

A Study Of Prevalance Of Altered Joint Proprioception Of Ankle Joint In Competative Roller-Skating Players

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ABSTRACT

background proprioception is defined as one's ability to integrate the sensory signals from various mechanoreceptors to thereby determine body position and movement in space and plays important role in balance control. ankle proprioception can be affected by sports specific training, sports related injuries and fatigue which lead to altered balance ability. overall, the studying ankle proprioception in skating players provides a valuable insight into injury prevention, performance optimization, rehabilitation strategies and equipment design contributing to the overall wellbeing and success of athletes in sports.

methods and materials this cross-sectional study was conducted at three sports academies over 1.5 years. 60 roller skating players recruited for this study altered joint proprioception of ankle joint. pre and post assessments were conducted to measure change in proprioception using goniometer and functional capacity of ankle joint measured by foot ankle ability measuring scale.

result the analysis revealed prevalence of altered joint proprioception of ankle joint in competitive roller-skating players. that means adolescent roller-skating players which significantly showed a difference in their proprioception of ankle joint. out of 60 participants 54 were positive for altered joint proprioception and 6 were negative with that showed 90.00% prevalence of altered joint proprioception of ankle joint in competitive roller-skating players. with reduced range of motion (rom)closed eyes, which significantly showed a difference in their proprioception. difference was as follows with mean and sd: plantarflexion of rt is 43.77 ± 4.0 , for lt 43.45 ± 4.15 . dorsiflexion rt 11.58 ± 2.70 for lt is 11.67 ± 2.80 . inversion rt leg is 26.02 ± 2.9 for lt is 26.67 ± 2.55 . eversion rt leg is 14.72 ± 4.00 for lt is 14.80 ± 3.55 . total participants were 60. total 49 participants were shows normal function of ankle joint with 81.67%. and 11 participants shows 18.33 nearly normal function with foot ankle ability measure scale

conclusion this study concludes that prevalence of altered joint proprioception of ankle joint in competitive roller-skating players is 90.00%. with reduced range of motion of ankle joint that highlighted the functional impact on the performance of the athletes.

Keywords: ankle joint, proprioception, roller skating, goniometer, range of motion, sports injury.

1. INTRODUCTION

The ankle joints mainly involved the 3 joint structures: distal tibiofibular syndesmosis, the subtalar joint and the talocrural joint. These 3 articulations mainly make up the ankle complex. Coordinated and well synchronized motion of the foot is

made possible by these 3 articulations. the ankle joint stick consists of rear foot advert to the back part of foot, including the cad and ankle area. Anatomically, it consists of the calcaneus (heel bone) and talus and bring essential role in weightbearing, balance and trend.it is crucial for walking running and jumping and landing. The rearfoot motion are frequently used to characterized in following planes as follows: sagittal plane motion involved (plantarflexion-dorsiflexion), frontal plane motion (inversion-eversion), and transverse plane motion involved (internal rotation- external rotation). rearfoot motion still does not occur in isolation in the case of planes; the unified movements of three joints permits the rearfoot to move as single unit about an axis of rotation perpendicular to the long axis of the lower leg. The ankle joint stability is primarily influenced by three factors: (1) the articular surfaces congruency under the load; (2) static constraints of ligaments; and (3) musculotendinous units, which enable dynamic joint stabilization⁽¹⁾

Importance of proprioception of ankle and balance control – Sport-related injuries, general and sport- specific training, and fatigue from sports can all affect ankle proprioception. They could all result in change in one's ability to balance. Because the ankle- foot complex is the only region of the body that makes contact with the ground during the majority of sports activities, ankle proprioception may be one of the more significant factors influencing balance control in sports. The ability to adjust ankle positions and upper body movements is made possible by ankle proprioception, which is crucial for completing the intricate motor tasks needed for the sports. Sports- related injuries; general and sport specific training, and sport induced fatigue can all change ankle proprioception, which can therefore change one's ability to balance.⁽⁶⁾

Experience with sports training is associated with improved ankle proprioceptive abilities. The quality of ankle proprioception should be corelated with improved ankle proprioception. And it might be shows that the relation between the sports specific training and the higher competition level⁽⁶⁾

2. RELATION OF ANKLE PROPRIOCEPTION IN ROLLER SKATING:

Ankle proprioception is crucial and most important factor in sport activities including jumping, landing, start and quick stopping, and running and cutting lateral movements. Because it supports the good athletic performance. And also shows a good ankle control. Some sports required the good ankle control for successful playing activities. For example: In roller skating the individual is using the roller skates which consist of 4 wheels skating shoes, which required the skilled ankle movements. The following points may be considered:

postural control: to control the muscular activity and preserve balance while skating, the ankle proprioceptive receptors sense the change in position. And also, beneficial to adjust the balance on roller skates.

Dynamic stability: the roller skating requires the continue adjustments while playing the skating. Strong proprioceptive input making quick changes while shifting weight or during into obstacles and lateral and cutting lateral movements.

Edge control and weight distribution: In order to prevent falls and improve maneuverability, skaters use their ankle proprioception to distribute weight evenly across their wheels in a suitable manner.

Reflexive Adjustments: quick adjustment and response from external environment like sudden starting and stopping quickly, and quick turn and landing are mediated by proprioceptive feedback, ensuring that the skaters doesn't lose the control⁽⁷⁾

Factors affecting the proprioception in roller skating:

Increased ankle load: skating places higher demand ankle joint, requires a strong proprioception to avoid excessive strain or sprain and also the ankle stability. And lateral rotational forces shift weight to side to side. Forces put additional strain, on ankle ligaments, tendons, and stabilizing muscles.

Overuse and fatigue: repetitive movements and position change and daily practice sessions may lead to muscle fatigue as well as proprioceptive fatigue. Reducing the accuracy of proprioception of ankle joint.

Reduced ground contact: the skating minimizes the sensory input, proprioception is more reliant on ankle adjustments than walking, where the foot makes firm contact with the ground. Narrow base of support, wheels reduce friction of surface as wheels roll continuously meaning the foot is rarely in full, stable contact with the ground⁽⁷⁾

Risk of injury: poor technique, ankle sprains, and frequent fall which may result into impaired balance and poor proprioception and also increased risk of injuries during the sports.

Boot structure: rigid and stiff boots limit the proprioception of ankle joint. Loose straps and lancing may lead to instability of the joint. And material of the boots also important for proprioception of joint. Loose Wheels also shows the alter the proprioception.⁽⁷⁾

3. METHODOLOGY

Material: Goniometer, Foot ankle ability measure sport subscale

Study Type – Observational, cross sectional study done at Kolhapur city on adolescent's roller skating players using Simple

random sampling method for a duration of 6 months. Inclusion criteria: Age group adolescent 12 to19 years of age All genders, Participants who practicing skating for 1 year., Participants willing to participate in the study. Exclusion criteria: Participants with congenital musculoskeletal morbidities, Participants with any recent injuries, fractures and who underwent recent surgeries, all other participants who are not fulfilling the above-mentioned criteria.

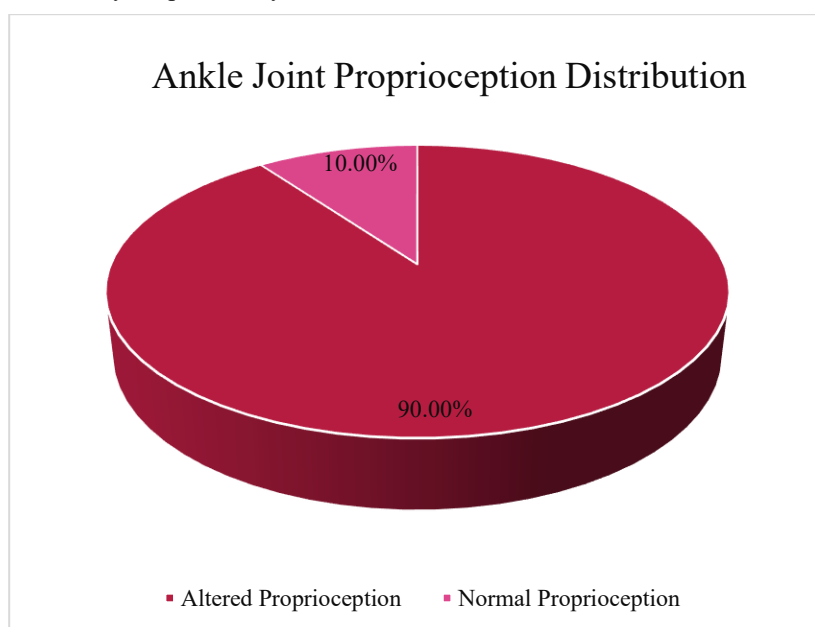
4. PROCEDURE

The study protocol will be presented for approval in front of institutional ethical committee and protocol committee of Dr. D. Y. Patil Education Society Institution Deemed to be University, Kolhapur and D.Y. Patil college of Physiotherapy, Kolhapur. After that consulting participants will be approached and purpose of study will be explained. Written consent will be taken for participants willing to participate. The participants for study will be selected from sports club of skating in Kolhapur city. Initially, a brief demographic data including name, age as per data collection sheet will be recorded. A written as well as informed consent will be taken for all the participants. Participants will be assessed for joint position sense test. Participants will be then assessed considering the inclusion and exclusion criteria. The nature of the study will be explained to the participants those willing to participate will be included. Data collection sheets will be recorded including personal details and sport history. The interpretation of the study will be based on foot and ankle ability measure subscale of sports and joint position sense test scores recorded during this study. This study will be concluded by statistical analysis of outcome measure.

5. RESULTS

A total 60 participants were included with 12to 19 years of age. With a mean age 14.05 and SD 1.56. among 54 competitive skating players reveled a prevalence 90.99%. the result shows altered joint proprioception of ankle joint in competitive roller-skating players. With reduced range of motion of ankle joint.

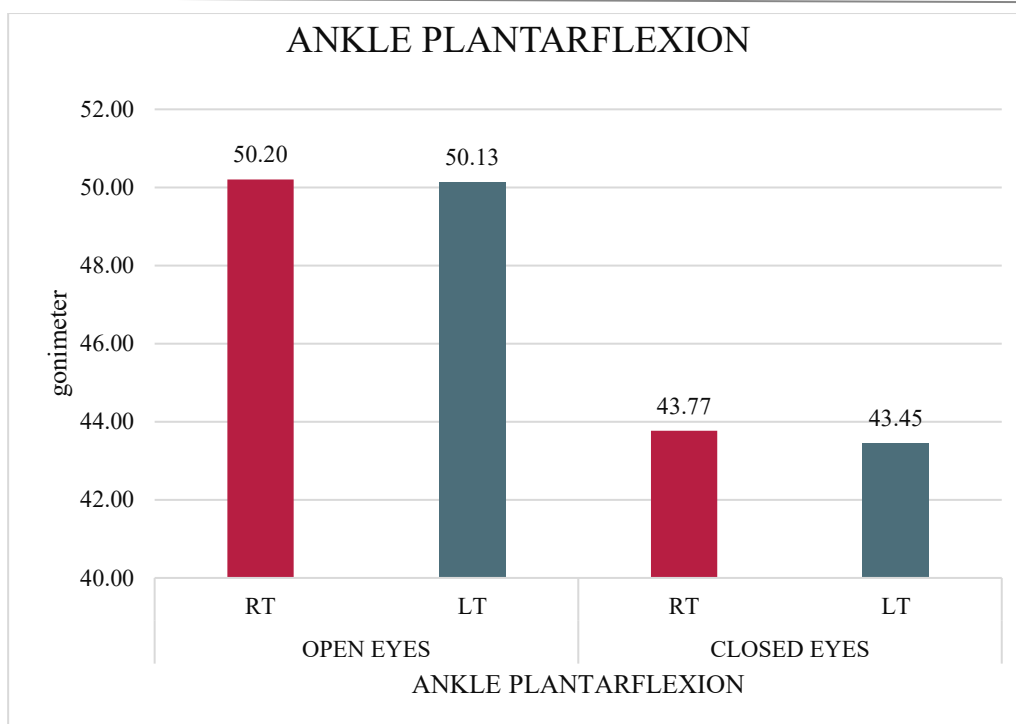
Gender distribution – the prevalence of altered joint proprioception of ankle joint in males 73.33% and in females is 26.67% by joint position sense test with eyes open and eyes closed.



Graph no.2 Prevalence of Altered joint proprioception distribution

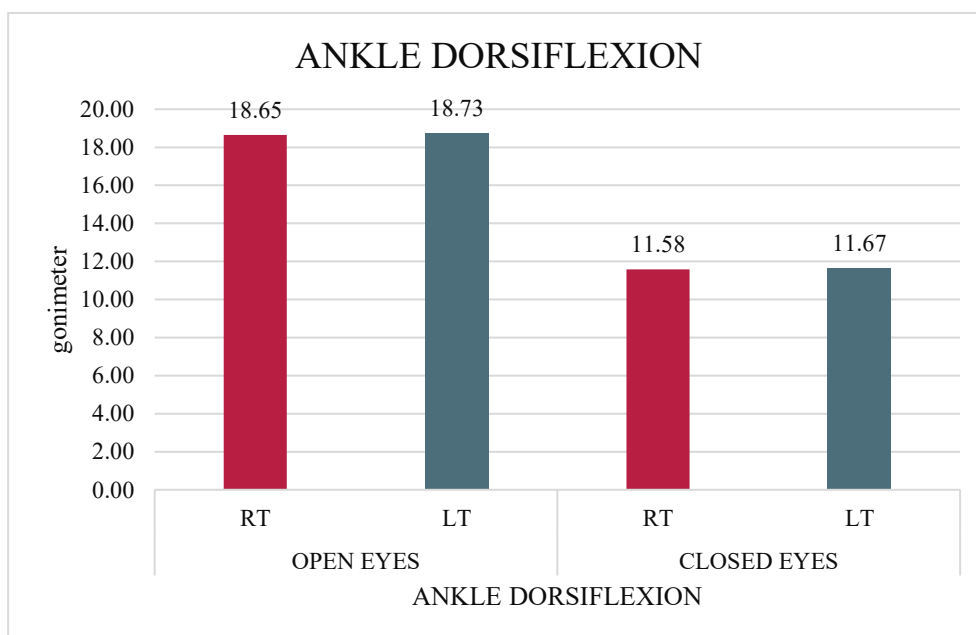
Graph no. 2 graphical presentation shows the total altered joint proprioception prevalence is 90.00%

Total sample 60 in which 54 shows the altered proprioception and 6 were shows 10% normal proprioception



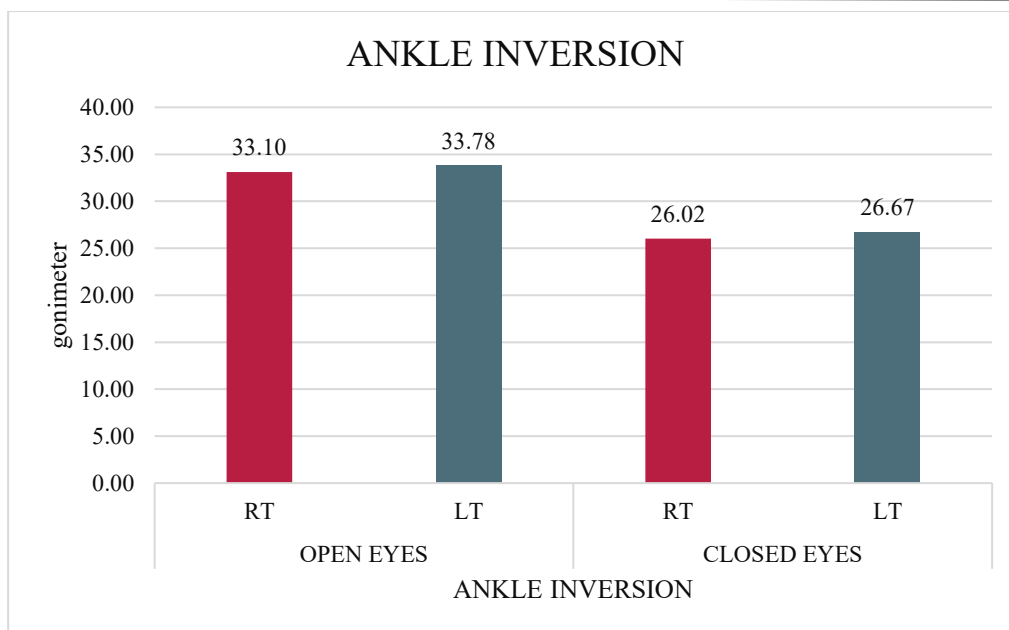
Graph no.3 Ankle plantarflexion range of motion mean and standard deviation.

Graph no.2 shows graphical presentation of goniometer ranges for ankle plantarflexion movement for right leg and left leg with open eyes and closed eyes. The mean of open eyes of RT leg is 50.20 ± 2.87 and for LT leg is 50.13 ± 2.39 . the mean of closed eyes for RT leg is 43.77 ± 4.02 for LT is 43.45 ± 4.15 .



Graph no. 4 Ankle dorsiflexion range of motion mean and standard deviation

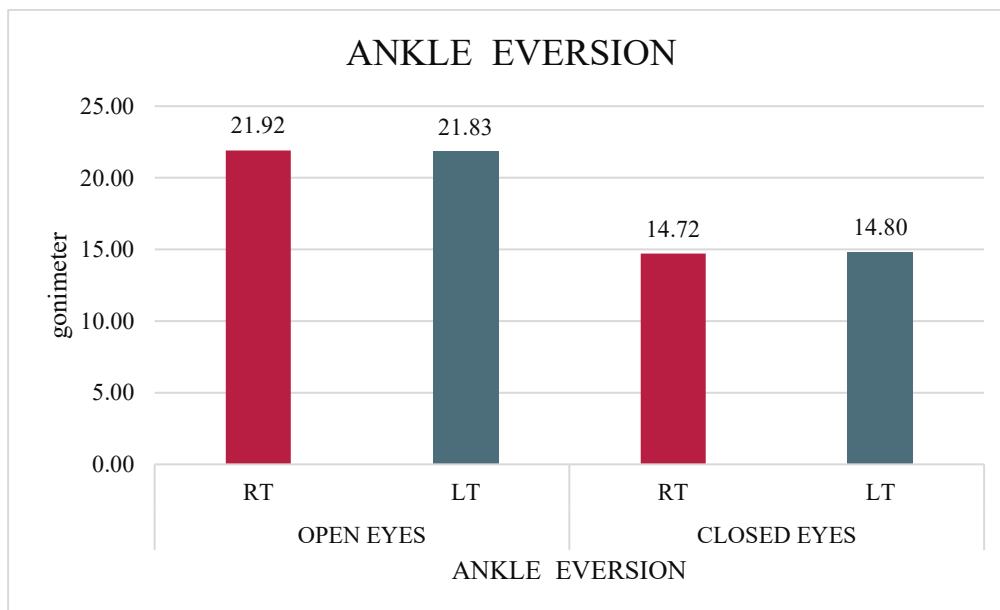
Graph no.3 shows graphical presentation of goniometer ranges for ankle dorsiflexion movement for right leg and left leg with open eyes and closed eyes. The mean of open eyes of RT leg is 18.65 ± 1.66 and for LT leg is 18.73 ± 1.42 . the mean of closed eyes for RT leg is 11.58 ± 2.70 for LT is 11.67 ± 2.80 .



Graph no.5 Ankle inversion range of motion mean and standard deviation

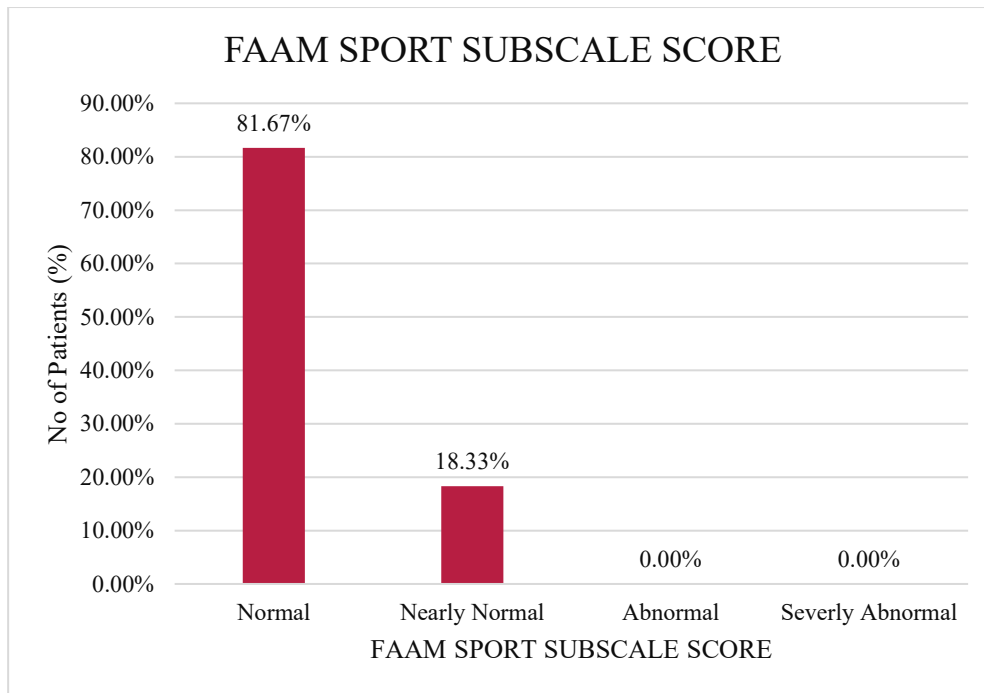
Graph no.4 shows graphical presentation of goniometer ranges for ankle inversion movement for right leg and left leg with open eyes and closed eyes. The mean of open eyes of RT leg is 33.10 ± 1.98 and for LT leg is 33.78 ± 1.75 . the mean of closed eyes for RT leg is 26.02 ± 2.9 for LT is 26.67 ± 2.55 .

Table no.5 Ankle inversion range of motion mean and standard deviation



Graph no.6 Ankle eversion range of motion mean and standard deviation

Graph no.5 shows graphical presentation of goniometer ranges for ankle Eversion movement for right leg and left leg with open eyes and closed eyes. The mean of open eyes of RT leg is 21.92 ± 2.89 and for LT leg is 21.83 ± 2.29 . the mean of closed eyes for RT leg is 14.72 ± 4.00 for LT is 14.80 ± 3.55 .

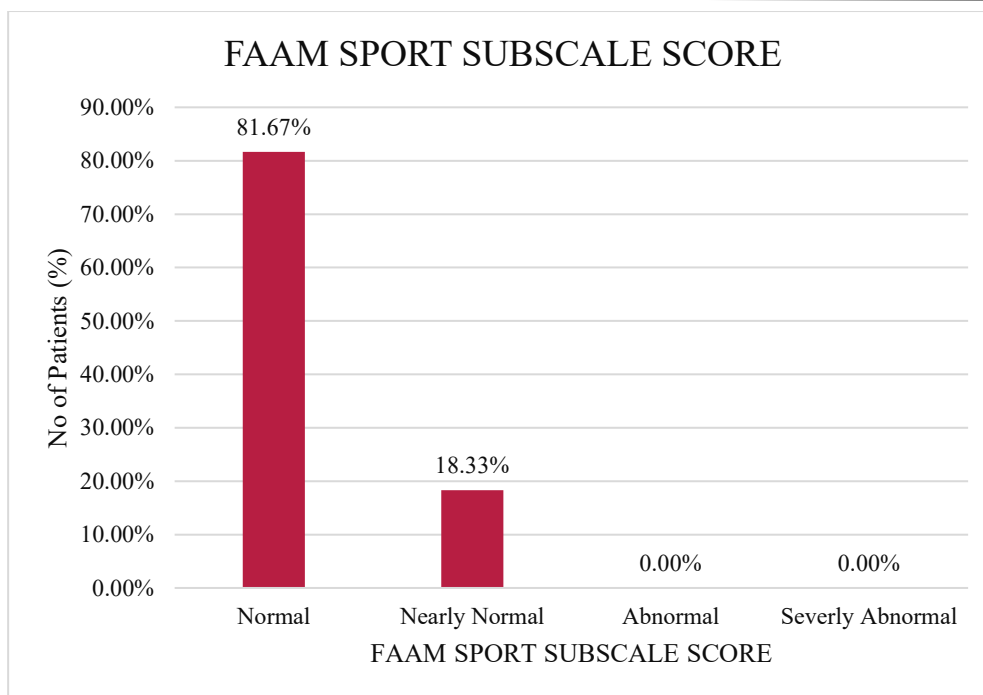


Graph no.7 Foot ankle ability measure sport subscale score in % distribution

Graph no.6 graphical presentation shows functional capacity and current level of function to assess functional limitation sports and high demand physical activities. Total participants were 60. Total 49 participants were shows normal function of ankle joint with 81.67%. and 11 participants shows 18.33 nearly Normal function. were 0 participants shows abnormal and nearly normal function.

Table no.7foot ankle ability measure scales core % with mean distribution.

FAAM SPORT SUBSCALE SCORE	No of Participants	Percentage
Normal	49	81.67%
Nearly Normal	11	18.33%
Abnormal	0	0.00%
Severely Abnormal	0	0.00%
Total	60	100.00%



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6. DISCUSSION

The present study to estimate the prevalence of altered joint proprioception of ankle joint in competitive roller-skating players.

A total 60 athletes were screened during the research period, the 12-19 years of age who are participating since 1year was included. The mean age of the participants 14.5 years. The result of the study concluded that 54 participants show altered joint proprioception with 90.00% were 6 participants shows normal proprioception of ankle joint with 10.00%. The altered joint proprioception was screened by joint position sense test which is a gold standard measure for assessing the proprioception. The current level of function is assessed with foot ankle ability measure sport subscale.

The several studies have highlighted that impact of intense training, repetitive mechanical stress on joint proprioception in athletes. Frequent high-speed turns, jumps, sudden and quick stops increase the mechanical strain on ankle joint also chronic repetitive microtrauma can lead to proprioceptive deficits, affecting joint stability and movement accuracy. chronic ankle instability players who have suffered from multiple ankle sprains, without proper rehabilitation weaken the proprioceptive feedback increasing the risk of injuries.¹⁵

The competitive skaters in this age group between 16-19 undergo intensive training with prolonged sessions often leading to the neuromuscular fatigue. And fatigue reduces the ability of proprioceptive receptors to provide the accurate joint position feedback, affecting balance and coordination.⁸ Due to excessive skating, some muscle groups (calf muscles) become overactive and also intrinsic muscle group become weaker interrupting the stability and proprioception. The variation of surfaces and training intensities may influence proprioceptive function. Uneven surfaces or prolonged practice sessions may disrupt joint position sense. Roller skaters have a high risk of injury because of falls and lifts.¹¹

Reduced ground contact, increased ankle load in repetitive, foot wear structure and also fitting of boot also shows the impact on ankle joint proprioception, lower strengthening of muscles of foot and ligament laxity lack of proprioceptive training may lead to the proprioceptive deficits these are the several factors contribute to the prevalence of altered joint proprioception. Which directly

affecting the skating performance of the athlete and increase the injury risk. Competitive skaters with proprioceptive deficits may struggle with balance, precision in movement execution, and reaction time which lead to frequent falls and missteps, higher risk of ankle instability, ankle sprain, strain of ankle these factors included in altered joint proprioception.³

Demographic profile:

Age distribution in years

The age of participants in the study ranged from 12 to 19 years. With an average 14.5. and SD1.56 the minimum age of the participants is 12 years. And the maximum age of the participants is 18 years. the participants of study show altered joint proprioception of ankle joint in competitive roller-skating.

Gender

Male roller-skating players were predominantly higher than female roller-skating players in present study. This predominance may be due to higher population of males attending competitions of roller-skating players than females. study involves 44 were males with overall 73.33% .and 16 females with overall 26.67%. In our study males shows higher distribution than females

Number of years playing roller skating

In our study we included the participants practicing the roller skating since 1year. The minimum year is 1 year in our study. And the maximum years of participants playing the roller skating is 7 years. hence these players are more susceptible to overuse injury due to training sessions involved for competitions and attending competitions many years. lead to altered joint proprioception of ankle joint.⁸

Number of days playing per week roller skating

In our study age group between 12-19 years of participants practicing roller skating players 6 days per week. Minimum 3to 4 days of practicing. And maximum 5 to 6 days of practicing the roller-skating players.

Number of playing hours per day

The number of playing roller skating mainly 1 hr. to 3hr per day. The minimum time of practicing roller skating is 1 hr. and maximum time of practicing is 3 hrs. in competitive roller-skating players

Any previous injury while playing

In our study we included the participants with previous injuries. But not recent injuries. As previous injuries show impact on proprioception of ankle joint affecting the performance of athletes which shows the deficits of joint position sense test.¹⁵

outcome measures:

Joint position sense test

In our study the joint position sense test was performed with eyes closed and with eyes open. All the movements of ankle joint were involved and the difference between targeted angle and replicated angle is measured by the goniometer of both side right foot as well as left foot. If error of angle is 0-5 degrees considered normal proprioception .and if angle error is 6-10 degrees the altered joint proprioception.

Mean and SD value goniometer ranges of all movement's ankle plantarflexion, ankle dorsiflexion, ankle inversion, ankle eversion of ankle joints is given. Total 60 participants involved in study among 54 are positive with joint position sense test

and 6 are negative in the study. Means 54 shows altered joint proprioception of ankle joint. And 6 participants show normal proprioception of ankle joint.

foot ankle ability measure sport subscale

In our study by this scale, we detect current level of function of ankle joint. The scale contains 8 components: running, jumping, lunging, starting and stopping quickly, cutting/lateral movements, low impact activities, ability to perform activity with your normal technique, ability to participate in your desired sport as long as you would like. Every component contains 4 score total score is 32.

The calculation is obtained score is divided by total score into 100. And the score in %. the interpretation of scale involved 4 level of function as follows- normal function 90-100%, nearly normal function 75-89%, abnormal function 50-74%, severely abnormal below 50%. In our study 49 participants were shows normal level of function. And 11 were shows nearly normal level of function. The overall % is given in (graph no.7) 49 participants show normal level of function with 81.67%. and 11 participants shows 18.33 overall %.

7. CONCLUSION

The goal of our study was to investigate the rate of prevalence of altered joint proprioception of ankle joint in competitive roller-skating players. According to our research prevalence of altered joint proprioception of ankle joint in competitive roller-skating players is 90.00%. this study concludes that (54 participants out of 60) shows altered joint proprioception with reduction of range of motion of ankle joint. were (6out of 60) shows normal proprioception of ankle joint in capitative roller skating players. All participants show the normal function and nearly normal function by using foot ankle ability measure sport subscale

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