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Rumaisah Pathan
Intern, Tilak Maharashtra
Vidyapeeth College of
Physiotherapy, Pune,
Maharashtra, India

Dr. Divya Jethwani
Associate Professor, Tilak
Maharashtra Vidyapeeth College
of Physiotherapy, Pune,
Maharashtra, India

Corresponding Author:
Dr. Divya Jethwani
Associate Professor, Tilak
Maharashtra Vidyapeeth College
of Physiotherapy, Pune,
Maharashtra, India

Comparitive study of core muscle endurance, balance and ankle instability in basketball players with and without ankle sprain injuries

Rumaisah Pathan and Dr. Divya Jethwani

Abstract

This study was undertaken to compare core muscle endurance, balance and ankle instability in basketball players with and without ankle sprain injuries (age group 18-25years.) To reduce the risk of injuries and to increase the endurance and balance sport specific physical therapy can be helpful. The McGill core endurance test is used to assess the endurance of core muscles- trunk flexors, trunk extensors and lateral musculature. One leg stance test for balance and Foot and Ankle Ability Measure for ankle instability. Statistical analysis was done based on data received from 50 participants. According to this study we concluded that there is no significant difference between trunk flexors and extensors and balance in players with and without ankle sprain injuries, there is a significant difference in lateral musculature and there is a significant difference in ankle stability in players with ankle injuries affecting ADLs and sports activities.

Keywords: basketball, trunk flexor endurance, ankle instability, balance, injuries

Introduction

The second most popular sport in the world is Basketball with over 450 million players regularly playing the game either on a competitive or recreational level in 213 countries [1]. The main differences compared to other team sports, specific to the demands placed on basketball players during practice and matches are faster and shorter accelerations and decelerations, change of directions, jumps and several contacts among players that could potentially create trauma [2]. Players are also characterized by large muscle mass and body size, which could influence their susceptibility to fatigue compared to smaller or leaner athletes [3]. Therefore, it is important to institute procedures to avoid injuries, aid recovery and optimally train basketball players [4]. The physiological demands of Basketball sport include aerobic and anaerobic capacity in addition to assimilating physical characteristics including muscular strength, power, endurance, flexibility, speed, agility, skill etc [5]. The literature on sport-specific pre-participation musculoskeletal screening and functional testing procedures is limited, lower extremity and lower back are the common symptoms and complaints of the athletes. Though trunk, head, and upper extremity injuries are predominant in basketball, evidence suggests that most injuries (58%-66%) are sustained in the lower extremity. Especially, both overuse (eg, tendinopathy, stress fracture) and traumatic (eg, ligamentous sprains) injuries are commonly observed in basketball populations. The 2 basketball-related injuries that traditionally obtain the most attention are ankle sprains and anterior cruciate ligament (ACL) ruptures in both male and female basketball players. Sprains, especially lateral ankle sprains, are the most common identified injury in both male and female basketball players, accounting for approximately 25% of all injuries [6]. CAI has been related to different contributing features, including discrepancies in postural control [7]. Impaired balance, trunk instability and ultimately postural instability are Some major problems that people with chronic ankle instability face [8]. Balance training has been proven to be an effective modality in the rehabilitation and inhibition of repeated sprains in with CAI. The main deficits associated with CAI include insufficiencies in proprioception, neuromuscular control, strength and postural control. Subjects with CAI mostly show impaired postural control and functional deficits in postural control. Distal neuromuscular deficits are compensated by subjects with the

use proximal muscles. One of the most important factors in maintaining postural stability and balance in the body is the function of the core muscles. There is close relationship between unbalance and lower body injuries^[9]. The control of strength, balance, and movement in the center of body maximizes the connection between the upper and lower kinetic chains are the core muscles as it is the center of all kinematic chains. To improve balance, postural control, and reduce the risk of lower extremity injuries core stabilization training is essential. This theory is supported by the fact that subjects with a history of lower extremity injuries required better trunk muscle recruitment to stabilize the body during dynamic tasks compared to healthy and strong subjects. To describe core stability hip and trunk muscle strength, trunk muscle endurance, maintenance of a particular pelvic inclination or of vertebral alignment, and ligamentous laxity of the vertebral column all have been used^[10]. The integration of core stabilization exercises into injury prevention programs, particularly for lower extremity, is demonstrating decreased injury rates. Core muscle function has been reported to influence structures from the low back to the ankle, to apply this concept to injury prevention^[10]. Therefore, it is necessary to evaluate the function, role and efficiency of core muscles in people with ankle instability to improve postural stability and balance.

Materials and Method

Materials

1. Scales, Consent form, Data collection sheet
2. Plinth, Straps, jig, blood pressure cuff
3. Pen, Paper, Calculator, stopwatch

Method

1. Study setup: Sports academies in and around Pune
2. Sample size: 50
3. Target population: Basketball players

Results and Discussion

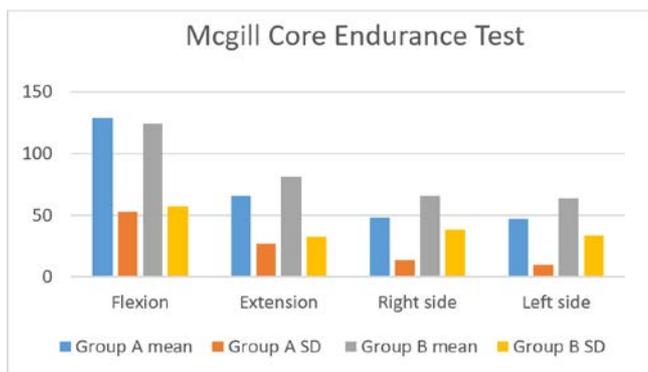
Results

Group A – With ankle sprain injuries
 Group B- Without ankle sprain injuries

MCGILL Core Endurance Test

Table 1: MCGILL Core Endurance Test

	Group A		Group B	
	Mean	SD	Mean	SD
Flexion	129	53	124	57
Extension	66	27	81	33
Right side	48	14	66	38
Left side	47	10	64	34



Graph 1: MCGILL Core Endurance Test

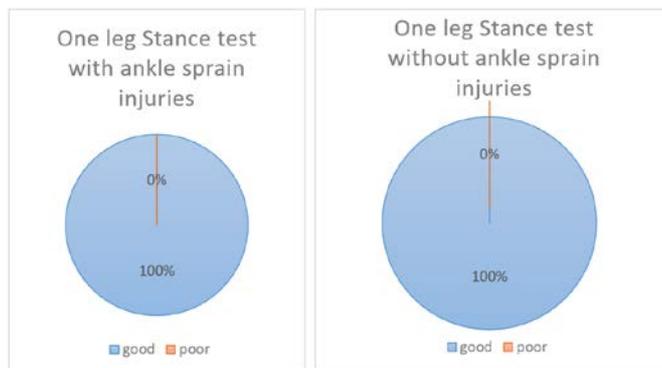
Interpretation

Graph no 1 shows that there is no significant difference in trunk flexor (p=0.9) and extensor (p=0.1) core endurance in group A (subjects with ankle injuries) and group B (subjects without ankle injuries). But have a significant difference in right lateral flexors (p=0.04) and left lateral flexors (p=0.02) core endurance in group A (subjects with ankle injuries) and group B (subjects without ankle sprain injuries).

One leg stance test

Table 2: One leg stance test

With ankle sprain injuries	Without ankle sprain injuries
100%	100%



Graph 2: One leg stance test

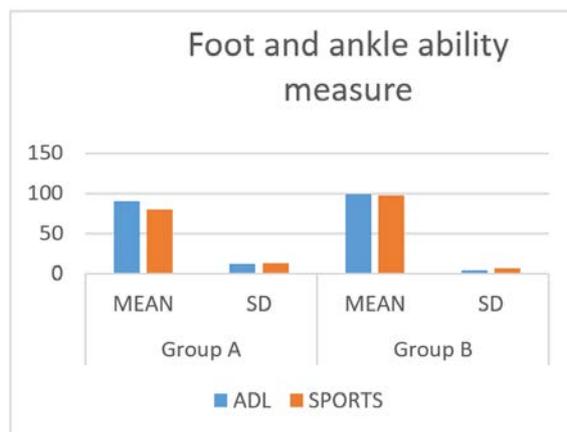
Interpretation

In our study we found out that one leg stance test showed no significant difference between both the groups A (with ankle sprain injuries) and group B (without ankle sprain injuries) and that both groups A and B had good balance.

Foot and Ankle Ability Measure

Table 3: Foot and Ankle Ability Measure

	Group A		Group B	
	Mean	SD	Mean	SD
ADL	90	12	99	4
Sports	80	13	98	7



Graph 3: Foot and Ankle Ability Measure

Interpretation

Graph no 3 shows that there is a significant difference in ADLs (p=0.001) and sports (p=0.01) in group A and B and this implies that players with ankle injuries have poor ankle stability affecting ADLs and sports.

Discussion

In a study – Core Stability training for injury prevention, Kellie C. Huxel Bliven, PhD, AT,*† and Barton E. Anderson, MS, ATC, AT *et al.* stated that, In sports such as volleyball and basketball, jumping and landing are important for successful performance of both defensive and offensive skills. Making the transition from a jump to another skill is also important for successful performance, thus landings need to occur in a balanced position and with correct technique. The core plays an integral role in movement and dynamic balance. Thus, the results are in line with other study of (kahle, *et al.*, which has emphasized the effect of core stability on the dynamic balance. The core is comprised of the lumbo-pelvic-hip complex and is activated first prior to gross body movements. Core stability can improve strength of hip and trunk muscle which is important to increase dynamic balance. Dynamic balance is a key component essential in players especially the ability to landing. Since holding dynamic stabilization, good balance and ability to stabilize quickly after landing might help decrease the risk of knee and ankle injury in athletes (Faries & Greenwood). Dynamic balance, pelvic stability and trunk control are required for good landing. Therefore, core strengthen play important role to stability of pelvic and trunk^[11]. In this study titled “the effects of core stability exercise on dynamic balance of volleyball players”, Akutota, *et al.*, demonstrated that lack of sufficient coordination in core muscles can lead to decrease efficiency of movement and injury. This study has chosen dynamic balance instead of a direct measurement of core stabilization. The core includes the lumbo-pelvic hip complex and its governing musculature which work synergistically to produce force, reduce force, and provide dynamic stabilization throughout the movement (Akuthota, Kilber, Akuthota *et al.* alleged that hip muscles are important for lower extremity stability during athletic movements. Lack of stability lead to lower extremity injuries which is called “victim of core instability”. Mills, Taunton, and Mills, suggested that the stability of the pelvis and trunk is essential for all movements of the extremities. Pelvic stability also helps equilibrium during performance. Hence, the stability of core was suggested as compulsory to lower extremity injury prevention (Jacobs *et al.*, and Leetun.). The abdominal muscles which are important in core stability include transverse abdominus, internal and external obliques, and rectus abdominus. All contract to provide stabilization for the spine and therefore a stronger base of support for lower extremity movement (Kilber, *et al.*) (Lederman). Marshall and Murphy warranted core stability exercise to improve abdominal muscles. In our study we assessed balance of players using Single Leg Stance test and found out that there was no significant difference between balance in both groups A (with ankle sprain injuries) and group B (without ankle sprain injuries) and does not have an effect on core endurance and ankle instability^[12].

This study assessed ankle stability of players using Foot and Ankle Ability Measure and found out that players with or without ankle sprain injuries have poor ankle stability affecting both ADLs and sports activities in basketball players.

Conclusion

The study concluded that there was no significant difference between trunk flexor and extensor endurance between basketball players with and without ankle sprain injuries but there was a significant difference in lateral flexor endurance that was assessed using McGill core endurance test.

There was no significant difference in balance between basketball players with and without ankle sprain injuries.

There was a significant difference in ankle stability between basketball players with and without ankle sprain injuries affecting both ADLs and sports activities of players, this was assessed using Foot and Ankle Ability Measure.

Acknowledgement

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