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Comparison of Dynamic balance in lower Limbs among Knee Injured and Uninjured male Professional Footballers

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Abstract

Football or Soccer is the world's most popular sport. There are over 240 million registered players worldwide and many more recreational football players. The knee is a complex joint with many components making it vulnerable to a variety of injuries. In this study we have investigated the effect of dynamic balance on injured and uninjured male professional football players. Cross sectional comparative study design used for this research .Total hundred and six (106) male professional football players were selected for the study as per the inclusion criteria. Eighty one (81) right and left knee uninjured samples and forty five (45) right and left knee injured were collected from 106 subjects. Star excursion balance test (SEBT) used to evaluate dynamic balance at eight directions. Dynamic balance of lower limbs measured at anterior, anterior-medial, anterior-lateral, medial, lateral, posterior, posterior-lateral, posterior-medial for injured and uninjured groups. Data analysis did to find out the significant difference in dynamic balance among the groups. Comparative study performed by independent t' test for dynamic balance between knee injured and uninjured groups. P<0.05 was considered as significant difference in effect for the study. The means of knee injured and uninjured groups were 55.90 and 57.21 respectively with t' value 1.96 for degree of freedom 1006. The study found that dynamic balance has significant effect on knee injury, with P<0.049. The study concluded that dynamic balance has significant effect on knee injury. Dynamic balance of lower limb was more among uninjured male professional footballers than injured players.*

Keywords: Soccer, professional footballers, knee injury, star excursion balance test.

Introduction

Football is one of the most important and popular sports in the world. Football injury is a priority of health issue which affects their participation and effectiveness in the field of football. The location and nature of injuries are common in knee and ankle joint as per the recorded sports injuries. 27-50% of all sports injuries affect the lower extremity. Knee injuries are responsible about 13% of all injuries, and are the second most common injury (25%) location after ankle injuries, out of total 40% sports injuries in the lower extremity.

Dynamic balance of lower limb affect in joint injuries associated with joint position sensation and joint instability. Dynamic balance of lower limb can be evaluated using star excursion balance test (SEBT) of dynamic stability that may provide a more accurate assessment of lower extremity function than tests involving only quiet standing. SEBT is a dynamic balance test that measures single stance maximal reach in multiple (four and eight) directions. It is a valid reliable test to check the dynamic balance, which has been proved by many scientists like Shinichi Demura and Takayoshi Yamada have proved that SEBT is more reliable simple test and suggested that four directions are very practicable. A verbal and visual demonstration of the testing procedure is required to each subject by the examiner[1-7].

Balance is an important component for activities of daily life, any disturbance in balance affects physical functions of every individual. Physiotherapy treatment is essential for patients suffering from balance dysfunction. Balance dysfunction is related to the injury of joints, muscles and nervous system. Muscle injuries or muscular fatigue of lower limbs lead to imbalance on standing and ambulation. Neural control on concentric and eccentric muscular contraction is disturbed by muscular fatigues this result in imbalanced movements of limbs. Joint injuries in ankles, knees and hips affect balance of lower limb activities. Joint injury reduces proprioception and kinaesthetic feedbacks of joints there by impair balance lower limbs[8-11].

Football is a contact sport and running game that involves periods of continuous physical activity, interspersed with periods of high-intensity activity, including unexpected, explosive and agile movements and heavy physical contact. The game features contribute to the high risk of injury. Balance is related with minimal postural sway when the ability of body to maintain in base of support within the line of gravity. Horizontal movement of a body in centre of gravity even when a person on standing is referred postural sway. External sources on body produce certain amount perturbations which result in postural sway. Poorer balance is associated with increased sway; it is related with decreased neuromuscular control. Balance is controlled by multiple sensory systems including the vestibular,

somatosensory and visual systems. Changes in body position is analysed by the senses with respect to the base of support and signalled to the central nervous system to control the body position in centre of gravity regardless to whether the body moves or the base moves. An imbalance of body on base of support can be due to musculoskeletal injury, head trauma, disease or ageing[12,13].

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

Material and Methods

This study was cross sectional comparative study design. This study included male professional footballers with medically diagnosed as first and second degree unilateral and bilateral knee injury with in five months period with age group between 20 and 35 years for the year 2012. Total hundred and six (106) subjects selected for the study. Eighty one (81) uninjured and forty five (45) knee injured (right and left) samples were collected from 106 subjects. The subjects were selected from registered football associations of Kuala Lampur, Petalling Jaya, Port Clang, Subang Jaya, Puchong, Selangor and Sungai Pelek in Malaysia. Medically diagnosed lower limb injured (unilateral and bilateral) footballers within 20 weeks prior to the investigation were selected for this study. Professional football players with minimum one year experience were included for the study. Any subjects with trauma or pathology of lower limb were excluded from the study. Knee injured and uninjured subjects were divided in to two groups for the study.

Procedure: Knee assessment of professional football players performed and divided them in to injured and non- injured group. Both group checked for their lower limb dynamic balance. Star excursion balance test (SEBT) used to evaluate dynamic balance at eight directions. Appointed physiotherapist has taken the measurement of dynamic balance to avoid bias in data collection. Dynamic balance of lower limb measured at anterior, anterior-medial, anterior-lateral, medial, lateral, posterior, posterior-lateral and posterior-medial for injured and non- injured groups. Materials include color adhesive tape, measurement tape and marker pen were used to measure the dynamic balance of injured and uninjured lower limb. All the data collected separately and did the statistical analysis.

Statistical Analysis: Data analysis did to find out the dynamic balance among injured and uninjured groups.Compared the dynamic balance of injured and non-injured knee joint. Independent t' test used to find out the significant difference between the groups. P value <0.05 has considered as significant difference in dynamic balance among injured and uninjured football players.

Results and Discussion

Independent t' test used to compare dynamic balance between knee injured and uninjured groups. P<0.05 was considered as significant difference in effect for the study. The means of knee injured and uninjured groups were 55.90 and 57.21 respectively with t' value 1.96 for degree of freedom 1006. The study found that dynamic balance has significant effect on knee injury, with $P< 0.049$*.

Improving balance with training in a healthy population has positive effects with reducing injury. Balance of lower limb is depends on the proprioception of joints, muscle strength and joint laxity. Any injury in the joint affects the integral function of neuron receptors, which alter the normal level of balance control. Many studies proved balance of lower limb can improve in athletes with knee injury after different training program that consists of strengthening, agility, plyometric, 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 professional football players to evaluate their dynamic balance between injured and uninjured knee joints. This study result provides knowledge about reduced dynamic balance for knee injured players; there by balance training is necessary to prevent knee injuries among football players.

A study was conducted to find out the balance of ankle and knee joint. This study analyzed the proprioception of joints among healthy and injured subjects standing on an unstable and minimal area. Proprioceptive sensation from muscular, articular and tendinous receptors to the central nervous system regulate balance of body. Dynamic balance of athletes was evaluated by asking them to stand up on a seesaw. Accelerometer was used to monitor and record the changes in balance. The purpose of the study was to evaluate the role of articular receptors on spontaneous dynamic equilibrium of ankle joint and knee joint among soccer players. The study found more energy was required for injured ankle to stand on seesaw than with healthy ankle. Knee articular receptors contribution on dynamic balance was evaluated by antigravity extension. This study performed by asking five knee injured and three healthy basketball players to do bipodal stance and antero-posterior sways was measured in eyes-open and eyes-closed situations. The outcome of study found that balnce in healthy knees was more compared to the injured knees[14].

Many studies found that balance of single-limb stance is affected by Proprioception and muscle strength of patients with chronic anterior cruciate ligament injuries. Proprioception, muscle strength, and knee laxity are analysed in this study to find the role in dynamic standing balance among patients with ACL injury. Unilateral ACL injured ten young men were selected for this study. Single-limb dynamic balance was performed for both injured and uninjured limbs by measuring knee laxity measurements, passive re-positioning and threshold

for detection of passive motion proprioception tests, quadriceps and hamstring muscle strength tests. Differences between the injured and uninjured sides were analysed in this study and found significant effect for all test parameters. In this study dynamic standing balance for the injured limb were not correlated with independent variables of knee laxity, passive re-positioning proprioception, and muscle strength. But dynamic single-limb stance balance and threshold for detection of passive motion proprioception found a significant positive correlation among the injured limbs. This study concluded that dynamic balance is less on injured players compared with healthy players[15].

In our investigation mean age of professional footballers were 27.5 ± 7.5 and professional experience was 4.79. Mean ± standard error mean for dynamic balance scores of footballers were 55.90 ± 0.56 and 57.21 ± 0.39 for knee injured and uninjured group respectively. Dynamic balance of injured knee found less compared to the uninjured male footballers. Many studies proved that less balance of lower limbs is prone for injury of knee joint. In respect to this issue footballers are trained well with balance exercise programs to prevent lower limb injuries.

Table-1
Shows the means, standard mean errors, degree of freedom and t' value of dynamic balance for injured and uninjured knee joint. Significant effect of dynamic balance between injured and uninjured knee joint The independent t' test found significant difference in effect with *P*< 0.049* and df 1006 between the groups of study

Dynamic balance of injured knee (Mean ± SEM) SD	Dynamic balance of uninjured knee (Mean ± SEM) SD	T value	df	P-Value
55.90 ± 0.56 10.68	57.21 ± 0.39 9.86	1.96	1006	*P*<0.049*

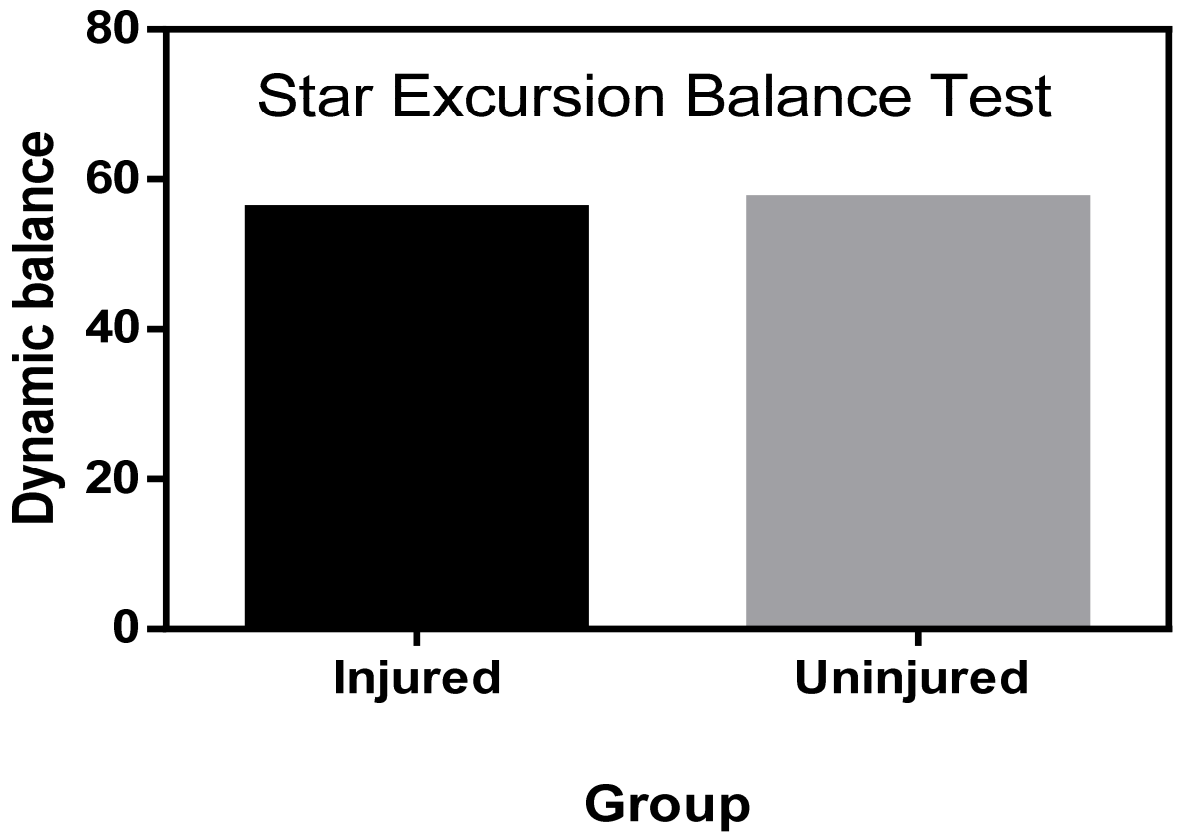

Figure-1
Graphical representation of mean difference of dynamic balance between injured and uninjured knee joint

Table-2
Star excursion balance test data entry form

Star Excursion Balance Test (SEBT)	Dynamic balance of knee injured	Dynamic balance of knee Uninjured
Anterior (A)		
Antero Medial (AM)		
Antero Lateral (AL)		
Posterior (P)		
Postero Medial (PM)		
Postero Lateral (PL)		
Medial (M)		
Lateral (L)		

Table-3
Screening form for selection of samples

	Screening Form	
SI. No.	**Name: Age: Sex:**	
1.	How many years are you playing as professional footballer?	
2.	Do you had any minor joint injury (Grade 1or 2) at lower limbs during last 20 weeks	YES/NO
3.	Do you have swelling in the knee joints associated with difficulty to bend the joint and bear weight?	YES/NO
4.	Do you have knee injury associated with menisci or cartilage tears?	YES/NO
5.	Do you have a known arthritic condition in your lower limb joints?	YES/NO
6.	Did you have any fracture of lower limb for last one year?	YES/NO
7.	Do you have any present history of lower limb strain or sprain?	YES/NO
8.	Do you have any radiating pain in your lower limbs?	YES/NO
Subject Included / Excluded		
Place:		
Date:		
Investigator signature		

Conclusion

The study found that knee injury will effect on dynamic balance of lower limb among football players. The study concluded that dynamic balance has significant effect on knee injury. Dynamic balance of lower limb was more among uninjured male professional footballers than injured footballers.

Dynamic balance of lower limb in injured knee is less compared to uninjured knee among professional footballers might be due to decreased proprioception, muscle strength and increased knee laxity of lower limb.

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