



# COMPARISON OF DYNAMIC BALANCE IN LOWER LIMBS AMONG ANKLE JOINT INJURED AND UNINJURED MALE COLLEGIATE BASKETBALL PLAYERS

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## Abstract

Basketball is one of the largest growing team sports in the world. While playing the sport it is very important to have good control in balance. The ankle joint has to bear a lot of body weight and forces. While running and jumping, ankles have to carry forces equivalent to several times of the body weight. Ankle injuries such as sprains, strains and fractures mainly affect the upper ankle because many studies proved that the lower ankle is more stable than the upper ankle.

The ankle joint is one of the most vulnerable to injury through participation in sports and exercises. The management of ligament injuries is usually quite straightforward, such injuries are often accompanied by repeated sprain episodes, instability of the joint, and as a result, reduced physical activity participation. Ankle sprains are the most common acute injuries in basketball while landing on an opponent's foot or during changing direction.

Balance gets affected due to acute ankle injury in basketball players therefore present study was done to know the effect of balance due to acute ankle injury which is important factor while playing any sport. Predicting risk for ankle injury could be important to reduce the risk of these injuries and save health care costs.

Total 30 subjects (15 ankle joint injured and 15 uninjured) had performed Y balance test (lower quarter version) as per the inclusion criteria to determine balance. Dynamic balance of lower limbs measured at anterior, posteromedial, and posterolateral directions for injured and uninjured groups. Data analysis did to find out the significant difference in dynamic balance among the uninjured and injured groups. The mean and standard deviation of right and left uninjured and ankle joint injured were 122.4 + 11.1, 90.6 + 12.8; 126 + 13. , 92.2 + 10.4 respectively (simple paired t test  $p < 0.005$ ). Hence it is concluded that ankle injuries in basketball players significantly affect balance. Dynamic balance of lower limb was more among uninjured basketball players than ankle joint injured players. The decline in dynamic balance ability experienced during playing basketball can increase the risk of injury and decreases the performance of player so it is required that the dynamic balance be assessed in time and if required balance training exercise should be given.

Keywords: Basketball, Dynamic balance, Balance-test, T-test, Ankle injury.

## Introduction

Basketball is one of the world's most popular sports. According to the International Basketball Federation, 450 million people play basketball worldwide ranging from amateurs to licensed players.<sup>1</sup> Although as a contact sport basketball is not strictly considered, during game the lower limb joints are constantly subjected to physical stress from the technical movements and intense physical interactions.<sup>2</sup> McInnes et al<sup>3</sup> identified different types and intensities of activities and movement patterns, including quick and frequent running movements, shooting, direction alterations, and jumps, every 2 seconds that changed during play. They estimated that during play a mean total of  $105 \pm 52$  high-intensity runs (mean duration = 1.7 seconds) recorded in a game translated into 1 high-intensity run every 21 seconds. While playing the basketball the center of gravity (COG) is often at the edge of the base of support (BOS) in lateral, forward and backward movements.<sup>4</sup> Basketball game requires fast movement, strength and high coordination and all the movements of basketball are performed in a very limited space. It is a high-demand sport activity with a high prevalence of injuries in lower limbs, namely knee and ankle injuries. Commonest injury that occurs in sports is ankle sprains, which accounts for up to 40% of injuries in athletes participating in basketball. Regarding the distribution of injuries - the lower limb contributes 46.4% to 68.0% of injuries, head and neck injuries contributes 5.8% to 23.7%, upper-limb injuries contributes 5.6% to 23.2% of injuries, and spine and pelvis injuries for 6.0% to 14.9%.<sup>5</sup>

Balance can be defined as the ability to maintain the body's center of gravity over the base of support. It results from neuromuscular actions in response to continuous visual, vestibular and somato-sensory feedback<sup>6-8</sup>. Chances of reinjury risk increases with the sensorimotor impairments associated with lower limb injuries. Joint injury reduces proprioception and kinaesthetic feedbacks of joints therefore impair balance of lower limbs<sup>9-12</sup>. Dynamic balance is the ability to maintain postural stability and orientation with the COM over the BOS while parts of the body are in motion.<sup>13</sup> Balance is an important component in every individual's life as any disturbance in balance affects the physical functions. It is very important to have good control in balance while playing the sport as misbalance can be found in every specific movement of basketball.

The Y-Balance Test (YBT), a validated derivation of the Star Excursion Balance Test (SEBT), is a functional screening tool that can be administered reliably for a variety of purposes: to assess lower extremity stability, monitor rehabilitation progress, understand deficits after injury, and identify athletes at high risk for lower extremity injury.<sup>14</sup> It is a dynamic test performed in a single-leg stance that requires strength, flexibility, core control and proprioception.

The YBT uses the anterior (A), posteromedial (PM), and posterolateral (PL) components of the SEBT to evaluate neuromuscular characteristics such as lower extremity coordination, strength, balance and flexibility. Therefore there six tests were performed, in the following order: Right Anterior Reach, Left Anterior Reach, Right Posteromedial Reach, Left Posteromedial Reach, Right Posterolateral Reach, Left Posterolateral Reach. Plisky et al<sup>15</sup> found that poor performance on the YBT was associated with an elevated risk of noncontact lower extremity injury. Therefore, the aim of our study was to compare dynamic balance in lower limbs between ankle injured and uninjured male collegiate basketball players using Y balance test. Players while playing basketball injure their lower limb due to any wrong technique; direct contact with the other players, muscular imbalance and no such data is available which described that which leg is affected more either right or left.

Research Objective: This study focused to evaluate the dynamic balance on ankle injured and uninjured basketball players. The study also aimed to evaluate and compare the lower limb dynamic balance among knee injured and uninjured male collegiate basketball players.

## Subjects and methods

This study was cross sectional comparative study design. Total 30 male subjects were recruited from Jamia Hamdard University in New Delhi. Out of 30 subjects, 15 were uninjured subjects and 15 injured subjects (including right and left lower limb). Inclusion criteria included age group of 18 to 25 years, university level basketball players with minimum two years of experience, subjects who have been diagnosed with acute ankle injury in injured group and in uninjured group who didn't have lower limb injuries in last six months and were physically fit. Exclusion criteria included players with history of any trauma in lower limb (including hip and knee injuries), any psychological disorders and any metabolic diseases. The subjects were conveniently selected and screened after signing consent as per the inclusion and exclusion criteria. After the baseline assessment the subjects were allocated to the groups i.e. Group A (uninjured) and Group B (injured) and assessment was done according to assessment perform and measurements were taken according to Y test procedure. The dynamic balance of lower limb measured at anterior (A), posteromedial (PM), and posterolateral (PL) for injured and uninjured groups. Materials included color adhesive tape, measurement tape and marker pen were used to measure the dynamic balance of uninjured and injured lower limb. The data then was recorded for both groups and were compared.

## Data analysis

Data was managed on an excel spreadsheet and was analyzed using SPSS (Statistical Package for Social Sciences for windows) software, version 21.0. To evaluate the differences in right injured and uninjured and left injured and uninjured were compared between groups. To determine the differences in balance between the groups, paired t test was used with  $p < 0.05$  denoting significant differences among groups.

## Result

A total no. of 30 participants volunteered for this study. No dropouts were found during the study. The Mean ages in the uninjured and injured group were  $21 \pm 1.8$  and  $20.4 \pm 1.9$  respectively and are described in table 1.1.

table 1.1- the mean and standard deviation of ages in the uninjured and injured groups.

	Uninjured (Group A)	Injured (Group B)
Mean (SD)	$21 \pm 1.8$	$20.4 \pm 1.9$

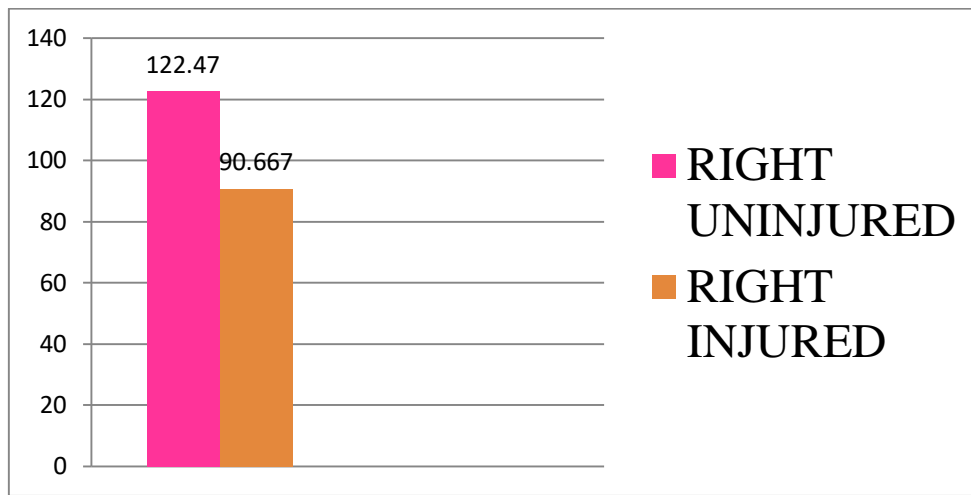
The mean and standard deviation of right and left uninjured and ankle joint injured were  $122.4 + 11.1$ ,  $90.6 + 12.8$ ;  $126.0 + 13.8$ ;  $92.2 + 10.46$  respectively and is described in table 1.2 and 1.3.

table 1.2- the mean and standard deviation of right and left uninjured and ankle joint injured players.

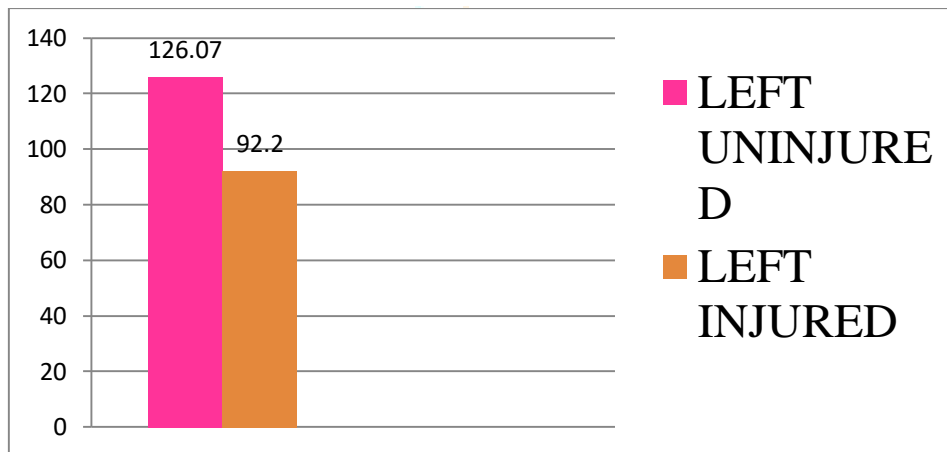
			Mean(SD)
Pair 1	Group A	Right Uninjured	$122.4 \pm 11.1$
	Group B	Right Injured	$90.6 \pm 12.8$
Pair 2	Group A	Left Uninjured	$126 \pm 13.8$
	Group B	Left Injured	$92.2 \pm 10.4$

table 1.3. standard deviation and error mean

PAIRED SAMPLE TEST		Paired Differences		
		Mean	Std.Deviation	Std.Error Mean
Pair 1	Right uninjured -Right injured	31.8	16	4.1
Pair 2	Left uninjured -Left injured	33.8	14.8	3.8



graph-1.1- comparison of means of y test score between right uninjured and right ankle joint injured (pair 1).



graph-1.2-comparison of means of y test score between left uninjured and ankle joint injured (pair 2).

## Discussion

The purpose of this study was to compare dynamic balance in lower limbs between injured and uninjured male collegiate basketball players. Independent t' test was used to compare dynamic balance between ankle injured and uninjured groups.  $P < 0.05$  was considered as significant difference in effect for the study. The mean and standard deviation of right and left uninjured and injured were 122.4, 90.6; 126.0, 92.2 respectively. The study found that dynamic balance has significant effect on ankle injuries of lower limb in basketball players.

According to the between-group comparison, significant difference was found in the dynamic balance in Group A and B. Under the light of available evidence the probable mechanism for the results can be suggested. In this study total 30 players participated, no one withdrew from the study. The players were recruited from Jamia Hamdard University, New Delhi. The players between the ages of 18-25 years were selected.

In a healthy population improving balance with training has positive effects with reducing injury. Balance of lower limb depends on the proprioception of joints, joint laxity and muscle strength. Injuries in the joint affect the function of neuron receptors, which alter the normal level of balance control. Many studies proved balance of lower limb can improve in athletes with ankle injuries after different training program that consists of plyometric, strengthening, agility, and balance exercises. There are several studies that have evaluated the effects of balance training on static and dynamic balance abilities, but there are no studies conducted on collegiate basketball players to evaluate their dynamic balance between injured and uninjured ankle joints. This study result provides knowledge about reduced dynamic balance for ankle injured players; therefore balance training is necessary to prevent ankle injuries among basketball players.

After selecting the players according to the inclusion criteria, y balance test on uninjured and injured group players were conducted in which six test were performed in the following order: Right Anterior Reach, Left Anterior Reach, Right Posteromedial Reach, Left Posteromedial Reach, Right Posterolateral Reach, Left Posterolateral Reach. Each test was repeated three times, and the maximum reach in each direction was recorded. The results were calculated taking limb length into consideration, to determine a "composite reach distance". Asymmetry was also assessed by comparing the results from each leg.

There were significant differences found between right injured and uninjured players and between left injured and uninjured players. On comparing the results in injured and uninjured groups it was concluded that there were significant difference between both groups of players.

The result of the study shows that the ankle injuries in basketball players will significantly affect balance.

### Significance of the study

The decline in dynamic balance ability experienced during playing basketball can increase the risk of injury and decreases the performance of player so it is required that the dynamic balance be assessed in time and if required balance training exercise should be given.

### Conclusion

There were several studies available on sports other than basketball and balance but till date no study available on dynamic balance between uninjured and ankle joint injured male collegiate basketball players. Therefore the present was aimed at studying dynamic balance in basketball players.

The results of the present study show that ankle injury in basketball players significantly affects dynamic balance in them.

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