws

The javelin throw is also a Greek event that evolved from the use spears in battle. The competition javelin was about six fit long, smaller and lighter than the spear used by military. The ancient javelin was made out of wood and had an a mentum or small loop made of rope attached behind the center of mass that helped the thrower carry the javelin and assist creating additional force and rational spin during the flight of the javelin. Wood was used until the late 1980s when aluminum replaced it. (A modern javelin shown in figure 1.)

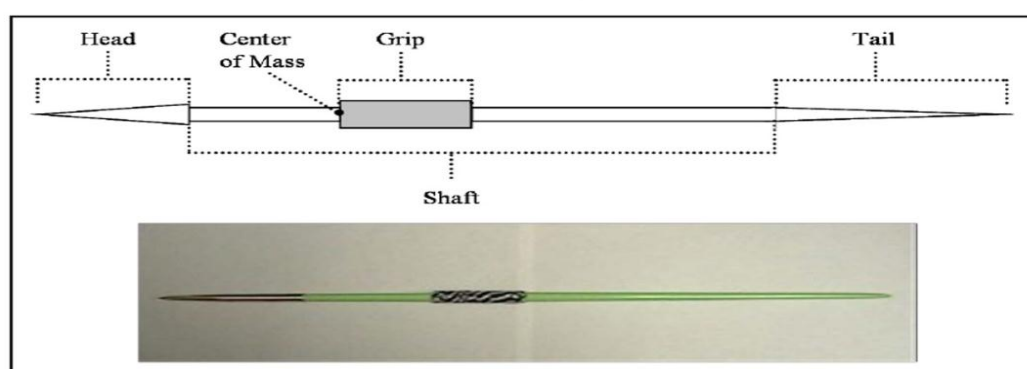
It is likely that the javelin throwers in ancient Greece were required to aim at a target during competition and were juggled the distance and accuracy. Although the javelin is one of the oldest events and a cornerstone of the ancient Olympic games, it was not introduced in modern

Olympics until 1908. Early competitions allowed free style grips, and, like the discus, required athletes to throw with their left and right hands (Encyclopedia of Track and Field 196)

2.3. Javelin throwing technique

2.3.1. The javelin:-The javelin is a type of light spear designed for throwing in an athletic competition. The javelin consists of a metal head, a shaft made of a homogenous material such as steel, aluminum, or carbon Fiber, and a cord grip which is wound round the shaft at the center of mass (Figure 1).

Fig.1. The javelin



Source:- IAAF Competition rule and Regulation (2015).

The javelin is circular along its length and tapers to a point at the front and rear of the grip. For male javelin throwers, the javelin weights 800 gram and is 2.6 meter to 2.7 meters long. For female javelin throwers, the javelin weights 600 grams and is 2.2 meters to 2.3 meters long (IAAF, 2015).

2.3.2. The Arena: The javelin throw is performed by throwing from a run way in to a throwing sector. The throwing sector is often located within a track and field arena, inside a running track. The runway is 30 meters to 36.5 meters in length and 4 meters in width. The runway end with a foul line, and throw must be performed behind the foul line. The foul line is not straight but is an arc that has a radius of 8 meters. The javelin is thrown in to the throwing sector from behind the foul line arc, and the sector extends outwards from the area.

2.3.3. Components of technique: - Although detailed technique may vary among athletes, a javelin throwing technique generally consists of seven components for a right handed thrower (Morriss and Bartett, 1996);

1. The carry: -The javelin must be held at the cord grip, which is wound around the shaft of the javelin at the center of mass (figure 2.2). The throw begins with the javelin thrower facing the throwing direction and carrying the javelin above their right shoulder with their palm up, their elbow flexed approximately 90 degrees, and their shoulder abducted approximately 90 degrees.

2. The run-up: To reach the maximum controllable speed at the release, a javelin throw will include a run up before transitioning into a throwing motion. This serves to increase momentum of the thrower plus javelin system, which can be transferred to the javelin only at release. The javelin thrower will face forwards and run in relatively upright position towards the throwing sector with the line of their shoulders and the line of their hips approximately perpendicular to the throwing direction, and their feet facing the throwing direction. The javelin thrower will run towards the throwing direction at a speed suitable for their ability for around 10-15 strides. They will accelerate to increase their running speed throughout this phase to a speed phase that can be controlled during the transition from run to throw.

3. The withdrawal: -Near the end of the 10-15 strides of run up, the javelin thrower will start withdraw the javelin, so it is further behind them. Their right arm will have almost full elbow extension, and will be externally rotated and horizontally abducted so the javelin throwers hand is behind them at approximately at shoulder height. Getting in to the withdraw position is usually accomplished by pushing their right hand backwards and turning their shoulders so that the line of their shoulders is approximately parallel to the line of the throwing direction with the left shoulder leading the right shoulder.

4. The crossovers: Around the time the javelin is moved in to the withdrawn position, the javelin thrower will transition from running while their hips are facing towards the throwing direction in to crossover are type of sideways run, where the line of the javelined thrower's hips is turned to between 45 degrees and 90 degrees to the throwing direction. For a right hand thrower, their left

hip will lead their right hip. The line of the javelin throwers shoulder and the javelin are maintained at roughly parallel to the throwing direction.

The athlete will attempt to have their feet contact the ground underneath their center of mass, which produces a characteristic backward lean. Usually three to seven crossover to achieve the maximum runway speed at the start of the delivery stride. The final stride of the crossovers, known as the impulse stride, ends with a forceful horizontal drive from their left leg, and fast action from both leg during the flight phase between the impulse stride and the delivery stride. This fact leg action brings their left leg level with, or forward of, their right leg at the instant their right leg contacts the ground to begin the delivery stride.

5. The single support phase

The single support phase of the delivery stride starts from the right foot touchdown of the last cross-over stride, and ends at the following the left foot touchdown. The objective of the delivery stride is to position the javelin thrower in the optimum position for executing the throwing action.

During delivery stride, the javelin throwers right foot will contact the ground first, while their left leg reaches out in the direction of the throw. The javelin thrower should still have a backward trunk tilt, with an approximately straight line joining their left foot, the hip and right shoulder. The lines of their hip and their shoulders will start to rotate towards the throwing direction during this phase, with the line of the hips leading the line of the shoulders.

The javelin throwers right hip, knee and ankle joints flex during single support to facilitate rotation of their body over their right foot. This always greeter runway speed and momentum to be maintained up to the release by minimizing braking.

6. The delivery phase: The delivery phase starts from the left foot touchdown of the delivery stride and ends at release of the javelin from the hand. The objectives of the delivery are to give the javelin a final acceleration and to release the javelin with maximum velocity in the optimal

direction. The javelin thrower braces their left knee, at the left foot touchdown in process known as blocking.

This decelerates the javelin thrower and allows momentum of the javelin thrower plus javelin system to be transferred into the javelin only. The javelin thrower will fully rotate their right hip towards the throwing direction to bring the line of their hips perpendicular to the throwing direction. This hip rotation is followed by forward rotation of the upper trunk, moving their right shoulder towards the throwing direction, and bringing the line of their shoulder perpendicular to the throwing direction. Following this hip and shoulder rotation, the joints of the upper arm in the sequence to increase linear velocity. The joint action is firstly shoulder joint horizontal adduction and internal rotation; this is followed by elbow joint extension, and then wrist joint flexion, and finally the release of the javelin. For a legal the javelin must be released over the shoulder and upper arm of the right arm.

7. Recovery: Immediately after the release the javelin thrower will take a few recovery steps to dissipate the remaining momentum and to come to complete stop. They also slow the motion of their throwing arm from maximum velocity at the release to rest over along displacement. The javelin thrower must complete the throw behind the foul line, and the javelin must land point first a legal throw.

For a left hander javelin thrower, the same basic sequence is followed however the left and the right side roles are reversed a left hander javelin thrower, will carry the javelin in followed; in their left hand. They will have a lead of their right shoulder over their left shoulder from the withdrawal and a lead of their hip over their left hip during the crossovers. The impulse stride will begin with a drive from their right leg. The single support leg will be the left leg, and they will block with their right leg.(Figure 2.1 illustrate the whole phases of javelin throw technique)

Fig. 2. Javelin throw technical phases



Source:- Colvin Morris, Steven Leigh and Roger Bartlett. Biomechanical factors critical for performance (1996).

Calvin Morris and Roger Bartlett (1996) reviewed javelin throw technical factor in to the following 4 phase. Each with its own biomechanical function. These are generally accepted to be the run up, the crossover (including the withdrawal), the delivery and recovery.

In descriptions of the thrower's body position it is assumed that the right handed

1. Run-Up

That athletes can throw for these after a run up than from standing position follows Newton's second law of motion which suggests that the javelin should have an initial velocity before its most important phase of acceleration. Initial velocity is given to the javelin in during the run up typical horizontal velocities for the throwers center of mass at instants later in the throw were been reported to range from 5.2 to 7.0 M/sec for elite level athletes.

2. Crossover

In modern javelin throwing, a series of crossovers are performed in which the thrower can maintain the velocity generated through the run up but also put their body and the javelin in to a position that will optimize the effectiveness of the deliver. In both cases the hip and the shoulder axis the athlete can be seen to be approximately parallel to the ground and to the throwing direction. In addition the javelin held such that the elbow of the throwing arm is fully extended with the javelin parallel to the ground. This serves to lengthen the distance between the javelin position at the end of the crossovers and its position at release.

3. Delivery

The delivery stride begins with the thrower's final right foot strike. However, it is at the instant of final left foot strike when the thrower is considered to transfer the horizontal momentum gained in the run up in to a combination to horizontal and vertical momentum of the upper body, which is then the javelin. This instant also known as final foot plant or final foot contact. At this instant the javelin speed for the elite male athlete will be approximately 8m/sec. this leaves approximately 20 to 21 m/sec to be generated during 0.12 seconds. After which the javelin will be release. A body position should be adopted that will allow him to maximize the force that he can apply to the javelin, lengthen the time in contact with implement, and transfer momentum to the javelin in the most effective manner.

3.1. The Block

At final foot strike the thrower begins the process of transferring momentum from the lower body to the upper body. For a right handed thrower this is achieved by flexing the hip and extending the knee of the left leg prior to ground contact. This leg is then used as a brace for the upper body to work against at left foot strike. For the transfer of momentum to be most effective it is thought that the athlete should flex the left knee only very slightly between foot strike and release. The act of blocking at final foot strike induced strong eccentric then concentric contraction of the quadriceps muscles in the front leg. The act of blocking also facilitates lateral rotation of the shoulder axis to the line joining the 2 shoulder joints from a parallel position to one that is perpendicular to the javelin in runway. Again it is feasible that eccentric

followed concentric contraction of the abdominal musculature facilitate this process. Similar observations could be made for musculature of the shoulder, upper arm, fore arm and wrist.

It has been found that in some elite throwers as much as 70% the kinetic energy of the javelin was generated in the last 50 m/sec prior to release. It has been suggested that such a short time is insufficient for the working muscles to generate high force. A muscle can begin shortening with greater than its maximum isometric level should it be stretched before hard. Thus, it would seem that a series of stretch shortening cycle, commencing with the proximal musculature and ending with that more distal, is a feasible mechanism for generating the high forces necessary to throw the javelin a long way.

3.2. Shoulder Axis Rotation

In addition to the orientation the hip and shoulder axes, throwers seek to lengthen the acceleration path of the javelin by maintaining an extended elbow of the throwing arm until the instant of final foot strike. Accurate values for the elbow angle at final foot strike necessitate a filming protocol that is 3 dimensional in nature and the best throwers reportedly achieve values in excess of 150° . Using only the angle of elbow flexion at final foot strike to give an indication of the acceleration path of the javelin can be misleading some elite athlete while arrived at final foot strike with a relatively flexed elbow, have been found to perform a small degree of elbow extension immediately following final foot strike. Although a flexed elbow position at final foot strike may reduce the acceleration path available to the thrower, these negative effects may be out weighted by other, more beneficial factors carrying the javelin with a slightly flexed elbow may put the working muscles that cross the shoulder and elbow joints in the optimum position regard to their core length velocity relationship. In relation to javelin throwing a coach's instruction to an athlete would normally advise the maintenance of a relaxed upper body and extended right elbow through the crossovers until final foot strike.

3.3 carry height

The carry position of the javelin is generally measured as vertical distance between the throwing shoulder and the grip or as the horizontal distance between the right hip joint and the grip. Lower carry has been reported significantly correlate with the distance thrown. This suggested that the

better throwers tended to carry the javelin lower, which may have been for one or two reasons to increase the acceleration path of the javelin or to help the thrower in attaining an appropriate angle of release. Morris and Bartlett (1996) cited in this document that they found an athlete who adopted a higher carry at the start of the delivery seem to benefit in many ways. The angle of attack and the angle of yaw or side slip were lower. This resulted in throw with a cleaner' release with smaller drag forces acting on the javelin, but not to the detriment of the release speed or release angle. Furthermore, the maximum lateral displacement of the javelin during the delivery was less for the longer throws which implies that smaller lateral forces applied to the javelin.

This has consequences for the aerodynamics of the implement because the application of forces that are not directed through its long axis will cause it to vibrate when released. Vibration is highly likely to increase the aerodynamic drag activity upon the javelin in-flight so shortening its flight time and, consequently, the distance thrown.

3.4. Sequencing of segmental movements

Possibly the most important element of any successful over arm throwing activity is the sequential timing of the peak linear speed of body segments. Proximal segments should reach their peak speeds first followed by those progressively more distal.

An orderly progression in peak linear speeds from proximal to distal segments was reported for the 22 finalist in the men's and women's javelin finals of the 1992 Olympic games. A similar finding has also been reported for the high level athletes, surprisingly novice athletes throwing a mean distance of 29.80m have also been found to show a correct pattern of temporal sequencing. The difference of course lies in the peak speed of each joint center, with elite athletes obviously attaining greater speed at each joint of much interest to the sport scientist and javelin coach is the contribution to the release of the implement made by the movement of each body segment.

The hip, shoulder, elbow, wrist and hand of the throwing side of 2 Olympic athletes in which each athlete achieved relatively similar javelin release speeds of 29.2 and 29.5 m/sec were markedly different. This must have resulted from the very different movement patterns of the 2 athletes studied. Supporting data, from analysis of the men's javelin final at 1995 world

champion ships, on the same 2 athletes also achieved markedly movement patterns for example the value of the maximum lateral displacement of the javelin during the delivery were calculated to be 0.63 and 0.09 m for the throw for both throwers the frontal plane horizontal displacement of the center of the hip axis from the center of the shoulder axis was 0.09m. hence, the different paths of the javelin attributed more to the movements of the throwing arm than to the orientation of the trunk, which has suggested to be the causal factor in such movements what is more the peak angular velocities of the shoulder and elbow joints for 2 throwers were 15.6 and 21.8 rad sec shoulder angular velocities and 45.0 and 25.6 rad sec (elbow angular velocities) the angular velocity of the upper arm at the shoulder joint was produced by a combination of abduction, horizontal flexion and extension, whereas extension was the only action of for exam about the elbow.

Internal rotation of the hummers and possibly probation of the fore arm could contribute greatly to the acceleration of the javelin but these were not measured. Nevertheless, these results suggest that the patterns of the muscular activation or the muscles used to accelerate the javelin were different for the 2 athletes. It would therefore seem appropriate that the training programs each athlete should be different and designed very specifically to their unique movement pattern.

4.Recovery

Following release, the javelin is only acted up on by aerodynamic and gravitational force. Hence the thrower can do no more influence the right path of the javelin, but his task is not yet complete. He must deliver the javelin and then half his forward momentum such that the foul line is not crossed the thrower, they refer, has conflicting goals. He wants to deliver the javelin as close as possible to the foul line but not so close that his forward momentum will carry him across it. This makes the blocking action of the left leg at final foot strike all the more important more specifically. The reduction in the horizontal velocity of the center of mass center between the instant of the final foot strike and release has great value for successful performance.

Jeff Gorski (1981); in his first published article a soft step javelin throw technique. ;reported that there are basic fundamentals found in each technique these fundamentals include maintaining or increasing run up momentum, from transition steps to the throw, leading the throw with the hip,

noticeable backward lean, a firm brace or plant with the left leg (right hand thrower), and delaying the arm strike. Other factors influencing the throw that can be controlled are the alignment, the angle of attack and the angle force of the javelin in at release. Alignment is defined as keeping the long axis of the javelin in line with the axis of the shoulder, and keeping both in line with the proposed path the throw.

Angle of force

The angle of force is the deferent between the path of the javelin's flight at release and the path of force or power exerted on the delivery by the thrower . The smaller the angle, the better this deals with adage of force at zero, a perfect release.

Angle of Attack

The angle of attack is the different between the flight path of the javelin's center of mass and the actual position of the center point of the javelin during flight (diagram 2) the angle of attack is a direct result of the angle of force. Again, the smaller this deference, the better, because a large angle of attack means the javelin will stall in the air.

Momentum of greatest importance however, is maintaining a, uninterrupted flow of momentum from the approach in to the throw. To do this the athlete must accelerate through the step pattern, so that the last two steps, the crossover and the plant are the fastest of all it was also extremely important that the plant leg contract the ground as soon as possible after the cross over. The long it takes to ground the plant, the greater the chance of planning in the bracket' and loosing valuable power.

Soft step

It is helpful for the thrower to think in terms of running away from the javelin to delay the arm, and running out the plant. This running action has been called the soft step or deep knee position by various authors the soft step, or some variations of it is what allows effective use of momentum in the throw as the thrower approaches the crossover, javelin is well back, the shoulder are above the hip and the legs are driving forward giving the whole body a slight

backward lean going in to the crossover, the athlete drives powerfully forward of the leg (right hand thrower), while the right shin is pushed as far forward as possible with minimum vertical motion. Too much vertical motion will cause the thrower to settle on his power right leg, negating the run up and plant throwing from this seated position, similar to a base ball pitcher throwing from a stretch will substantially limit distance and the use of momentum.

From the position described in diagram 3, the athlete must quickly pull the leg forward so he is further in alignment to the rural. At this point, the athlete is just about to strike ground with his right foot, the left legs extended forward waiting to plant and the left arm is starting to open the chest.

The hip and center of mass (or gravity) are well ahead of the torso when the right foot does touch the ground, the so called soft step takes place. It allows the hips and center of mass to pass quickly over the power leg, so that the plant jolts the hips and starts the throw. As the hip over the right leg, the right knee bends (and continues to be bend so that the forward movement of the hips and the center mass is unhindered. Soft stepping is a passive movement by the right knee and leg that positions the center of mass forward thrust and hip stay ahead of the rest of the body without any loss in forward momentum going to the plant.

2.4. The Over Arm throwing

Javelin throwing is an over arm throwing action. Meiser (2000) suggested that movement such as the baseball pitch, football pass, and the tennis serve could all modeled as a variation of general a very throwing motion, with pitching as the base model. Javelin throwing may be part of a general over arm throwing motion. Along with base ball pitching, hand ball passing tennis serving.

Wickstrom (1977) made comparison between javelin throwing and base ball pitching. This research determined that following the running approach and crossovers, the javelin throwing motion is similar to the base ball pitching motion. That is, single support phase and delivery phase of javelin throwing is similar to the acceleration phase motion of baseball pitching. Atwater (1970) noted that the shoulder and arm motion of baseball pitching, American football passing, tennis serving, badminton, volleyball spiking, and javelin throwing were all similar. She found that the differences among these skills were mainly the orientation of the arm, and that orientation of the arm varied due to lateral trunk flexion instead of a different shoulder joint

movement pattern. Baseball pitching has a visually similar motion pattern to javelin throwing. During the single support phase of javelin throwing, the thrower, extends their left leg toward the throwing direction, start to twist their trunk left wards decreasing the hip shoulder separation angle, abducts, externally rotate their shoulder and flexes their elbow javelin throwing motion could be considered as a part of generalized over arm throwing motion. The similarity of the base ball pitching and javelin throwing technique set the bases of comparing the loading between the two technique and injury mechanism.

2.4.1. The throwing mechanism

To understand how to prevent and treat overuse injuries resulting from a throwing action, it is important to understand the anatomical and physiological sequence of events (figure 5) Stephen Copeland (1993), reviewed throwing phases as follows.

Wind phase: this can be separated in to two parts, in early cocking the arm is abducted at 90° and horizontally extended 30° . Late cocking involves external rotation of the shoulder and elbow flexion in the already abducted and extended arm. Infraspiratus and teres minor provide external rotation and also contribute to glenohumeral stability by drawing the humeral head towards the glenoid fossa. Late cocking when contraction eccentrically to decelerate shoulder external rotation and protect the anterior structure of the shoulder which are under extreme tension at this point

Acceleration phase

This phase of throwing is explosive and implies the hummers in to rapid internal rotation by means of a concentric contraction subscupularis appears to act as a steering muscle to position the head in the glenoid. The acceleration phase includes elbow extension, forearm pronation and wrist flexion.

Follows through phase

The muscles now contract to decelerate the arm which is adducted, internally rotated and forward flexed at the end of acceleration. Posterior fibers of deltoid, supraspinatus, teres minor and infraspinatus all contract in this phase of throwing. Gina M. Moreno (2014) also reported those phase in to four stages. Early cocking stage, late cocking stage, acceleration stage and deceleration stage.

2.5. Upper extremity kinetic chain

According to Setayesh K. (2017) report; The etiology and epidemiology of all throwers, regardless of the event, share common fundamentals of the kinetic chain. The force used in throwing event begins with ground reaction force that transferred up the lower extremities, through the core and torso, across the scapula, shoulder, elbow and ultimately the hand. An injury at any link along the kinetic chain will lead to abnormally increased forces and predispose the athlete to injuries further distal along the kinetic chain and may impact overuse and acute injuries of the upper extremity

The sequences of events in the standard throwing motion differ slightly from throw to throwing event. The twisting and ballistic nature of these throwing events can place large torque and axial loads across the glen humeral joint and can predispose to injury with shoulders as well as further distal in kinetic chain. The javelin throw involves 4 phases. Approach run, cross steps, delivery stride the thrust phase. The javelin throw begins with the javelin in the palm of the hand, horizontal to the ground over the throwing shoulder with the elbow flexed to approximately 90 degrees and the forearm supinated. The athlete will regain running with their hips square to the direction of throw. With the final two strides, the contra lateral leg should be forward while the throwing arm is extended at the elbow and javelin held at shoulder highest. This elbow extension allows for maximum acceleration and the reform throwing distance, during the thrust phase (final foot strike to release) the elbow flex from 40 degrees to 60 degrees (high level athletes).

2.5.1. Shoulder

The stresses and torques required for javelin throwing are generated through the lower and is progressively transferred to the arm, initially, stride is converted, in to pelvic rotation, which

leads to rotation of the torso, shoulder internal rotation, elbow extension, and wrist flexion and pronation along various point in the kinetic chain. The dynamic and static stabilizers are subject to large stresses and torques, which can lead to chronic and acute injuries of the stabilizing structures. Dysfunction of the shoulder girdle muscles, such as in scapular winging can affect motion of the shoulder as well as throwing velocity, and can cause the micro trauma seen in rotator cuff disease. Javelin throwers demonstrate signs similar to

chronic impingement, such as an inflammatory thickening of the structures include the rotator cuff, biceps tendon, and subacromial bursa, posterior capsulitis and capsular rents can also be seen in javelin throwers. Posterior rotator cuff muscles such as the teres minor and infraspinatus can become strained especially as they restrict anterior translation of the humerus during follow through. The posterior capsule can become pinched between the humeral head and glenoid during the thrust phase of the throwing motion, which can lead to chronic microtrauma and scarring, posterior shoulder pain and pain with internal rotation. EMG activity from javelin throwers demonstrates an increased activity in posterior rotator cuff and deltoid muscles, which supports the theory of internal impingement present in these athletes. Scapulothoracic injuries can occur due to eccentric loading of the scapula stabilizers during the follow through phase, which typically occur at the musculotendinous junction of the medial scapular border. There are instances of piercing injuries to shoulder from javelin throw with the subclavian artery beneath the clavicle at risk. Damage to the subclavian artery has been shown to cause significant bleeding, hemothorax and decreased blood flow to the area.

2.5.2. Elbow

Similar to the shoulder, during training and competition throwing sports the elbow is subjected to potential pathologic repetitive loads which can lead to injury.

The elbow is the next abnormality proximal in the kinetic chain that can lead to overuse injury at the elbow, like the shoulder the actual forces across the elbow joint depend on the event.

In elite athletes, 70% of javelin release speed is developed in the last tenth of second before release. This puts significant valgus force on the medial side of the elbow, and repetitive use can lead to failure of the ulnar collateral ligament (UCL) and valgus extension overload. The first

reported UCL injury in 1946. In addition to volunteers javelin throwers occasionally have symptoms of ulnar neuritis related to attenuation of the UCL. There have been several reports of occlusion stress and fractures occurring in javelin throwers ..

2.5.3. Wrist and hand

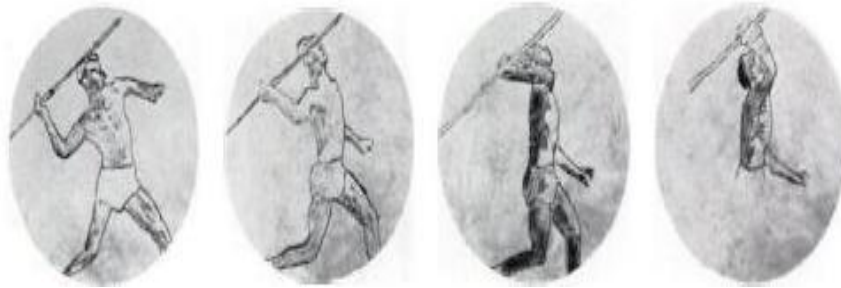
The terminus of the kinetic chain in all throwing athletes is the hand and wrist. Forces generated via the kinetic chain culminate at the wrist and hand to transfer energy to the object being thrown. The javelin is held with multiple grips, but all have a circular grip in common with the primary load across the risk being radial to ulnar

Throwing events in general appear to have very low rate of hand and wrist injury as compared to the shoulder and elbow. Injury patterns in younger or less elite throwers may be associated with poor mechanics. It is clear in other sports that altered throwing mechanics along the kinetic chain will increase the load at subsequent segments increasing the risk injury.

The successful running throw requires the highest degree of coordination of limbs and trunk to affect a transfer of momentum to the javelin. The absence of a smooth train of movements the javelin is delivered by a short quick jerk of the arm which may strain or injure the elbow in addition the general lack of coordination in the throw, the action of the propelling arm is of the greatest significance in the development of pain (J.E, Miller 1960) he adds; there are two common arm motions, the round arm or the side arm and the correct arm method. The round arm method (figure 3) develops in the novice athletes that the action of the arm begins, the elbow rolling around in a circle at about the level of the shoulder, with the arm abducted position parallel to the ground, and the elbow flexed to a right angle, medial rotation of the shoulder transmits the required force to the javelin, but at the same time exposes the medial ligament of the elbow to considerable strain and damage appears to be cumulative rather than the result of single incidence. The pain is felt when extension of the elbow begins, at movement of the throw and quickly resolves with rest, to recur with the next session of throwing. Nothing is known about the degree and duration of re injury required to produce these changes.

There are more recognized principles in the treatment of this type of ‘ Javelin elbow’ other than reduction the intensity of throwing with increased emphasis on the employment of correct coordination and technique.

Fig. 3. Round arm “ method of arm action”



Source:-J.E.Miller (1960) Javelin thrower's Elbow

The second method (Figure 4); the elbow is brought well forward in the throw so that it reaches a position directly in front of and above the shoulder, powerful extension of the elbow then transmits the necessary force to the javelin without then transmits the necessary force to the javelin without the medial ligament and it is seldom mastered completely by throwers.

Fig.4. The correct method arm action



Source:-J.E.Miller (1960) Javelin thrower's Elbow

2.6. Upper extremity throwing injuries

Injuries related to throwing sport commonly seen in the general sport injury clinic. The upper extremity accounts 75% these injuries with the shoulder being the most important (Stephen Copeland 1993). Javelin throwing have a mechanisms of injury with over arm throwing sports have common in jury risk factors. Over arm throwing has been show to exert significant musculoskeletal stress on multiple joints, particularly the shoulder and elbow used for throwing and these musculoskeletal stress lead to acute and over use shoulder and elbow injuries (Andrews and fleisig, 1998). These injuries SLAP lesions, which are teaps of the superior labrum from anterior to posteriors displacement of the hummers in the glonoid fossa of the scapula, which is termed shoulder desolation for full displacement of the hummers out of the glenoid fossa and shoulder sublxation for partial displacement, shoulder impingement, rotator cuff tear, and damage to the hummers bone (Melster, 2000) Shoulder impingement was common injury observed in over arm throw athletes. This injuries has been attributed to anterior gleno humeral instability, which arises due to the increasing range of motion demands of modern over sports in left untreated, the impingement symptoms will persist and the impingement will progress to full tear of rotator cuff or a lesion to the glenoid labrum (bechlar and job, 1994)

Elbow pain is such common affliction of Javelin throwers that the serious an athlete regards it as an unpleasant and often unavoidable accompaniment of the sport and seldom seeks medical advice. Most coaches believe that the condition is the result of an incorrect throwing technique (J.E Miller 1960).

It is experienced at some time by almost every competitor, varying from high discomfort to symptoms sever enough to prevent throwing (J.E Miller 1960).

Lesions to the anterior superior gleniod labrum (SLAP lesions) were observed in 73 baseball players, all of whom were undergoing arthroscopic examination (JR. Andrews, Broussard, and classon, 1985), and the researchers concluded that the injury was probably due to repetitive over use. Rapture of the distal tendon may lead to significant functional deficit with both a reduction of power and a decrease in range of movement of flexion at the elbow supplication the forearm (Baker and Bieragen, 1985).

The prevalence of injury to ulnar collateral (UCL) of the elbow in over head throwing athlete has been clearly documented serious injury a rise to the ligament as a result of the repetitive and force fully valgus strain that placed on this structure thought the throwing motion. Intact research has determined that the over head throw by an elite a athlete can place a load on the UCL which approaches the tensile strength of the ligament (Gina Me . Moreno 2014).

Miller 1960, sited a common injury sustained by Javelin athletes is tear of the UCL, also target“ javelin throwers’ elbow” it is an injury experienced by most javelin athletes and base ball at some point in their careers most he therapist relate a UCL tears primary with base ball athletes, but interestingly the first reported diagnosis a ULL tears was made in a javelin thrower. In 1946.(Gina M.2014). Gina added that, AUCL injury is usually seen in unskilled or untrained athletes, it can develop in an elite athlete as well and also thought this injury to be related to poor technique.

An ulnar collateral ligament (UCL) tear caused significant disability to the thrower, specifically medial elbow pen and ulnar nerve parenthesis. Throwers noted a significant decrease in velocity and control. Following the UCL tears, the throwers opted for non operative or operative treatment. Non operative treatment prohibited throwing for two to three months. Whereas surgery was expensive and included the risk of ulnar nerve damage (D.H petty.Et al. 2004.). A UCL tears is potentially career threatening for any over arm thrower and dramatically increase in base ball players.

Greater external elbow valgus torque is the direct cause of ulnar collateral ligament tear (fleisig, et al, 1995). The force associated with external elbow valgus torque tends to push the for arm away from the body and separate the medial epicondyle of the hummers from the coronoid process. This force is responsible for the tensile stress that results in strain of the UCL, because the UCL connects these bony prominences. Great external elbow valgus torque may be caused by an extended elbow posting during a period of high velocity internal rotation of the hummers. This position may increase the external valgus torque by significantly increasing the moment inertia of the throwing upper extremity, which results in inertial lag of the forearm behind the upper arm as it internally rotates. The extended elbow position may a rise due to fatigue of the shoulder gardlemesoulature requiring greater activation of the triceps to maintain shoulder

stability, which in turn leads to greater elbow extension since are an elbow flexor (fleisig, et al, 1995).

A failure to maintain lead of the pelvis over the trunk has also been suggested as a cause of great external elbow valgus torque. The failure to maintain lead of the pelvis over the upper trunk means that the shoulder and arm rather than trunk rotator must generate the torque necessary to throw at high speeds. This may cause the extensive fatigue of the shoulder musculature which leads to a compensatory extension of the throwing elbow as the triceps muscles contract to assist the shoulder stabilizer (fleisig et al, 1995). A short deceleration phase alone is unlikely to be the primary risk factors, since the greater torque is not solely dependent on high angular velocity. An extended elbow during a period of high velocity internal rotation of the humerus and a lead of the upper trunk over the pelvis are two positions associated with ulnar collateral ligament injury to over arm throwing (fleisig, et al. 1995). Excessive amount of throw repeatedly at high speed, the repetitive valgus stress can lead to a wide range of overuse UCL injuries. In many cases overuse injuries developed when an athletic movement repeated often during single period of throw and when these periods of play or throw or practice are so frequent that body does not have enough time to recover. In addition to this abnormal mechanism, limited flexibility and poor training and technique also are the causes of overuse injuries (Dennis S.PT, 2014).

Extreme elbow flexion torque is a mechanism of injury for SLAP lesions and tears of the biceps tendon. Concentric elbow flexion and eccentric elbow extension required in great internal elbow flexion torque. A strong contraction of the biceps brachii may develop enough force to tear the glenoid labrum away from the bone. Enough force may be developed, particularly during rapid eccentric elbow extension, to rupture the biceps tendon (adrews, carson, et al., 1985).

Great elbow joint resultant forces were associated with injuries to the elbow. A great joint resultant force is indicative of very high bone on bone contact forces. These contact forces are responsible for damage to the bone itself as fractures or lesions (Dunham, Takaki, Johnson, and Dunning, 2005).

Anterior shear force at the shoulder was determined to be associated with shoulder subluxation and dislocation, because this was the force that caused the humerus to translate anteriorly out of the glenoid fossa, which is a common mechanism of shoulder subluxation (Fleisig et al, 1995). Maximum shoulder and elbow joint distraction forces have been shown to occur at the release during over arm throwing activities. (Werner et al, 2007). A forward lean of the trunk before the release has been suggested as a risk factor for shoulder joint subluxation. A backward tilt of the trunk allows for correct scapula setting to occur, and for the head of the humerus to center in to the glenoid fossa (Meister, 2000) forward trunk tilt may increase the chance of shoulder joint subluxation or dislocation by placing the shoulder in an initially unstable position out of the center of the glenoid fossa. A forward trunk tilt before release was a position out associated with shoulder subluxation or dislocation injuries in over arm throwing (Serner, et al, and 2001). Great shoulder anterior shear force is related to these injuries.

Shoulder joint horizontal abduction and external rotation torque are also related to injuries of the glenoid labrum (Fleisig et al, 1995) these torque may represent the head of the humerus exerting great pressure on the glenoid labrum in a grinding motion. The glenoid labrum may be damaged as fibers are abraded during this motion (Fleisig, et al, 1995).

The muscles of the rotator cuff act to provide external rotation and horizontal abduction torque to counteract the internal rotation and horizontal adduction torque. The opposite torque tends to decelerate the motion of the arm and dissipate the high forces generated during the throwing motion. The rotator cuff muscles also act to maintain stability of the humerus in the glenoid fossa (Andrews, et al, 1995). In addition to the association with glenoid labrum injuries. Great external; rotation and horizontal; abduction torque may be related to rotator cuff injuries. Increased internal rotation and horizontal adduction to torque requires increased external rotation and horizontal abduction torque to be generated by the rotator cuff muscles, which may be so great as to cause an injury. Extreme shoulder joint resultant forces were associated with injuries to the shoulder. A great joint resultant force is indicative of very high bone on bone contact force. These contact forces are responsible for damage to the bone itself in the form of humeral fractures. (Hill Sachs lesions Abdelhady, 2010) great shoulder joint resultant force may contribute to shoulder instability, because anterior shear force is a component of resultant force. Acromioclavicular (AC) joint injuries were common in athletes and active individuals (Alberta,

yocum, 2004), and the specific injuries range from minor sprains to fracture dislocations. Ac joint injuries have been attributed to repetitive high stress loads, and not to throwing activities.

The scientific literatures contains some numeric values of process that are associated with damage to the tendons bones and ligaments of the shoulder and elbow. Approximately 40 NM of elbow valgus torque was required to cause an injury to the UCL. Elbow flexion angles were varied between 50 and 100 olecranon osteotomies were varied between 2mm and 8mm and external values torque applied to the elbow joint of the cadaver. The cadavers were loaded at different external values at different elbow flexion angle. Increase in posterior medial olecranon contact pressure and a decrease in contact area in the UCL inefficient cadavers. These differences were statistically significant at elbow flexion angle of 90 and less, (Dellman, et al, 1991). A similar cadaver study by Braun et al. (2010) reported that elbow flexion torques in excess of 75mm were related to glenoid labrum injuries. Dellman, et al (2005) reported that 1140N of elbow joint resultant force and 1710 No of shoulder joint resultant force were thresholds for injuries to humerus bone for impact injury. Forces in excess of the value of not guarantee that their occurrence in a javelin thrower will result in an injury, forces in excess of the value of not guarantee that their occurrence in a javelin thrower will result in an injury, but high forces in general are risk factors for fatigue and overuse injuries. The values in these literatures are useful, because diesel force and torques will probably not cause an acute injury to a javelin thrower.

As stated earlier, the valgus torque produced by a javelin throw during each throw often reach the tensile strength of the ligament. However, unlike a base ball player whose UCL is stressed by an elbow extent in angular velocity, a javelin throwers UCL is stressed by an elbow flexion angular velocity, at near full extension and flexion past 120 degrees. The bony articulation of the humerus and ulna assist the ligaments and muscle tissue to resist the stresses placed on the joints. The posterior bundle the VLC is responsible for Stabilizing the joint beyond 90 degrees of flexion where as the anterior band is responsible period to 90 degrees of flexion. The repeated stress caused by the throwing motion can cause micro trauma to the joint ligament and ultimately complete failure of the tissue (Gina M. Moreno 2014).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 The Study Area

The research was conducted in Addis Ababa, SNNP Region and Athlete Tirunesh Dibaba Sport Training Center in Oromia region, Arsi zone, Asella

3.2 Research Design

The methodology employed for the research is basically the descriptive survey method. This is because the descriptive method is used to provide answer for the what, when, where, how type questions and is the one often used to conduct such studies.

The method we have chosen to obtain the relevant data was quantitative and qualitative research in the form of a questionnaire, observation and interview. It is stated by Bryman (2004) Baxter R. (2013) questionnaires as are cheap and quick to administer cost effective and is convenient for respondents. The questionnaire was designed based on the objectives and literature review

3.3. Sources of Data

The study used sources of data obtained from one training center and six first division Athletics clubs organizations. The subjects of the study are athletes of Trunesh Dibaba Training Center, and some selected athletics club in Ethiopia.

3.4 Sample Size and sampling Techniques

For this research all the population of javelin throwers of the 6 clubs and one training center were involved because of the number of javelin throwers are small that is a maximum of 6 in each club. Finally based on the entire or available number 40 of the reference population (n=40) were representative involved in the study.

3.5. Data collection Instrument

The method used in the study was both quantitative and qualitative methods. The source of data to be used includes both primary and secondary sources. Among the primary data sources, the questionnaire, observation and interview method was used. The entire javelin thrower athletes were questioned to obtain primary data. Published research papers, books and medical profiles were used as a secondary data sources

3.5.1. Questionnaire

To determine the prevalence of injuries by javelin throwers a survey study were conducted through self made questionnaire to defense club, prison police club, ELPA club,CBE club, Sidama buna club ,South police club and Trunesh Dibaba Athletics Training Center Back

ground information, types & location of injury, throwing technique and injury relationships and the impact or influence of injury on the Performance and quality life of javelin throwers. Comprise part one up to part Four of the questionnaire . The contents of the questionnaire is designed to gather information about the type of injury, causes, nature of injury, mechanism, severity of injury sustained on the scale of training, and competition time lost, the relation technique to injury, and the number of healthcare professional visit for treatment of the injury.

.3.5.2. Observation

Observation session were conducted as it is one of the main tool to gather information about the influence of javelin throwing technique on upper extremity injury risk of javelin throwers in to three selected practical sessions in each club by a means of check list. The check list include phases of throwing technique, sequence of throwing motion, throwing procedure, consistency, intensity, rest & recovery. The scoring mode of the direct observation check list on a five point modified Likert scale type in positive from score thus; Excellent-5,very good-4,good-3,poor-2 and very poor-1.

3.5.3.Interview

To complement the data gathered and to obtain information that remains un clear by the questionnaire the researcher employed un structured face- to- face interview with throwing event coaches and physiotherapists from some selected Ethiopian Athletics club and Trunesh Dibaba Athletics Training Center. The coaches and the physiotherapist were asked to respond any injury the athletes they coached and treat has sustained during their javelin throwing careers. The interview include the relationship between technique and injury, type of injury, nature of injury, mechanism, severity of injury sustained on the scale of training, and training and competition time lost, and the number of healthcare professional visit for treatment of the injury.

3.6 Pilot Study

To evaluate the reliability and validity of the questionnaire as well as the Amharic and English version a pilot study were conducted for 12 defense and prison police club athletes. Pearson correlation result for the questionnaire indicated a very good or 0.89 for English and Amharic version. Then the instrument was given to expertise to check validity and reliability. This is to

see the consistency of instrument and check up whether the instrument has measured the required objectives or not. Finally the instrument improved based on suggestions and recommendations gathered.

3.7. Data Organization and Analysis

The data collected through questionnaire, observation and interview will be organized and categorized based on the objective, considering the research question of the study. There for quantitative and qualitative analysis will be employed and also descriptive statistics will present to accomplish the relevant aim and objectives. The Response obtained through questionnaire and interview were analyzed & interpreted quantitatively, where as the information obtained from direct observation were analyzed qualitatively

CHAPTER FOUR

4. RESULTS AND DISCUSSION

This chapter comprises the study findings to be discussed under different sections, based on the objectives of the study.

4.1 Background characteristics of respondent athletes

Table1. Back ground characteristics of the respondents

S.No.	Variables		Numbers of Respondents	Percentage %
1	Sex	Male	22	55
		Female	18	45
		Total	40	100
2	Chronological age	16-17	7	18
		18-19	13	32
		Above 19	20	50
3	Training age	1-2	10	25
		3-4	13	32
		5-7	9	23
		8-9	7	17
		10+	1	3
		Total	40	100
4	Educational level	Primary school	12	30
		Secondary school	22	55
		Preparatory	2	5
		Collage level	4	10
		Total	40	100

Table 1 show that from the overall athlete's respondents 22 of them/55%/ are male and 18 of them/45%/ are female athletes.

Regarding the age category of the athlete 7of them /10%/ are in the age category 16-17years. 13 of them /32%/are under the category of 18-19 and 20 of them /50%/ of the respondents were under the category of above age 19. Serial number three in the table also show the respondent training age in the athletics club and training center were10of them /25%/ of the respondent are 1-2 years, 13of them /32%/ of the respondents are 3-4 years,9of them /23%/ of the respondent

are 5-7 years ,7of them /17%/ of the respondents are 8-9 years and 1of them /3%/ of the respondents are above 10 years training age athletes. Concerning the educational level background, 12 of them /30%/ of the respondents were under the category of primary school/grade 1-8/,22 of them/55%/majority of the respondents were under the category of secondary school/grade 9-10/, 2 of them/5%/ of the respondents were preparatory school/grade 11-12/and 4 of them/10%/ of the respondent are collage levels.

The table implies that all respondents respond to the questioners and balanced gender Participation were maintained and majority of the respondents are gangsters

4.2 Data Analysis and Discussions

4.2.1 Types of Javelin Throwing Injuries

Table 2, Athletes response for question that if they sustained any injury during their javelin throw career.

Q. No 2	Question	Response		Percentage (%)
		Yes	No	
No 2	Is there any injury occurred in your javelin throw career?	100	-	100

The above table show that the responses of the respondent were sustaining injury in their career of javelin throw all of the respondents /100%/ had sustain throwing related injury in their javelin thrower career. As the respondents' response indicated that involved in javelin throw sustain injuries due to complicated techniques used in throwing. This study was in agreement to Best, Bartlett &Morris, 1993; javelin thrower makes complex, multi-joint movements that require great muscular strength, sophisticated coordination, and accurate control. Thus movements must develop the great forces that are necessary to accelerate the javelin to greater release speed, while carefully controlling the direction of the release.

In addition to that feleisig, Andrews...1995; as with other throwing motions, the generation of great force exerts significant musculoskeletal stress on multiple joints of the upper extremity.

Table 3- Athletes response the injury they sustained and the specific area of the body was affected.

Individual body location	No respondents	Percentage(%)
Shoulder	12	30
Elbow	22	55
Trunk/back	6	15
Knee	-	-
Ankle	-	-
Never sustain an injury	-	-
Total	40	100

Table 3 illustrates the response of respondents about the specific areas of the body location were affected. As the above table shows that shoulder, elbow and trunk/back/injuries were occurred.22of them /55%/ the highest one were elbow injury 12of them /30%/the second higher were shoulder injury sustained by the respondent and 6of them /15%/ of them respond that they had sustained trunk/back injury in their javelin throw career.

As the result indicate that mostly injuries were sustained in upper extremity of the body parts like shoulder, elbow and trunk. As Stephen Copeland,(1993); states that injuries related to throwing sport commonly seen in the general sport clinic, The upper extremity account 75% of these injuries,

The Physiotherapist respondents were also supported the idea that in javelin throwing injuries that were occurred mostly in upper extremities like shoulder, elbow and trunk/back/injures. They also explained the types of injuries in thus muscle, joints and ligaments such as; the Shoulder

injuries included labrum tears, shoulder impingement, and rotator cuff tears, Elbow injuries included ulnar collateral ligament /UCL/ rupture and tendonitis, Trunk injuries included slipped disc and fractured of vertebrae.

This idea was with agreement to Andrews and fleisig, 1998 said that Javelin throwing have a mechanisms of injury with over arm throwing sports have common injury risk factors. Over arm throwing has been show to exert significant musculoskeletal stress on multiple joints, particularly the shoulder and elbow used for throwing. These musculoskeletal stress lead to acute and overuse shoulder and elbow injuries

Shoulder impigment was common injury observed in over arm throwing athletes. These injuries have been attributed to anterior glenohumeral instability, which arises due to the increasing range of motion demands of modern over sports is left untreated, the impigment symptoms will persist and the impigment will progress to full tear of rotator cuff or a lesion to the glenoid labrum (bechlar and job, 1994)

4.2.2 Relationship between Javelin Throwing Technique and Injury

Table 4. Athlete's response to training session mostly they sustained injury.

Training session	No of respondents	Percentage (%)
Technical Training	40	100
Weight training	-	-
Speed training	-	-
Others	-	-
Total	40	100

Table 4, Illustrate response of the respondent towards the training session mostly they sustain injury. It is clear from the data in the above table that all of the respondent respond the technical training or the javelin throw session .The coach and the physiotherapist respondents were also strongly agree that the technical training session which the javelin thrower mostly sustained injury.

As Lyle Micheli, 2013 stated that “When you use poor athletic technique, muscle and joints are put in positions that increase strain and make your body work harder”.

The successful running throw requires the high degree of coordination of limb and trunk to effect transfer momentum to the javelin. In the absence of a smooth train of movements the javelin is delivered by a short quick jerk of the arm which may strain or injury of the shoulder and elbow (J.E MLLER, 1960)

Athlete response on the major reasons why injuries happened in technical training sessions?

For this open ended question the majority respondent respond generally that the technique is very complex. But in regarding to this question most coach and physiotherapists responded that javelin throw is more technical and which requires high coordination and muscular strength of

the upper extremity. Those coaches and physiotherapists ideas were in agreement to Steven Liegh, Jesus Dapena... 2000, says that javelining requires great release speeds, necessitating javelin throwers to generate high forces. Their techniques exert significant musculoskeletal stress which may causes injuries.

Table 5. Athletes Response to the techniques training phases mostly they sustain injuries

Techniques Training	No respondents	Percentage (%)
Approach Run	-	-
Cross over	-	-
Release	40	100
Recovery	30	75
Total		

Table 5, illustrates the response of javelin throwers respondent towards the training phase mostly they sustain injury injuries. All respondents /100%/ of t them respond mostly they sustain injuries in release phases and 30 of them /75%/ of the respondent respond in the recovery phase of the throw. The above data clearly indicated that the release and the recovery phase of the javelin throw technical phases are the main phase for injury occurrence on javelin throwers.

This question were raised to coaches and said that mostly the injuries were occurred in the last phases of release and recovery due to very complicated techniques used in javelin throw.

Throwing with lesser power, optimal movement of chain is possible, but with high power, weak muscle does not clear and movement chain is lost then the result is bad and injury risk is high,(ILKKA TULIKOURA/ www.hpp. And also the Author adds Painful throwing inhabits healing of injuries and involve in risk of new injuries

Table 6. Athletes response for question, if they were involved other than javelin throw.

Training Events	Sex	Numbers of respondents	Percentage (%)
Shot put	M	12	55
	F	10	56
	T	22	55
Discus	M	6	27
	F	5	27
	T	11	27
Hammer	M	2	9
	F	-	-
	T	2	5
Total		35	87

As Table 6 illustrates the response of javelin throw respondents' whether they were involved other than javelin throw. It is clear that the above table indicates 35 of them /87%/ of majority was involved in addition to javelin throw. From thus 22 of them /55%/ were involved in shot put throw and 11 of them /27%/ of the javelin throwers respondent had been involved in discus throw and 2 of them /9%/ of the respondents were involved in hammer throw. As the discussion indicate that javelin throw has more than enough training load to training, but the respondents response indicated that 87% of the majority were involved in other throwing events in addition to javelin throw. This implies that mostly javelin throwers were in the risk of overuse injuries. This study was in agreement to Dennis S. pT, 2014, an overuse injury occurs gradually over time. In many cases, overuse injuries develop when an athlete movement is repeated often during single periods of practice, and when thus periods of practices are so frequent that the body does not have enough time to rest and heal. And also Lyle Michel 2013, added that working the same muscle over and over can lead to overuse injuries. So, the frequent happening of injuries in our clubs and training centers was the javelin throwers involvement in multi events of throw.

Table 7. Athletes Response for how many days you train javelin throw in a week.

No of visit	No respondents	Percentage (%)
3 days	15	37
4 days	23	58
5 days	2	5
6 days	-	-
Total	40	100

Table 7 shows the respondent respond to the number of days they trained in a week. 15/37%/ of them respond 3days ,23/58%/ majority of them respond 4 days and 2/5%/ of them respond 2 days in a week.

Repeating moves again and again during practice can make muscle, ligaments, tendons and bones susceptible to strain, sprains and fatigue. When athlete don't take enough time off to rest and heal these minor problems can develop in to chronic injuries (Dennis Schultz, PT,2014)

Table 8.Athletes' response on the number of session they involve in a technical training in a week.

No of training days in a week	No respondents	Percentage (%)
6 session	4	10
8 sessions	13	33
10 session	23	57
12 session	-	-
Total	40	100

Table 8, illustrate the respondent of athletes respond to the number of session they involved in a javelin throw in a week.23/57%. The majority respond 10 session in a week,13/33%/ of them respond 8 session in a week and 4/10%/of them respond 6 session in a week. Repeating moves again and again during practice can make muscle, ligaments, tendons and bones susceptible to strain, sprains and fatigue. When athlete don't take enough time off to rest and heal these minor problems can develop in to chronic injuries(Dennis Schultz, PT,2014)

Table 9.Athletes response on the number of training days in a week other than javelin throw.

No of training days in a week	No respondents	Percentage (%)
1 day	2	5
2 days	33	82
3 days	5	13
4 days	-	-
Total	40	100

The above table indicate the respondent respond to the number of training days other than javelin throw.33/82%/the majority respond 2 days in a week ,5/13%/ of them respond 3 days in a week and only 2?5%/ of them respond 1day in a week.

Too much strain in one direction can be put on the shoulder rotator cuff and upper back resulting in shoulder aches and pains.(Dennis Schultz, PT, 2014)

Table 10, In which training age you experience this injury first?

Training age	No respondents	Percentage (%)
1-2 years	36	90
3-4 years	3	7
5-7 years	1	3
Above 7 years	-	-
Total	40	100

Table 11, In which training stage you experience this injury first?

Training age	No respondents	Percentage (%)
Basic training stage	36	90
Intermediate training stage	3	7
Advanced	1	3
	-	-
Total	40	100

Table 10 and 11, indicate that athlete responses on the training age and training stage they experienced injury first. They were responded that 36 of them /90%/ the majority nearly almost all of the respondent had respond 1-2 years training age and 3 of them /7%/ of them respond 3-4 years training age and 1 of them /3%/ of them respond 5-7 training age that they had been sustained injury for the first time in their javelin throw career.

During interview with throwing event coach and the physiotherapists, to the questioner, they were responded that most javelin throwers were sustained injuries in the early training age and in basic athlete development stage.

As the respondents response indicate in table number 10 and 11, that mostly javelin thrower were involved in early specialization training that leads them to sustain injuries in early in training and competitions. So, the coach and athletes has to recognize the training age stages of athletics development and understand well that athletics is a late specialized sport.

This study in agreement with Peter J L Thompson, 2009 Athletics is recognized as being a late specialization sport. This because most athlete achieve their best performance generally between 24-34 years age. Taking a long term approach to athletes' development and training benefits all athletes, whatever their age or level of competition. The long term athlete development approach is an organized approach toward achieving the optimal training, competition and recovery throughout an athlete's career. It recognizes that any individual has just commenced athletics has different needs from and capabilities for training than someone who has been doing it for longer. This is true no matter what age an athlete's starts being involved in athletics and emphasizes the importance of coaches knowing the 'training age' as well as the 'developmental age', of each athlete they coach.

Peter J L Thompson, 2009, added that an athlete development is affected by the importance placed on winning or losing. Striving to win is always important. 'A win at all costs' attitude, however, ignores the development the athlete. It is an attitude frequently used by those coaches who judged themselves by how well their finish.

Javelin throwers respond for the nature of injuries they sustain.

For these question the athlete and coach has responded that the nature of javelin throw is more technical that causes injuries and it lead the athlete mostly to pain and sever injuries.

Majority of the athletes and coaches said that javelin throwing injury was:-

- *So painful during training and competition*
- *It reliefs when taking recovery and rest*
- *It causes permanent trouble*
- *It cannot be treated easily*

Javelin throw place axial translational and distraction force across the glenohumeral, Acromioclavicular (AC), and sternoclavicular (SC) joints. This can lead to overuse injuries such as muscle strains, degenerative joint disease, ligament sprains, instability and occasionally more acute injuries such as dislocation. The javelin while slightly non-traditional in throwing motion place the elbow at risk of valgus extension overload of the elbow where there is an associated risk of trancnon injury to the medial ulnar collateral ligament, as well as axial injury of the Capitellum and radial head and posterior impingement with full extension. Although most upper extremity javelin injuries occur in the shoulder, there are several case series demonstrating elbow injuries. Setayesh K. (2017)

4.2.3 Impact or Influence of Javelin Throwing Injuries on performance and quality of life

Table 12, Athlete response if they were visit the physiotherapist for treatment

Q. No	Question	Response		Percentage (%)
		Yes	No	
No	Do you visit physiotherapist when injuries occurred?	100	-	100

The above table 12, indicate that all of the respondents were responded that they were visit the physiotherapist when they sustain injuries. As the respondent idea expressed that javelin throwing is more technical that causes injuries when they train and compete.

Table 13, Athlete response on how often you visit physiotherapist for treatment.

No of visit	No respondents	Percentage (%)
1-5	8	15
6-10	20	50
Above 10	14	35
No visit	-	-
Total	40	100

Table 13, show that the respondent of throwers respond how often they visit the physiotherapist for treatment 8 of them /15%/ of them respond 1-5 time visit category, 20 of them /50%/ the majority of the respondent respond 6-10 visit time category, 14 of them /35%/ of them respond above 10 category and none of them respond no visit.

In this category of interview the physiotherapist forwarded that most javelin thrower are often visit the clinic for treatment due to repeatedly occurrence of injuries than other throwers.

As the respond indicated that most javelin throwers visit physiotherapists due to frequent causes of injuries in javelin throw and due to not recovering well once they injured but starting with out well recovery the level and severity of injuries increase and recovery time being long. It is also stressed by Newell (2011) that allowing adequate time to recover from injury can help reduce the incidence of non-contact injuries. In addition, Quinn (2012) says that returning early from an injury increases the chances of a re-occurrence or developing a chronic problem that will lead to a longer recovery.

Table 14. Athletes' responses on the impact or influence of javelin throw injuries on their performance and quality of life.

Influence of javelin throw injury	No respondents		Percentage(%)
	Yes	No	
Loss training time	X	-	100
Miss competitions	X	-	100
Reduce performance	X	-	100
Financial cost for treatment	X	-	100
Affect quality of life	X	-	100

Table 14, illustrate the respondent of javelin throw athlete respond to the influence of injuries on their performance and quality of life. The above table data clearly indicated that all population of the javelin throwers respondent respond that loss of training time ,miss of competitions, reduction of performance ,financial cost for treatment and affection of quality of life were been the incidence of javelin throw injury supported by all/100%/ of the respondents.

The ideas were with agreement to Laurel T Mackinnon2000, stated that Recovery from injury may require weeks to month of complete rest or greatly reduced exercise training. Inconsistent or poor performance at critical time in an athlete's career may influence selection for competition and possibly cause the athlete to prematurely retire from sport.

According to IlkkaTulikoura(www.hpp), said that some injuries cannot be treated effectively enough to continue competing javelin throwing and some injuries cause permanent trouble until older age.

Summary of Athletes questionnaire response

- The necessary data were Collected through questionnaire were analyzed and discussed based on the objective and the research questions of the Study.
- The training Center and the Selected First division athletics Clubs have young javelin throwers with almost equal number of sex
- The injury surveys revealed that javelin throwers sustained both acute and overuse injury that mostly located on the upper extremity of the body.
- Javelin throwing technique has a significance relationship with injuries sustained by javelin throwers and mainly Release & Recovery were the likely phases for on set and re-occurrence of injury

4.3 Summary of Observational Analyses

In this section the observation were presented as follow by researcher. The key findings from observation were to get detailed information regarding to warming up exercise, technical training and optimal movements of chain.

The researcher observed that in training session that inadequate warm up, failure to maintain optimal movements in the kinetic chain and technical error were lead the javelin thrower to sustain injuries.

The researcher were find that in club and training center most of the javelin thrower were not given great emphasis to specific warming up. As Peter J L Thompson, 2009 said that the first unit of every training session or preparation for competition should be the warm up.

Regarding to warming up witvrouw et.al, 2004, explained that a more active warming up may not only beneficial, may also be beneficial from an injury standpoint as this gradual progression activity prepare the muscle for the more strenuous demands of competition. So, inadequate warming up lead the javelin thrower to injuries.

Technical errors were occurred in the last phase of release and recovery that are commonly observed in training sessions. The delivery phase starts from the left foot touchdown of the delivery stride and ends at release of the javelin from the hand. The objectives of the delivery are

to give the javelin a final acceleration and to release the javelin with maximum velocity in the optimal direction.

In delivery/release phases the researcher has identified incorrect throwing technique such as

- Using round arm elbow flexion
- A forward lean of the trunk before the release
- Back ward lean of pelvis and
- Poor blocking.

(Stephen Copeland 1993). Javelin throwing have a mechanisms of injury with over arm throwing sports common injury risk factors. Over arm throwing has been show to exert significant musculoskeletal stress on multiple joints, particularly the shoulder and elbow used for throwing and these musculoskeletal stress lead to acute and over use shoulder and elbow injuries.

J.E, miller 1960) he adders; The round arm method develops in the novice athletes that the action of the aim beings, the elbow solving around in are at about the level of the shoulder, with the arm abducted position parallel to the ground, and the elbow flexed to a right angle, medial rotation of the shoulder transmits the required force to the javelin, but at the same time exposes the medial ligament of the elbow to considerable strain and damage appears to be cumulative rather than the result of single incidence. The pain is felt beer extension of the elbow begins, at movement of the throw and quickly resolve with rest, to recur with the next session of throwing.

Extreme elbow flexion torque is a mechanism of injury for SLAP lesions and tears of the biceps tendon. Concentric elbow flexion and eccentric elbow extension required in great intenral elbow flexion torque. A strong contraction of the biceps barchii may develop enough force to tear the glenoidlabrum accuracy from the bone. Enough force may be developed, particualry during rapid eccentric elbow extension, to repture the biceps tendon (adrews, curson, et al.,1985).

The failure to maintain lead of the pelvis over the upper trunk means that the shoulder and arm rather than trunk rotator most culture must generate the torque necessary to throw at high speeds. This may cause the extensive fatigue of the shoulder musculature which deals to a compensatory extension of the throwing elbow as the triceps muscles contact to assist the shoulder stabilizer (fleisig et al, 1995).

A forward lean of the trunk before the release has been suggested as a risk factor for shoulder joint subluxation. A backward tilt of the trunk allows for correct scapula setting to occur, and for the head of the humerus to center in to the glenoid fossa (Meister, 2000). Forward trunk tilt may increase the chance of shoulder joint subluxation or dislocation by placing the shoulder in an initially unstable position out of the center of the glenoid fossa. A forward trunk tilt before release was a position associated with shoulder subluxation or dislocation injuries in over arm throwing (Serner, et al, 2001). Great shoulder anterior shear force is related to these injuries.

In recovery phase the researcher also identified the following technical errors

- Shoulder horizontal adduction
- Unable to use Reverse technique of alternative leg

Stephen Copeland (1993) explained that Posterior rotator cuff muscles such as the teres minor and infraspinatus can become strained especially as they restrict anterior translation of the humerus during follow through. The posterior capsule can become compressed between the humeral head and glenoid during the thrust phase of the throwing motion, which can lead to chronic microtrauma and scarring, post error shoulder pain and pain with internal rotation.

The muscles now contract to decelerate the arm which is adducted, internally rotated and forward flexed at the end of acceleration. Posterior fibers of deltoid, supraspinatus, teres minor and infraspinatus all contract in this phase of throwing. Gina M. Moreno (2014) also reported those phases in to four stages. Early cocking stage, late cocking stage, acceleration stage and deceleration stage.

The researcher also has been observed on observational session that javelin throwers fail to maintain optimal movement of chain of motion. The stresses and torques required for javelin throwing are generated through the lower and is progressively transferred to the arm, initially, stride is converted, in to pelvic rotation, which leads to rotation of the torso, shoulder internal rotation, elbow extension, and wrist flexion and pronation along various point in the kinetic chain, the dynamic and static stabilizers are subject to large stresses and torques, which can lead to chronic and acute injuries of the stabilizing structures. Ilkka Tulikoura (www.hpp), reported that optimal movement of chain javelin throw brings best result and minimizes risk of injuries. Also he added that, on the base of the video about longest through we can evaluate

approximately optimal movement of chain, and about bad throw we can evaluate which probably dose not belongs to optimal movement of chain.

Table 15.Observation check list: Sample of one female participant (9) from Federal defense athletics club

- Place – Addis Ababa Stadium
- Date – 07/07/2010 E.C
- Time 9:30 Am
- Session - 2

<i>Technique variables</i>	Very High (excellent)	High (very good)	Medium (average)	Low (poor)	Very low (very poor)
<i>Rating scale</i>	5	4	3	2	1
<i>I. Preparation phase technique</i>					
<i>General & specific warm-up</i>				x	x
<i>The Grip/gripping</i>	x	X			
<i>Approach Run</i>	x	X			
<i>II. Crossover phase technique</i>					
<i>Impulse stride</i>	x	X			
<i>Withdrawal</i>	x	X			
<i>III. Delivery Phase technique</i>					
<i>Trunk backward tilt</i>				x	x
<i>Elbow flexion</i>				x	x
<i>Pelvis forward lean</i>				x	x
<i>Final stride length (brace)</i>				x	x
<i>The block</i>				x	x
<i>Knee extension/jump landing</i>				x	x
<i>Optimal Sequence of throwing motion</i>				x	x
<i>VI. Recovery phase technique</i>					
<i>Shoulder horizontal Adduction</i>				x	x
<i>Leg reverses</i>				x	x
<i>Cool down</i>		X			

Table 16. Observation check list: Sample of one male participant (12) from sidama buna athletics club

- Place – Hawasa Stadium
- Date – 25/07/2010 E.C
- Time - 4:30 Am
- Session - 3

<i>Technique variables</i>	Very High (excellent)	High (very good)	Medium (average)	Low (poor)	Very low (very poor)
<i>Rating scale</i>	5	4	3	2	1
I. Preparation phase technique					
<i>General & specific warm-up</i>				x	x
<i>The Grip/gripping</i>	x	X			
<i>Approach Run</i>	x	X			
II. Crossover phase technique					
<i>Impulse stride</i>	x	X			
<i>Withdrawal</i>	x	X			
III. Delivery Phase technique					
<i>Trunk backward tilt</i>				x	x
<i>Elbow flexion</i>				x	x
<i>Pelvis forward lean</i>				x	x
<i>Final stride length (brace)</i>				x	x
<i>The block</i>				x	x
<i>Knee extension/jump landing</i>				x	x
<i>Optimal Sequence of throwing motion</i>				x	x
VI. Recovery phase technique					
<i>Shoulder horizontal Adduction</i>				x	x
<i>Leg reverses</i>				x	x
<i>Cool down</i>		X			

In the direct observation session it has been observed that almost all participant throwers scored poor and very poor result in the selected technique variables for observation .The result has a significant relationship with athletes response through questionnaire that all javelin throwers sustained injuries during their javelin throw career.

4.4. Interview Analysis

Interviews were also used as supporting means to collect information in some selected ideas, issues and opinions which un clear through questioners with athlete respondents . 10 coaches and 5 physiotherapist were involved in the interview the researcher prepared 14 interview questions for coaches and 8 equations for physiotherapist and the result were summarized as follows The summary shows seven of the coaches interview and four of the physiotherapist interview questions in order to avoid redundancy .

Table 17. Summary of Coaches’ Interview Response

Interview Quotations	Response collected
- In which through event most through sustained injuries?	- The majority of coach respondents respond javelin throw .
- In which body location most javelin throwers sustained injuries?	- Upper Extremity - Shoulder - Elbow - Back/Invertebrate
- What do you think about the cases of javelin throwers injuries?	- Sophisticated technique . - High coordination . - High Segmental movement. - Poor technique. - Poor javelin throw background.
- Do javelin throwers involve in other throwing event ? would you explain the events ?	- Discus throw - Shot put - Hummer throw
- would you explain the number of training days and session in a week ?	- Most coaches respond Four and Five days and 8-10 sessions.
- In which athlete training stage throwers sustain injury?	- The majority of coach respondents respondent basic training stage .
- What is the influence of javelin throwers injury on their performance and quality of life?	- Loss training time - Miss competitions - Reduce performance - Financial cost for treatment - Affect quality of life

Table 18. Summary of physiotherapist interview response

Interview Quotations	Response collected
<ul style="list-style-type: none"> - How often javelin throwers visit you for treatment ? 	<ul style="list-style-type: none"> - The majority of physiotherapist respondents respond more frequent than other throwers.
<ul style="list-style-type: none"> - Would You explain the body location and types of injury of javelin throwers? 	<ul style="list-style-type: none"> - Upper Extremity - Shoulder :labrum tears ,shoulder in impingement, and rotator cuff tears - Elbow:- UCL rapture and tendinitis - Back/Invertebrate :slipped disc and fracture of invertebrate
<ul style="list-style-type: none"> - What do you think about the cases of javelin throwers injuries? 	<ul style="list-style-type: none"> - Most of the physiotherapist respond over use of muscles.
<ul style="list-style-type: none"> - What is the nature severity and performance of javelin throwers injuries? 	<ul style="list-style-type: none"> - So painful during training and competition - It reliefs when taking recovery and rest - It causes permanent trouble - It cannot be treated easily - Affect quality of there life.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the major findings of the study the following could be concluded

- ❖ The types of injury that was revealed in study were seen that javelin throwers sustained serious injuries related to javelin throwing technique. Mostly javelin thrower injuries were occurred on the upper extremities of shoulder, elbow and trunk. Shoulder injuries included labrum tears, shoulder impingement, and rotator cuff tears, Elbow injuries included ulnar collateral ligament rupture and tendonitis, Trunk injuries included slipped disc and fractured of vertebrae.
- ❖ The result revealed through observation check list is Compiled with the information obtained through questionnaire that the last two phases, the release and recovery were the exact phases for injury occurrence in javelin throw. Mostly injuries were occurred due to early specialization, overuse, incorrect technique, inadequate warming up and failure to maintain optimal movement of chain. These technique variables were significantly associated with javelin throwers upper extremity injuries.
- ❖ performance of javelin throwers were declined and their quality of life were seriously affected with injuries that were occurred in training and competition which leads to loss of training time ,miss of competitions, reduction of performance ,financial cost for treatment and generally affect their quality of life.

5.2 Recommendation

Based on the findings of the study the following should be recommended:

- ✚ The javelin thrower and coaches should seriously follow the nature and severity of injuries that were sustained in the last phases of release and recovery techniques.
- ✚ A long term approach should be designed to help individual throwers of all ages and all abilities to optimize their development and reach their potential without the risk of injuries.
- ✚ It is advisable for coaches and javelin throwers to engage in adequate general and specific warming up to reduce activity based injuries.
- ✚ Coach helps an individual athlete to do the right things at the right time for their long term development rather than early specialization.
- ✚ Rest and recovery are essential to prevent overuse injuries of javelin throwers so; coach and throwers limit the training session and training days in a week and also avoid the javelin throwers involvement in multiple throwing events.
- ✚ It is important to work with coaches and trainers on correct and proper throwing technique and optimal movements of segmental motion. The researcher believes that to avoid javelin throwing related injuries more attention should be paid on release and recovery phase of technical training.
- ✚ This study may not generalize the javelin thrower injuries rather than technical training they sustain injuries so; further study is essential on other aspects that may cause injuries, reduce performance and affect the quality of life.

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Observation check list

<i>Technique variables</i>	Very High (excellent)	High (very good)	Medium (average)	Low (poor)	Very low (very poor)
<i>Rating scale</i>	5	4	3	2	1
IV. Preparation phase technique					
<i>General & specific warm-up</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>The Grip/gripping</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Approach Run</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
V. Crossover phase technique					
<i>Impulse stride</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Withdrawal</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
VI. Delivery Phase technique					
<i>Trunk backward tilt</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Elbow flexion</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Shoulder horizontal Abduction</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Pelvis forward lean</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Final stride length (brace)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>The block</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Knee extension/jump landing</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Optimal Sequence of throwing motion</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
VI. Recovery phase technique					
<i>Shoulder horizontal Adduction</i>					
<i>Leg reverses</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Cool down</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDICES

Appendix I

አዲስ አበባ ዩኒቨርሲቲ

የተፈጥሮና ኮምፒዩተሽናል ሳይንስ ኮሌጅ

የስፖርት ሳይንስ ክፍል

በአትሌቶች የሚሞላ መጠይቅ

የዚህ መጠይቅ ዋና ዓላማ በአካዳሚና በክለሶች ውስጥ የሚሰጥ የጦር ውርወራ ስልጠናን ና ይህን ተከትሎ የሚያጋጥሙ ስፖርታዊ ጉዳቶች ምክንያት ላይ ለሚደረግ ጥናት መረጃ ለመሰብሰብ ነው። የምትሰጡት ምላሽ መረጃ ለዚህ ጥናት መሳካት እጅግ ከፍተኛ ጠቀሜታ አለው። ስለዚህ በመጠይቁ ላይ የቀረቡትን ጥያቄዎች በግልጽ፣ በታማኝነት እና በአግባቡ እንድትሞሉ ዘንድ በእክብሮት እየጠየኩ ለምታደርጉልኝ ትብብር በቅድሚያ አመሰግናለሁ።

አጠቃላይ መመሪያ

ስም መጻፍ አያስፈልግም

እያንዳንዱ ጥያቄ በመመሪያው መሰረት ይመልሱ። መጨረሻም በጥያቄዎቹ ላይ ተጨማሪ ሀሳብ ካላችሁ በመጠይቁ ላይ ባለው ክፍት ቦታ መጻፍት ትችላላችሁ።

ክፍል 1 የመላሾች ዳሰሳ ወይም ሁኔታ

ዕድሜ ----- ስድስት ወር ----- የትምህርት ደረጃ-----

የስልጠና ቆይታ ጊዜ-----

የስልጠና ክለስ/ማዕከል/ ስም -----

ክፍል 2- የጦር ውርወራ ጉዳት አይነትና የሰውነት ክፍሎች

1. በጦር ውርወራ ስልጠና ምክክያት ያጋጠመህ /ሽ/ የጉዳት ችግር አለ?

ሀ/አለ

ለ/የለም

2. በተራ ቁጥር 2 ለተጠየቀው ጥያቄ መልሱ “አለ” ከሆነ የጉዳቱ አይነት ከታች በተሰጠ ውሳኔን ወስኖ የ x ምልክት ይደረግ

ክርን/አጅ/ ትከሻ ወገብ ጉልበት ቁርጭም ጭሚት

3. የተጠቀሰው የጉዳት አይነት ወይም አይነቶች ምን ያህል ጊዜ ሆኖታል /ሆኗቸዋል?-----

ክፍል 3. ቴክኒክ፣ የቴክኒክ ልምምድና ጉዳት ግኑኝነት በተመለከተ

እያንዳንዱን ጥያቄ ካነበቡ በኋላ በተሰጡው ክፍት ቦታ ላይ መልስዎትን ያስቀምጡ

4 ለስንት ዓመታት በጦር ውርወራ ላይ ተሳትፏል?-----

5. ከጦር ሌላ የውርወራ ተሳትፎ ካለ ከታች ከተሰጡት ውስጥ በመክበብ ይመልሱ

- ሀ. አሎሎ
- ለ. ዲስክስ
- ሐ. መደሻ

6. የጦር ውርወራ ጉዳት በአብዛኛው የሚከሰትው በየትኛው የልምምድ ክፍል ነው?

- ሀ/የጦር ውርወራ ልምምድ
- ለ/ የክብደት ልምምድ
- ሐ/የፍጥነት ልምምድ
- መ/ሌላ

7. በተራ ቁጥር 5 ለተጠየቀው ጥያቄ ምላሹ ሌላ ከሆነም ክንያቱ ይጠቀስ-----

8. ከጦር ውርወራ የቴክኒክ ልምምድ ክፍሎች በአብዛኛው ጉዳቱ የሚከሰትው በየትኛው ነው?

- ሀ. በአሯሯጥ ጊዜ
- ለ. በመልቀቅ ጊዜ
- ሐ. ሚዛንን በመጠበቅ ጊዜ

9. ይህ ጉዳት የጀመረበት የስልጠና እድሜ የትኛው? ሀ/ 1-2 ለ/3-4 ሐ/5-7 መ/8-9

10. ይህ ጉዳት የጀመረበት የስልጠና ደረጃ ሀ. ጀማሪ ለ. መካከለኛ ሐ. የላቀ ደረጃ

11. ከጦር ውርወራ ልምምድ ጋር ተያይዞ ለሚመጣው ጉዳት ዋና ምክንያት ምንድነው?

12. በሳምንት ስንት ቀን የጦር ውረወራ ልምምድ ያደርጋሉ? ሀ/3 ለ/4 ሐ/5 መ/ 6

13. በሳምንት ስንት ክፍለ ጊዜ የጦር ውረወራ ልምምድ ያደርጋሉ? ሀ/6 ለ/8 ሐ/10 መ/12

14. በአንድ የውርወራ ልምምድ ክፍለ ጊዜ ስንት ጊዜ ይወረወራሉ?

15. ከጦር ውርወራ ሌላ በሳምንት ስንት ቀን የውርወራ ልምምድ ያደርጋሉ? ሀ/1 ለ/ 2 ሐ/3 መ/4

16. በአንድ የልምምድ ክፍለ ጊዜ በየመሀሉ ለምን ያህል ደቂቃ እረፍት ያደርጋሉ?-----

ክፍል 4- ጉዳቱ በብቃትና በወደፊት እድሜ ላይ ያለውን ተፅእኖ በተመለከተ

17. የዚህ ጉዳት ተፈጥሮ ፀባይ ምንድነው?

ሀ/ የማይደን ለ/አልፎ አልፎ የሚነሳ ሐ/አረፍት በመወሰድ የሚደን መ/ በህክምና የሚደን

18. በጉዳቱ ምክንያት ህክምና ተከታትለው ያውቃሉ ?

19. ለምን ያህል ጊዜ ህክምና አድርገዋል? ሀ/1-5 ለ/ 6-10 ሐ/ከ 10 በላይ መ/አላውቅም

20. በቂ ህክምና አግኝተው ከጉዳቱ ተፈውሰዋል ወይስ ጉዳቱ አብረዎት አለ?

21. ፣. ከጉዳት መልስ የማገገሚያ ልምምድ ያደርጋሉ?

22. በጦር ውርወራ ምክንያት ስለሚያጋጥመው ጉዳት አስከፊነት ከታች ከተጠቀሱት ፊት ለፊት የ x ምልክት በማድረግ ይግለጹ

- የብቃት መውረድ
- ልምምድ ማቋረጥ
- ውድድር ማቋረጥ
- አብሮ የሚኖር የህመም ስሜት
- የህክምና ወጪ

23. በመጨረሻም ስለጦር ውርወራ ልምምድና ተያይዞ ስለሚመጣው ጉዳት ህክምና እንዲሁም ስለጦር ወርዖሪነት የሚገልፁት ነገር ካለ

አመሰግናለሁ!!

Appendix II

Addis Ababa University

College of Natural and Computational Science

Department of Sport Science

Interview questions to be respond by Physiotherapist

The purpose of this interview is to obtain information on Causes of Injuries sustained by javelin throwers during technical training and Its Impact on Athlete's Performance at Athlete Tirunesh Dibaba Sport Training Center. The information procured through the interview will be used only for analysis purpose. Any information that you give will be kept confidential. Hence your cooperation in giving genuine information is highly valuable for the accomplishment of the study.

N.B

There is no need of writing your name on the questionnaire.

Please respond all questions.

Do you mention?

1. In which throwing event that throwers mostly sustained injuries?

2. for the above question if your answer is javelin throwing, in which body part mostly they sustained injury?/

3. would you brief the types of injuries sustained by javelin throwers?

/body location and medical name/

4. What do you think about the causes of javelin throwers injury?

5. How often javelin throwers sustained injuries?

6. Do javelin throwers visit the physiotherapist or the clinic for treatment ?

7. Would you explain the severity of thus javelin throwers injury ?

8. What is the influence of javelin throwers injury on their performance and quality of life?-----

Thank you !

Appendix III

Addis Ababa University

College of Natural and Computational Science

Department of Sport Science

Interview questions to be respond *by* throwing events *coaches*

The purpose of this interview is to obtain information on Causes of injuries sustained by javelin throwers during technical training and Its impact on Athlete's Performance at Athlete Tirunesh Dibaba

Sport Training Center. The information procured through this interview will be used only for analysis purpose. Any information that you give will be kept confidential. Hence your cooperation in giving genuine information is highly valuable for the accomplishment of the study.

N.B

There is no need of writing your name on the questionnaire.

Please respond all questions.

Do you mention?

1. In which throwing event that throwers mostly sustained injuries?

2. For the above question if your answer is javelin throwing, in which body part mostly they sustained injury?/

3. what throwing event javelin throwers train other than javelin throwing?

4. would you explain the body location of injuries sustained by javelin throwers?

5. In which training session javelin throwers most sustain injury?

6. . In which training stage most javelin throwers sustain injury?

7. In which technique training phases mostly javelin throwers sustain injury?

8. What do you think the causes of javelin throwers injury?

9. Do javelin throwers involve in other throwing events? _____

10..What is the impact or influence of javelin throwers injuries on their performance and quality of life?

11. How often javelin throwers perform technique training in a week?

12. What is the length of rest and recovery time between sessions?

13.what type of tainting javelin throwers perform after injury treatment?

14. What do you suggest about javelin throwers injury, treatment and mechanism of injury?

Thank you!

DECLARATION

I declare that this thesis is my original work, has not been presented for a degree in another university and that all resources of materials used for the thesis have been duly acknowledged.

Name: Negash Adem

Signature:-----

Date :-----

This has been submitted for examination with my approval, as a university advisor.

Name : - Sahilemichael Bizuneh(PHD)

Signature:-----

Date :-----