

Research Report

Comparison of Dynamic Balance in Female Basketball and Football Players.

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Abstract: Background: Dynamic balance is important for motor skill development in sports and prevents risk of injury during sports. Both basketball and Football Players are always exposed to the situations where the balance is dynamically challenged while performing sports specific skills. **Objective:** The purpose of this study is to compare Dynamic Balance in female Basketball and Football Players. **Methods:** Seventy healthy female players, Basketball (n=35) and Football (n=35) from different sports academy and schools of Ahmedabad, Gujarat were recruited randomly. The dynamic balance was measured by Y Balance Test. **Results:** To determine the significant difference between basketball and football players, independent t-test was used and find out significant ($p < 0.01$) difference between basketball and football players. Results indicated that increased reach distance of Y Balance Test of football players showed better dynamic balance ability than basketball players. **Conclusion:** There was significant difference in dynamic balance between Basketball and Football players. The Football players demonstrated higher dynamic balance than basketball players.

Keywords: Dynamic Balance, Y Balance Test, Star Excursion Balance Test, Basketball, Football

Introduction

Balance is the status of a body, under the influence of a force that maintains its ability to move whether it is static or dynamic condition.¹ Dynamic balance can be defined as the ability to perform a task while maintaining a stable posture.² It's believed to be more challenging because it requires the ability to maintain equilibrium during a transition from a dynamic to a static state.³ Dynamic postural control involves the additional demands of proprioception, range of motion (ROM), and strength in coordination with the ability to remain upright and steady.⁴

During highly mobile sports, while the athlete is in motion and needs to react quickly to the changing circumstances, dynamic balance is required.⁵ On field, athletes are always

exposed to the situations where the balance is dynamically challenged while performing movements like walking, running, stepping and jumping.⁶ Dynamic balance is of extreme importance in performing most daily physical activities and sports skills.

The factors influencing dynamic balance include sensory information obtained through visual, auditory, vestibular and kinaesthetic receptors which coordinate a series of motor responses.⁵ Somatosensory system which plays important role in maintaining the body in a particular position, whether in a static or in a dynamic state in response to external stimulus.⁷ An interruption or deficit in any part of the sensorimotor system can result in a loss of balance, which can result in injury. In particular, dynamic balance is an important component of motor skill development. Previous researcher have quoted that poor dynamic balance has been associated with sport related injury.^{8,9} Some injuries, such as acute sprain in ankle and knee is associated with lack of balance and deficits in strength of the lower extremities.^{10,11} Dynamic balance have been associated with a high risk for sustaining sport-related injuries. Radall dick et al found in their study that approximately 60% of all injuries were to the lower extremity; with ankle ligaments sprains, and knee internal derangements as most common injuries in Basketball players.¹² Morgan and Oblerlander et al. found that 77% of injuries in soccer players happen in their lower bodies with about 54% of the injuries to the knee.¹³

To accurately evaluate athletes' current level of motor ability, quantification of dynamic balance is often necessary. Among the various methods to assess dynamic balance, the Y Balance Test (modified star excursion balance test (SEBT) is considered as a reliable and feasible test.¹⁴ It challenges a person's ability to maintain a stable base of support while simultaneously performing reach movements. Hence, the SEBT may provide an effective non-instrumented and clinically applicable test for use in assessing lower-extremity balance and neuromuscular control.^{15,16} Previous investigators have suggested that the use of an injury-screening tool associated with dynamic balance may be successful in identifying athletes at risk for

injury.^{12,14,17} Pliskey et al found SEBT has been a predictive measure of lower extremity injury in high school basketball players. It is found to be a reliable measure to assess dynamic balance.¹⁴

Dynamic Balance is one of the main elements of most physical activities and it is an important factor in the performance of sports skills. The maintenance of dynamic balance is an essential requirement for excelling in sports like football, basketball, volleyball, gymnastics and many more.¹⁸ Dynamic balance is the important co-ordination abilities in the field of sport like basketball and football. Davlin et al showed that each sport discipline induces specific postural adaptations, which are associated with the muscles involved and loads required to execute the specific movement.¹⁹ Each sport needs various levels of sensorimotor processes to perform skills and to protect the muscular system against the injuries. For instance, Basketball players need to be able to change directions swiftly, dribble the ball from one end of the court to another, jump to make baskets, and defend the ball from the offending team throughout the game.²⁰ Their skills need joints' high speed while jumping, landing and the quick sudden maneuvers.²¹ The footballers often do skills such as passing, shooting and dribbling with the lower limb, while they wear studded or simple football boots in different situations of the pitch. The environmental situations and the skill requirements of the above mentioned sports probably will create different challenges for the sensorimotor systems, which finally affect the athletes' balance ability.²² These tactics are required by the players to score in the game; however, these also expose them to various injuries. Injuries are unfortunately an inseparable part of sports and therefore football and basketball are no exception. Hence, superior balance ability is necessary to achieve the highest competitive level and avoid lower limb injuries.²³⁻²⁵ In sports like basketball and football, passing, shooting and dribbling are considered as important aspects of the game and contribute to the high performance of the team. Researchers have also argued that balance is vital to the performance of fundamental motor skills like throwing, kicking, jumping, striking, hopping and skipping.²⁶⁻²⁸ Thus, dynamic balance require high degree of execution of such type of movements. Type of sport, different training methods and experience for team sports affects the athletes's balance ability and postural control.

Therefore, the purpose of this current study is to compare dynamic balance among female basketball and football players.

Methods

A total of seventy healthy female school going players (35 each of basketball and football players) were recruited for the study from different schools and sports academy of Ahmedabad, Gujarat. A cross-sectional study design was used for the study. The included participants were female players between age of 13-16 years, competing in only one sport for the previous 2 years and free from lower extremity injury for at least 6 months prior to testing. The excluded participants were those with vestibular problem (vertigo), visual problem, history of concussion type injuries in the 12 weeks before the study, current history of hip, knee and ankle surgery, current or undergoing treatment of inner ear, sinus, upper respiratory tract infection. Ethical clearance was taken from the institutional ethics committee. The participants were informed about the procedure thoroughly and informed consent was signed by them.

Procedure

The Y Balance Test, introduced by Plisky and Hertel as a modified version of SEBT was used for assessment of dynamic balance.¹⁴ The participants practiced six trials on each leg in each of the three reach directions prior to formal testing. The player stood on one leg in the centre of a grid, with the most distal aspect of the great toe at the starting line. While maintaining single-leg stance, the player was asked to reach with the free limb in the anterior, posteromedial, and posterolateral directions in relation to the stance foot (Figure 1). The maximal reach distance was measured by marking the tape measure with erasable ink at the point where the most distal part of the foot reached. The trial was discarded and repeated if the player (1) failed to maintain unilateral stance, (2) lifted or moved the stance foot from the grid, (3) touched down with the reach foot, or (4) failed to return the reach foot to the starting position. The process was repeated while standing on the other leg. The greatest of 3 trials for each reach direction was used for analysis of the reach distance in each direction.¹⁴

Limb length was measured to normalize excursion distance. To measure leg length, the participant was made to lie on a plinth; a mark was placed using a marker on the participant's most inferior aspect of each anterior superior

iliac spine and on the most distal portion of medial malleolus. The subject was asked to lift hips off the plinth and return them to starting position. The examiner passively straightened the legs to equalize the pelvis. The subject's limb length was measured in centimetres from the anterior superior iliac spine to the most distal portion of the medial malleolus with a cloth tape measure. To express reach distance as a percentage of limb length, the normalized value was calculated as reach distance divided by limb length then multiplied by 100. Composite reach distance was the sum of the 3 reach directions divided by 3 times limb length, then multiplied by 100. Left and right sides were averaged for each subject to provide the discrete variable to represent the athletes' performance for each direction as well as for the composite reach.

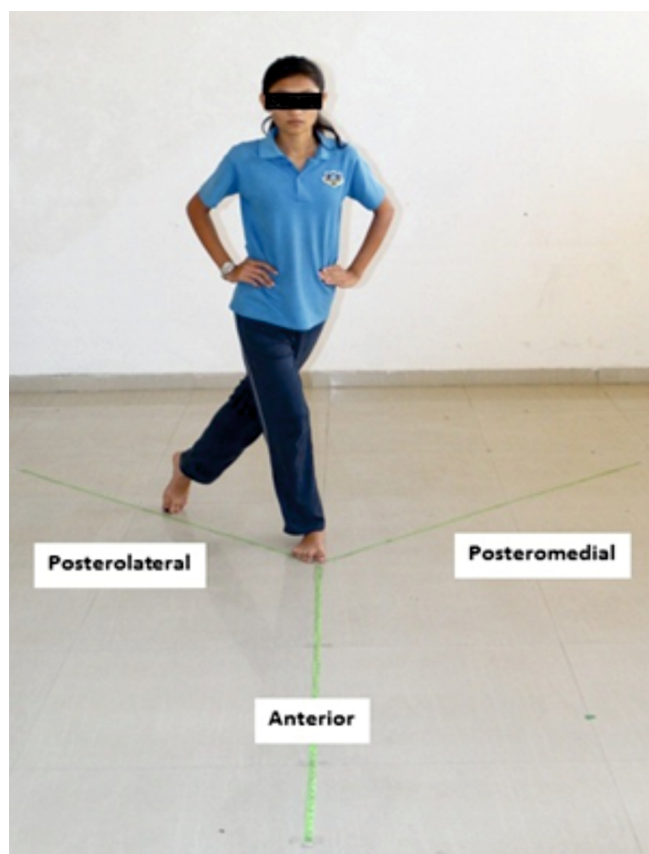


Figure 1: Y-Balance Test with reach directions labelled in reference to right stance foot

Statistical Analysis

The statistical calculations were done by SPSS software version 20. Normality distribution of data were verified using Shapiro Wilk Test. Statistical significance between groups (Basketball and Football players) was evaluated

using independent t-test and statically significance was assumed at $p < 0.05$.

Results

The demographic data is shown in Table 1. Both the groups were similar in age, body mass index and Limb length. The normalized anterior, posteromedial, posterolateral, and composite reach distance between basketball and football players were significantly different ($p < 0.01$), and are summarised in Table 2. Football players demonstrated higher dynamic balance than basketball players.

Table 1: Demographic characteristics of subjects

Groups	Age Mean±SD (Years)	BMI Mean±SD (Kg/m ²)	Limb Length Mean±SD (cm)
Basketball (n=35)	13.9±1.0	19.3±1.8	84.6±2.6
Football (n=35)	13.8±1.0	19.8±1.8	83.0±3.1

Table 2: Comparison of Dynamic Balance between Basketball and Football Players

SEBT (Directions)	Basketball (Mean±SD)	Football (Mean±SD)	P value
Anterior	68.4±4.7	92.8±6.0	<0.01
Posteromedial	73.7±4.5	99.4±6.1	<0.01
Posterolateral	70.8±4.5	96.2±6.1	<0.01
Composite	71.0±4.5	96.2±5.9	<0.01

Discussions

The purpose of this study was to compare dynamic balance in female basketball and football players. The result of the current study demonstrated that football players had superior dynamic balance as compared to basketball players. According to Edric Bressel et al, football players often perform single-leg reaching movements outside their base of support during passing, receiving and shooting may be because of this reason why their dynamic balance was better than basketball players.²⁹ Shaji john kachanathu et al evaluated dynamic balance between male collegiate soccer and basketball players and found increased reach distance of soccer athletes on SEBT that showed better dynamic balance ability than basketball players.³⁰ Hossein Berenjeian Tabrizi et al also found that basketball players have lower dynamic balance compared to footballers. The result of this study was in

accordance with this previous mentioned studies.

In this study, the statistical differences observed among female basketball and football players, may be related to specific sensorimotor challenges imposed by each sports. Football is an invasive game where players require dynamic balance while running at high speed, change direction rapidly and powerfully kick the ball to pass or shoot. Furthermore, players must conserve balance as they are prevented by opposing players and try to take possession of the ball.^{31,32} Basketball player also require dynamic balance to perform specific accelerations and decelerations, changes in direction, penetrations into the defensive perimeter, boxing out, dribbling and defence position recovery. These actions are often performed in a very limited space and require very fast movement, high coordination ability and appropriate strength and balance.³³ Significant balance disturbances may consequently hinder the performance of the particular tasks on the court by a basketball player.³⁴ Balance and correct reactions of body position play a major part in performing most motor offensive/defensive skills in basketball.³⁵

Compared with basketball players, football players had superior dynamic balance ability, football players often perform dynamic unilateral movements when kicking the ball and may be expected to have better dynamic balance than basketball players.²⁹ The above factors justify the reason for the significant difference in the dynamic balance between football and basketball players where football players have superior dynamic balance than Basketball players. It was found that athletes with poor balance or decreased balance were more prone to ankle injuries and also to other musculoskeletal injuries. According to previous study the dynamic balance assessment has been proved helpful in predicting risk factors for ankle injuries and other musculoskeletal injuries.^{14,24,36} Previous researchers have suggested that the Y-Balance (modified version of SEBT) performance is affected in athletes with history of injury of ACL rupture or chronic ankle instability.^{37,38} These factors should be considered when assessing an athlete's performance by Y-Balance Test with regard to detecting athletes at risk for injury and also establishing objective measures for return to sport criteria.

Balance training in sports has been shown to be effective for postural and neuromuscular improvement and also

reduces the risk of some musculoskeletal injuries, such as ankle sprains, especially if one or more balance components (eg, proprioception and joint ROM) are not optimal at the start.^{29,39,40} Sport training can improve sensorimotor performance and postural control and may cause different balance abilities. Trainers will find a variety of balance training programs that may be effective at improving balance, including uni-pedal balance exercises on progressively challenging surfaces. After knowing which balance training programs are effective, athletic trainers would benefit from knowing which athletes require more balance training to reduce musculoskeletal injuries.

This study found that inferior balance scores in basketball players compare to football players. Athletic trainers may find it useful to prescribe more balance training to basketball players than to football players. This is not to say that football players would not benefit from balance training but that balance exercises may be more necessary for basketball players.

A few limitations of this study should be noted. The first limitation is research conducted only on a small size of sample. Second, information regarding training sessions and training curriculum were not recorded in this study, which may have an impact on the balance ability on this study groups. Third, study is inherently limited because it only assessed female players, so future researchers can perform this on male players. Further studies should include some laboratory balance measures such as the Dynamic Postural Control Index, force platform, and time-to-stabilization test, may be more sensitive to specific balance deficits than field-based balance tests. Same type of study may be conducted with the players of other games.

Conclusion

Based on the result of this study may be concluded that there is significant difference in dynamic balance in between female Basketball and Football players. The football players demonstrate higher dynamic balance compared with basketball players.

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