

Effect of Single Leg Balance Training Program on Dynamic Balance in Recreational Football Players - An Interventional Study

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ABSTRACT

Background: Football being an asymmetric sport requires frequent phases of unilateral stance on the supporting leg to perform technical movements with the contralateral leg. The dynamic stability of the supporting foot is essential for accurate motion during kicking or passing therefore single leg balance training programs can improve the postural stability performance and reduce the risk of injuries in football players.

Purpose: To find out the significance and effect of single leg balance training on dynamic balance in recreational football players.

Methods: After taking informed, written consent patients were divided into 2 groups. Study was done on 46 males; Group A was Experimental group and B Control group. In both groups, all the exercises were performed 5 times/week for 4 weeks; each exercise was done for 60s with 5 repetitions. Y-balance was used as outcome measure and pre- and post- intervention measures were taken.

Result: Within group and between group analysis of outcome measures were done after 4 weeks of completion. Level of significance was kept at 5% and confidence interval of 95%. Parametric tests were applied for within group and between group analysis. Within group analysis of pre-post data showed significant effect in the intervention group on the non-dominant side (trained leg) for YBT balance reach distance in all directions. ($p < 0.05$).

Conclusion: The present study concludes that Single leg balance training exercise in addition to conventional training is superior in improving the dynamic balance in recreational football players.

Keywords: Single leg training, dynamic balance, Y-balance test, football players

INTRODUCTION

Football is a high-intensity, intermittent sport that calls for players to sprint, change directions, jump, and engage in several physical battles throughout the course of a match. It involves many different athletic talents and physical requirements from the player.¹ The incidence of injury during football games increases with age across all age groups, with an average incidence of 15 to 20 injuries per 1000 hours of match-play among players older than 15 years. It varies for male outdoor players (>16 years) from

12–35 injuries per 1000 match hours. For youth players, the reported incidences range from 0.5–13.7 injuries per 1000 hours' exposure.⁽²⁾⁽³⁾

The majority of football injuries are caused by trauma; the proportion of overuse injuries accounts for between 9% and 34% of all injuries. Most injuries (60%–90%) were located in the lower extremities.⁽⁴⁾ Football injuries affect predominately the ankle and knee as well as the muscles of the thigh and calf.⁽⁵⁾

Football is a multifaceted sport that calls for exceptional unilateral balance in order to carry out various technical movements (such as shooting and passing) in order to execute the appropriate skill and movement and prevent instability and subpar technique.⁽⁶⁾

For sporting activities, balance is a must, and it's also employed as a risk indicator for injuries. As a result, it's important to assess and coach athletes for balance. In athletic performance, postural stability is important for a variety of skills such as kicking or throwing a ball. Additionally, postural stability is key in making rapid postural adjustments in response to impact with the ground or other players.⁽⁸⁾⁽⁹⁾

Dynamic postural control entails carrying out a functional task with deliberate motions without jeopardizing an established base of support, as opposed to static postural control, which aims to maintain a foundation of support while reducing movement of body segments and the center of mass. Dynamic stability is the capacity to effectively use strength and endurance through all planes of motion and movement in spite of changes in the COG. Dynamic balance tasks are believed to reflect the underlying mechanism of postural control strategies utilized in daily life and sporting activities. Balance training may be valuable in the prevention of, or rehabilitation from, ligamentous injuries in football players. Also, good techniques in football such as stopping out-of running, safe stance while kicking, and one on one situations require a strong sense of balance.⁽¹⁰⁾

Recreationally active players are more likely to injure themselves or suffer during sports participation as they demonstrate lower fitness and technique levels than professionals, which makes them more susceptible to injury.⁽¹¹⁾

The support leg has an important role during kicking: to resist the large external force in order to stabilize the body and to transfer mechanical energy to the proximal segment, thereby contributing to a proximal–distal sequential motion of the swing leg in

indirect ways. Better stabilization of the supporting leg during a shot or pass leads to better ball-hit accuracy and subsequently to a faster ball speed and/or better ball-flight accuracy.^(12,13) Therefore, the dynamic stability of the support leg during a kicking motion is an essential physical and functional factor to maintain or improve kicking performance.

Therefore, this study focuses on effect of single leg balance training on dynamic balance in recreational football players.

MATERIALS & METHODS

The study was conducted on 49 male recreational football players after receiving the ethical approval. Players having current or recent history of soft tissue or orthopaedic injury, history of surgery to the lower extremity or any history of neuromuscular disorders, arthritis or rheumatologic disorders, systemic disease that might interfere with sensory input and/or disorders of vision not correctable by glasses.

Subjects were randomly divided into 2 groups using chit method: Group A (interventional) (n=25) and Group B (control) (n=24). On first visit, a complete assessment was done which include the descriptive data for age, height, weight and limb length.

The training leg i.e., supporting leg (non-dominant) was determined by the self-reported preferred kicking leg by the subject. Y-Balance distance scores were taken at the pre intervention (first day) and post intervention (at 4 weeks of completion of treatment).

Subjects in the Group A were given Single Leg Balance Training on the non-dominant leg along with their routine training with warm up and cool down.

Subjects in the control Group B were given warm up and cool down exercises and they continued their respective exercise protocol. Subjects in Group A performed the exercises 5 days a week for 4 weeks. The training group performed Single leg stance training on floor and on balance pad. The

exercises were performed with eyes open and eyes closed. Each exercise was performed for 60 seconds. Five repetitions with 30s rest in between each exercise.

Exercise
Single-leg stance with contra-lateral leg held in a relaxed position with minor knee and hip flexion by the side of the test leg.
Single-leg stance with contra-lateral leg was held in a relaxed position with minor knee and hip flexion by the side of the test leg.
Single-leg stance with the contra-lateral leg held in a comfortable relaxed position with minor knee and hip flexion. The trunk then rotated smoothly to the end of range in both directions.
Single-leg stance with contra-lateral leg held in a comfortable relaxed position with minor knee and hip flexion. The trunk then rotated smoothly to the end of range in both directions.
Single-leg stance with the contra-lateral leg held in 90degrees of hip and knee flexion. The trunk is then rotated smoothly to the end of range in both directions.
Single-leg stance with contra-lateral leg held in 90degrees of hip and knee flexion. The trunk is then rotated smoothly to the end of range in both directions.

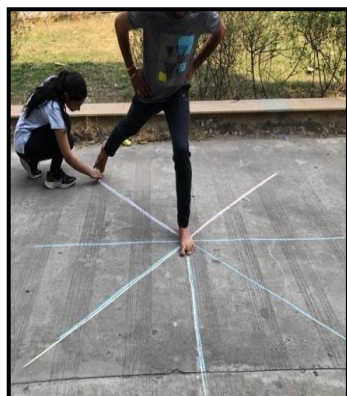


Figure-1: Player performing YBT posteromedial reach

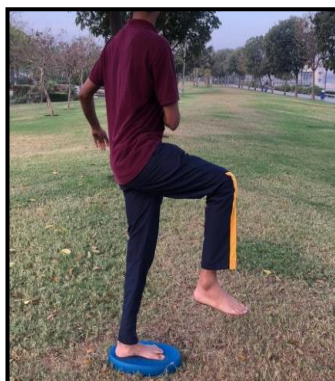
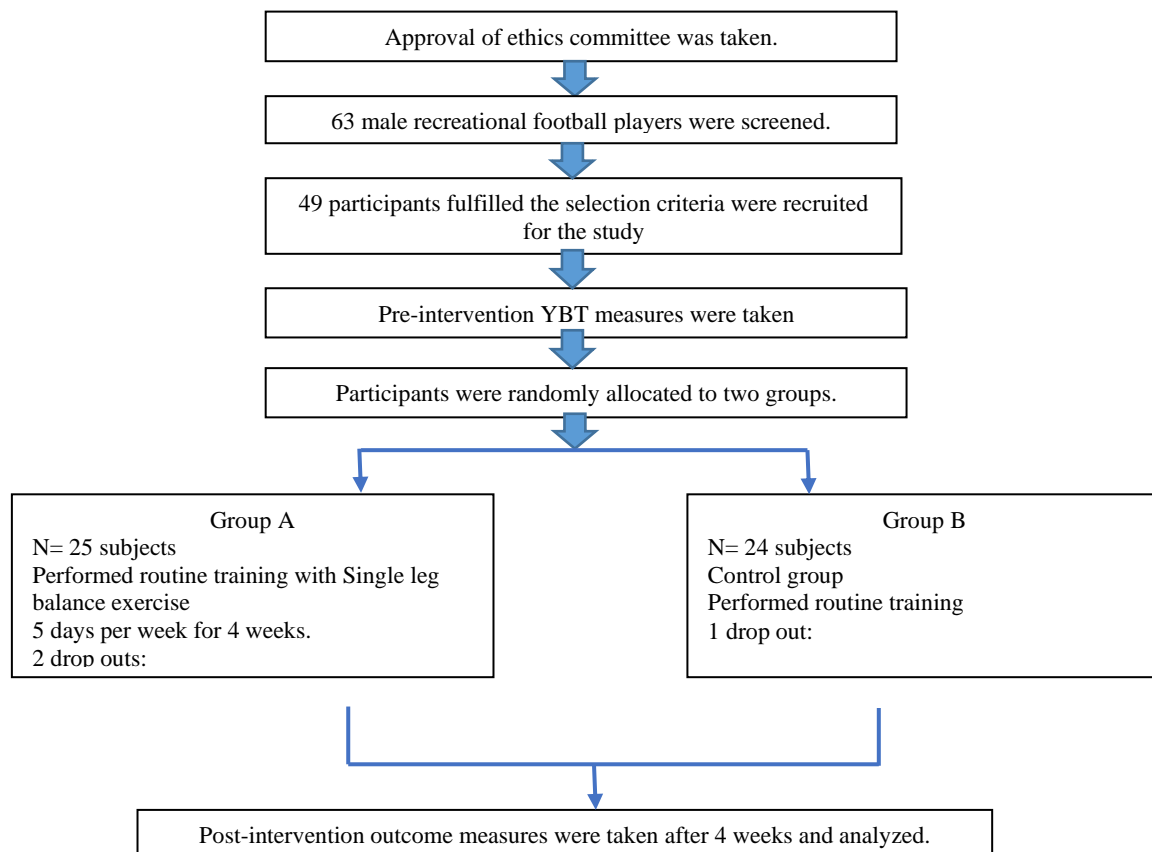


Figure-2: Player performing trunk rotation on foam pad



Figure-3: Player performing single leg balance exercise on ground

FLOWCHART OF PROCEDURE:



Data Analysis

Statistical analysis was done using SPSS version 16. Prior to the application of statistical tests, data was tested for the normal distribution by using Shapiro-Wilk test. Baseline characteristics were similar for both the groups. The data was normally distributed for all outcome measures. Within group and between group analysis of outcome measures were done after 4 weeks of completion of intervention. Level of significance was kept at 5% and confidence interval of 95%. Parametric tests were

applied for within group and between group analysis. Within group analysis was done using Paired t test and Between group analysis was done using Unpaired t test.

RESULT

The Table 1 shows the demographic characteristics for Age (years), BMI (kg/m²), limb length (cm), YBT reach distance scores of both the groups. Baseline independent t test was done to analyse the data and no statistical difference was found between the groups.

Table no.1: Shows the descriptive statistics for demographic details of Group A and Group B.

Characteristics	Limb	Group A (interventional) (Mean ± SD)	Group B (control) (Mean ± SD)	t-value	p-value
Age(years)		21.65±1.92	21±2.11	-1.096	0.279
BMI (kg/m ²)		22.08±1.36	22.5±1.41	1.029	0.309
Limb Length(cm)		97.70±2.40	97.09±3.03	-0.755	0.454
Anterior	Dominant	83.04±3.53	84.70±3.64	1.528	0.134
	Non-dominant	84.35±3.57	83.7±3.64	-0.600	0.552
Postero-medial	Dominant	98.43±4.28	100.13±4.24	1.321	0.193
	Non-dominant	101.78±4.36	101.04±4.35	-0.563	0.576
Postero-lateral	Dominant	89.48±3.94	91.35±3.71	1.619	0.113
	Non-dominant	91.04±3.94	90.30±4.06	-0.61	0.543
Composite	Dominant	90.32±3.92	92.06±3.75	1.482	0.146
	Non-Dominant	92.39±3.95	91.68±4.01	-0.059	0.558

Between group analysis for YBT balance reach distance was done by using Unpaired t- test. Analysis showed there was significant difference between group A and group B for YBT balance reach distance in all directions. (p<0.05)

Table no.2: Shows the Post mean YBT distance (cms) reached in both groups (non-Dominant leg)

Outcome YBT score	Group A (interventional) Post MEAN±SD	Group B (control) Post MEAN±SD	t - Value	p - Value	Cohen's Effect Size (d)	Significance
Anterior	91.96±3.93	86.91±2.99	-4.791	0.00	1.4	Significant
Posteromedial	115.43±3.21	102.13±4.48	-11.326	0.00	3.4	Significant
Posterolateral	106.74±2.97	91.13±4.07	-14.541	0.00	4.4	Significant
Composite	105.02±3.59	93.39±3.37	-11.084	0.00	3.3	Significant

Between group analysis for YBT balance reach distance was done by using Unpaired t- test. Analysis showed there was no significant difference between group A and group B for YBT balance reach distance in all directions. (p<0.05)

Table no.3: Shows the Post mean YBT distance (cms) reached in both groups (Dominant leg)

Outcome YBT score	Group a (interventional) Post MEAN±SD	Group b (control) Post MEAN±SD	t - Value	p - Value	Cohen's Effect Size (d)	Significance
Anterior	86.22±3.8	86.83±2.9	0.597	0.553	0.2	Non-Significant
Posteromedial	102.65±4.28	101.39±4.35	-0.969	0.338	0.3	Non-Significant
Posterolateral	91.83±4.00	93.30±3.64	1.283	0.206	0.4	Non-Significant
Composite	93.57±4.02	93.84±3.23	0.513	0.611	0.1	Non-Significant

Effect size comparison showed that Group A has large effect compared to Group B on non-dominant side.

Above results show that dynamic balance in recreational football players significantly improved on non-dominant side of group A (interventional) compare to group B (control). Results showed no significant difference on the dominant side (untrained) in both the groups. Thus, the null hypothesis is rejected and the alternate hypothesis that is “There is significant effect of single leg balance training on dynamic balance test in recreational football player” is accepted.

DISCUSSION

The primary objective of this study was to determine the effect of single leg balance training program in recreational male football players. The results of this study document that a simple, inexpensive, balance training program that can be performed during training period is effective in improving the dynamic balance among recreational football players. The methods used in this study can be easily used in the field for training.

The performance of both groups’ pre-intervention was similar to data published in past research by Jaffar et al., 2012 and Olmsted et al., 2002 and any small differences found were likely due to fitness and health status differences between cohorts. The improvements seen in the trained limb of the subjects following 4 weeks of balance-training programme appear to be broadly consistent with other studies involving different balance-training/assessment programs for individuals.⁽¹⁴⁾ There were significant improvements in total composite as well as all individual direction reach scores change from pre- to post-training.

The results of this study were similar to the findings of Gauffin et al. (1988) and Rozzi et al. (1999) that four weeks of unilateral balance training, using a single-leg stance on a foam pad, can decrease the error scores for the trained leg. The study found that

unilateral balance training not only improved balance on the trained leg but the untrained leg as well.⁽¹⁵⁾

The most recent biomechanical research into maintaining kicking performance in football players has focused on the dynamic stability of the supporting leg. Inoue et al. (2014) clarified that the supporting leg plays the role of attenuating impact during initial contact in the kicking motion.⁽¹²⁾ They also reported that the dynamic stability of the supporting leg contributes to the swing velocity of the kicking leg. Chew Bullock et al. clarified that the single leg balance ability in the supporting leg affects kicking accuracy in the kicking leg.⁽¹⁵⁾ These reports suggest that dynamic balance in the supporting leg in football players is an important physical and functional factor for maintaining or improving the kicking performance. The methods used in this study are also easily transferable into the “field” such that the practical application of the current data in a clinical setting should be quite straightforward. Future research in this field may also measure the effectiveness of such short intervention programs in decreasing injury and improving motor skill and function. For sportspeople, the ideal intervention maybe something that is of shorter duration, and thus applicable to specific short training cycles like pre-season preparation, as well as containing predominantly dynamic balance exercises to better simulate the challenges they face during participation.⁽¹⁵⁾ Interestingly, the magnitude of the cross-over effect may be direction dependent with greater effects occurring in transfer from the dominant to the non-dominant limb (Lee & Carroll, 2007) which also has potential implications for the success of any cross-over intervention in a clinical environment. This may have some implications for rehabilitation from athletic injury.^(16,17)

Limitation

Only males were included in the study potentially limiting the generalizability of findings.

CONCLUSION

From the present study it can be concluded that single leg balance training exercise has superior effect in improving dynamic balance of recreational football players than regular training.

Incorporating Single leg balance training exercise in routine physical training can improve the dynamic balance ability and reduce the risk of injury among recreational players.

Conclude your research paper here.

FUTURE SCOPE OF THE STUDY

Additional research could examine relationships between controlled postural sway testing and dynamic postural control with introduction of other variables, such as reactive or anticipatory movement as similar to an athlete on the field. Further research could also explore the relationship between static and dynamic balance and implications for prediction of future injury

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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