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RESEARCH ARTICLE

Effect of injured and uninjured lower limbs on dynamic balance among male professional footballers

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Abstract

Football or Soccer is the world's most popular sport. Injuries to various body parts especially ankle, knee and hip joint are common in footballers. In this research we have evaluated dynamic balance of injured and uninjured lower limbs of male professional footballers and also compared the dynamic balance between injured and uninjured lower limbs of footballers. Cross sectional comparative study design used for this research. Total hundred and six) male professional football players were included for the study as per the selection criteria. One hundred and thirty one right and left lower limbs injured (hip, knee and ankle) and eighty one right and left lower limbs uninjured samples were collected from 106 subjects. Star excursion balance test used to evaluate dynamic balance at eight directions. Iindependent t' test performed for dynamic balance of lower limb between injured and uninjured groups. $P<0.05$ was considered as significant difference in effect for the study. The mean of knee injured and uninjured groups were 57.26 and 58.67 respectively with t' value 2.92 for degree of freedom 1694. The study found that dynamic balance has significant effect on knee injury, with $P< 0.004$*. The study concluded that lower limb injury has significant effect on dynamic balance of lower limb. Dynamic balance of lower limb was more among uninjured male professional footballers than injured footballers.

Introduction

Football is one of the most important and popular sports in the world. When reviewing the published literature on football injuries, the overall incidence of injury in football is between 9 and 35 injuries per 1000 hours of football in adults and between 0.5 and 13 injuries per 1000 hours of football in adolescents. It is clear that the older the player the more likely they are to get injured.

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. The SEBTs are functional tests that incorporate a single-leg stance on one leg with maximum reach of the opposite leg. The SEBTs are performed with the subject standing at the center of a grid placed on the floor, with 8 lines extending at 45° increments from the center of the grid. The 8 lines positioned on the grid are labeled according to the direction of excursion relative to the stance leg: anterolateral (AL), anterior (A), antero-medial (AM), medial (M), poster medial (PM), posterior (P), poster lateral (PL), and lateral (L). The SEBTs appear to be a promising means of

identifying functional deficits in subjects with CAI via measures of lower extremity reach [1], [2], [3], [4], [5], [6], [7].

Balance can be negatively affected in a normal population through fatigue in the musculature surrounding the ankles, knees, and hips. Studies have found that muscle fatigue around the hips (gluteus and lumbar extensors) and knees have a greater effect on postural stability (sway). It is thought that muscle fatigue leads to a decreased ability to contract with the correct amount of force or accuracy. As a result, proprioception and kinaesthetic feedback from joints are altered so that conscious joint awareness may be negatively affected [8], [9], [10], [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 an ability to maintain the line of gravity of a body within the base of support with minimal postural sway. Sway is the horizontal movement of the centre of gravity even when a person is standing still. A certain amount of sway is essential and inevitable due to small perturbations within the body or from external sources. An increase in sway is not necessarily an indicator of poorer balance so much as it is an indicator of decreased neuromuscular control. Maintaining balance requires coordination of input from multiple sensory systems including the vestibular, somatosensory and visual systems. The senses must detect changes of body position with respect to the base of support, regardless of whether the body moves or the base moves or changes size. A decrement in balance can result from musculoskeletal injury, head trauma, disease or ageing [12], [13], [14], [15].

Research Objective

This study was to find out the dynamic balance on lower limb injured and uninjured professional footballers. The study also evaluated the difference of lower limb dynamic balance between lower limbs injured and uninjured male professional footballers.

Materials 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) lower limbs uninjured and one hundred and thirty one (131) lower limb injured (right and left) samples were collected from 106 subjects. Each sample had eight variables because star excursion balance scale used to evaluate dynamic balance at eight directions. The subjects were selected from registered football associations Subang Jaya, Petaling Jaya, Sungai Buloh, Selangor, Shah Alam, Sepang and Klang football association of Malaysia. Medically diagnosed hip, knee, ankle injured (unilateral and bilateral) footballers within 20 weeks prior to the investigation were selected for this study. Professional footballers with minimum one year experience were included for the study. Any subjects with trauma or pathology of lower limb were excluded from the study. Lower limb injured and uninjured subjects were divided in to two groups for the study.

Procedure

Knee assessment of male professional footballers performed and divided them in to injured and uninjured group. Both group checked for their lower limb dynamic balance. Star excursion balance test (SEBT) used to evaluate their dynamic balance at eight directions. Appointed physiotherapist has taken the measurement of dynamic balance to avoid bias in data collection. Asked the subject to hold hands on pelvis and stand on one leg in central point of the eight lines and did maximum movement of the other foot towards Anterior (A), Antero Medial (AM), Antero Lateral (AL), Posterior (P), Postero-Medial (PM), Postero-Lateral (PL), Medial (M), Lateral (L) to mark with big toe on the respective lines. The pad of big toe was pasted with colour chalk powder to mark on the line. The distance was measured in centimetre from the centre point of the eight lines to the chalk powder marking on each line. The mean distance of three measurements from each line has entered separately to the PC. [6], [7]. Materials include colour 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 lower limb injured and uninjured groups. The study compared the dynamic balance among the groups. 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 footballers.

Result

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 57.26 and 58.67respectively with t' value 2.92 for degree of freedom 1694. The study found that dynamic balance has significant effect on knee injury, with P< 0.004*.

Table1. Significant effect of dynamic balance between injured and uninjured lower limb

Dynamic balance of injured lower limb (Mean ± SEM) SD	Dynamic balance of uninjured lower limb (Mean ± SEM) SD	T value	df	*P*-Value
57.26 ± 0.30 9.83	58.67 ± 0.37 9.35	2.92	1694	*P*<0.004*

Above table shows the mean, standard errors mean (SEM), standard deviation (SD), degree of freedom (df) and t' value of dynamic balance for injured and uninjured lower limb. The mean of lower limb injured and uninjured groups were 57.30 and 58.67 with standard deviation was 9.83 and 9.35 respectively. Calculated t' value was 2.92 with degree of freedom 1694. The independent t' test found significant difference in effect with P< 0.004* between the groups of the study.

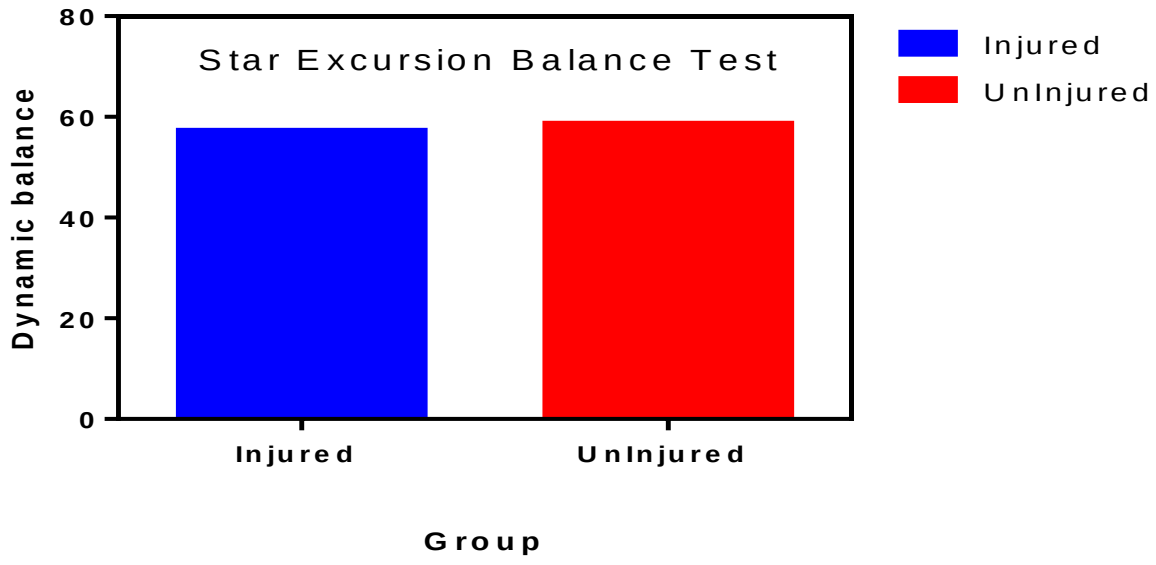

Fig1. Graphical representation of mean difference of dynamic balance between injured and uninjured lower limb

Data table

Star Excursion Balance Test

Direction of Movement	Dynamic balance of injured lower limbs		Dynamic balance of uninjured lower limbs	
	Right	Left	Right	Left
Anterior (A)				
Antero Medial (AM)				
Antero Lateral (AL)				
Posterior (P)				
Postero Medial (PM)				
Postero Lateral (PL)				
Medial (M)				
Lateral (L)				

Frequency of lower limb Injury

	Base line	
Joint	Right	Left
Hip		
Knee		
Ankle		

Screening Form
Name:
Age:
Sex:
1. How many years are you playing for professional football team?

2. Do you had any medically 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 and sprain? YES/NO

8. Do you have any radiating pain in your lower limbs? YES/NO

Subject Included / Excluded

Place:
Date:

Investigator signature

Discussion

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 with heavy physical contacts. The game features contribute to the high risk of injury. Potential relationship of dynamic balance is considered with knee injury, laxity, activity level, subjective function and age of an individual. Poor balance is associated with injury or falls in many populations and consequently is considered to be a critical component of common motor skills (16, 17).

Balance is generally defined as the ability to maintain the body's center of gravity within its base of support and can be categorized by either static or dynamic balance. Static balance is the ability to sustain the body in static equilibrium or within its base of support [18], [19]. Dynamic balance is believed to be more challenging because it requires the ability to maintain equilibrium during a transition from a dynamic to a static state [20].

Dynamic balance requires effective integration of visual, vestibular, and proprioceptive inputs to produce an efferent response to control the body within its base of support. An interruption or deficit in any part of the sensorimotor system can result in a loss of balance, which can result in injury. Specifically, poor balance may result in lateral ankle sprains [21], [22] and can explain differences between individuals with and without functional ankle instability [23], [24]. Therefore, improving balance is a critical and frequent objective of rehabilitation and injury prevention programs.

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 57.26 ± 0.30 and 58.67 ± 0.37 for lower limb injured and uninjured group respectively. Dynamic balance of injured lower limb found less compared to the

uninjured male footballers. Many studies proved that less balance of lower limbs is prone for injury of hip, knee and ankle joints. In respect to this issue footballers are required to train well with balance exercise programs to prevent lower limb injuries.

Conclusion

This study concluded that lower limb injury have effect on dynamic balance among football players. The study also found that dynamic balance has significant effect on injured and uninjured lower limbs. Dynamic balance of lower limb was more among non-injured male professional footballers than injured footballers.

Dynamic balance of lower limb in injured lower limb was less compared to the uninjured lower limb among professional football players might be due to increased balance, muscle strength and increased knee laxity of lower limb.

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