

The Immediate Effect of Stabilization Type Trunk Exercise on Y Balance Test in Male Adolescent Mallakhamb Players: A Randomized Control Trial

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Abstract: *Introduction:* One of the most overlooked areas is sports-related injury owing to the fact that many athletes simply "play through the pain." They avoid seeing a doctor for fear of missing out on their physical training or a tournament if things go wrong. A critical thing for majority of sports is the ability to maintain truncal stability. True stability is essential for coordination, performance, and injury prevention. Trunk stability refers to the ability to maintain the trunk's posture and motion throughout dynamic loading and movement scenarios. Y Balance test was used in this study for evaluation of dynamic balance. In terms of dynamic balance, it's a demanding test for athletes and other physically active people. *Methods:* This was an experimental, randomized controlled trial. The purpose of this study is to demonstrate the benefits of adding trunk stability exercises to Mallakhamb players in order to improve their performance and lower their risk of injury. We selected 126 male Mallakhamb players. Random sampling was used. The outcome measures was distance traversed in Y Balance test. *Results:* The control and intervention groups were comparable at baseline. Significant differences were observed between the 2 groups. Results indicated that the experimental group's Y balance test score improved in the anterior, posterior-medial, and posterior-lateral directions. However the anterior direction of the control group did not alter. *Conclusion:* The SEBT improved in the posteromedial and posterolateral directions immediately after the SE, but not in the anterior direction.

Keywords: Y Balance test, truncal stability, sport injuries, Dynamic balance, balance training

1. Introduction

Sports related injury is one of the most neglected areas of attention as many athletes just "play through the pain" They avoid consultation with a doctor with fear of missing out an opportunity of their physical training as well as the tournament in worst case scenario. Awareness of this topic is needed as studies also indicate a prevalence of sports related injuries in India to be as high as 73.4%^[1-4]

In India sports refers to a large variety of games ranging from tribal games to more mainstream sports such as Cricket, Badminton, Football, Wrestling, Mallakhamb, etc. Majority of these sports involve physical activities in which truncal stability is an essential component. Truncal stability is vital for better coordination, better performance and injury prevention. Trunk stability is the ability to control the position and motion of the trunk during dynamic loading and movement conditions.^[5]

One of the leading causes of sports related injuries is found to be falls and strains. It has been found in many studies that good dynamic balance and control can help in injury prevention. This can be achieved by better coordination, co-activation, and neural control of trunk muscles.

Various trunk exercises are often performed to improve the performance and strength of sportsmen and prevent injuries. One such exercise is trunk stabilization exercises (SE) which are focused on keeping the lumbar spine in a neutral position. In India, people regularly play a lot of different sports, and most of them focus on core stability.

One such sport, Mallakhamb, is a regularly practiced sport in India.^[8] This sport demands very good trunk stability. Till date, there is very limited published data speaking about the relationship between truncal stability and injury prevention specifically for this sport.^[6] The analysis of truncal stability is a major challenge. Test used for evaluation of truncal stability are star excursion balance tests, Y balance tests, four square step tests etc. Among these, the Y balance test is widely used to evaluate the strength, flexibility, and proprioception of players involved in various sports.^[6,7]

The Y balance test is a dynamic test requiring flexibility, strength, and proprioception. This test is feasible and can be used to evaluate Mallakhamb players. It is a measure of dynamic balance that presents athletes and physically active individuals with substantial difficulty. This test has been suggested as a screening instrument for sports participation and a post-rehabilitation test to verify dynamic functional symmetry. There is a paucity of published data giving information about the relationship between core stability and its effect on performance in Mallakhamb sport. This study is an attempt to illustrate the benefits of inclusion of the trunk stability exercises in Mallakhamb players to improve performance and reduce injury. We hypothesized that there will be immediate effect of stabilization exercise (SE) on Y balance test among the players. Our aim to conduct this study was to see the immediate effect of stabilization exercise (SE) on the Y balance test.

2. Methodology

The study design was an experimental, randomized controlled trial. The study was conducted at Phadke School, Mallakhamb Academy in Panvel. We included 126 adolescent male Mallakhamb players. Simple random sampling was adopted. The duration of study was one year. We included Mallakhamb players within the age group of 15-18 years. We didn't include athletes who had just started training (6 months ago), athletes who had never been hurt, athletes with no muscle pain, and athletes who didn't have any other health problems like high blood pressure, diabetes, etc. We even excluded athletes who are already doing trunk stabilization exercises regularly. The equipment used was measuring tape, mats, sticking tape, and pencil.

Y balance test: The participants performed the Y balance test in the anterior, postero-medial, and postero-lateral directions.^[9] The angles between the anterior stripe and both the posterior stripes are 135° with 90° between the two posterior stripes. Before performing the Y balance test, they got verbal instructions and a visual demonstration of the test

from the same examiner. The participants stood on the dominant or the leg preferably used to stand on the top of the mallakhamb, with the most distal part of the great toe placed on the centre of the grid.^[9] While keeping a single-leg stance, they extended the opposite leg as far as possible in the anterior, postero-medial, and postero-lateral directions along a grid. Then, the most distal portion of the reaching foot lightly touched the ground before returning to the starting position. During the test, their hands were positioned at the iliac crest. All experiments were conducted barefoot to eliminate the influence of footwear. After completing three practice trials, participants rested for two minutes before completing three test trials in each direction.^[10] In each test session, the order of the reaching directions was randomised. Whenever a participant failed to maintain the unilateral stance, raised or moved the standing foot from the grid, or failed to return the reaching foot to the starting position, the test was dismissed and redone in the same manner. The trunk stabilization exercise routine included the front plank, quadruped exercise, and back bridge



A) For the front plank, participants maintained a prone position with their toes and forearms supporting their body weight. From this position, they simultaneously raised their right arm and left leg straight up for five seconds. Next, they simultaneously elevated the left arm and right leg straight up for five seconds. The participants then lowered their bodies to the floor for a 10-second break. This procedure was carried out five times.



B) Participants took the quadruped stance for the quadruped exercise. They were then instructed to maintain a neutral pelvic position and normal breathing. Then, they simultaneously elevated their right arm and left leg straight up for five seconds. Next, they simultaneously elevated their

left arm and right leg straight up for five seconds. Then, they took a 10-second break. This procedure was carried out five times.



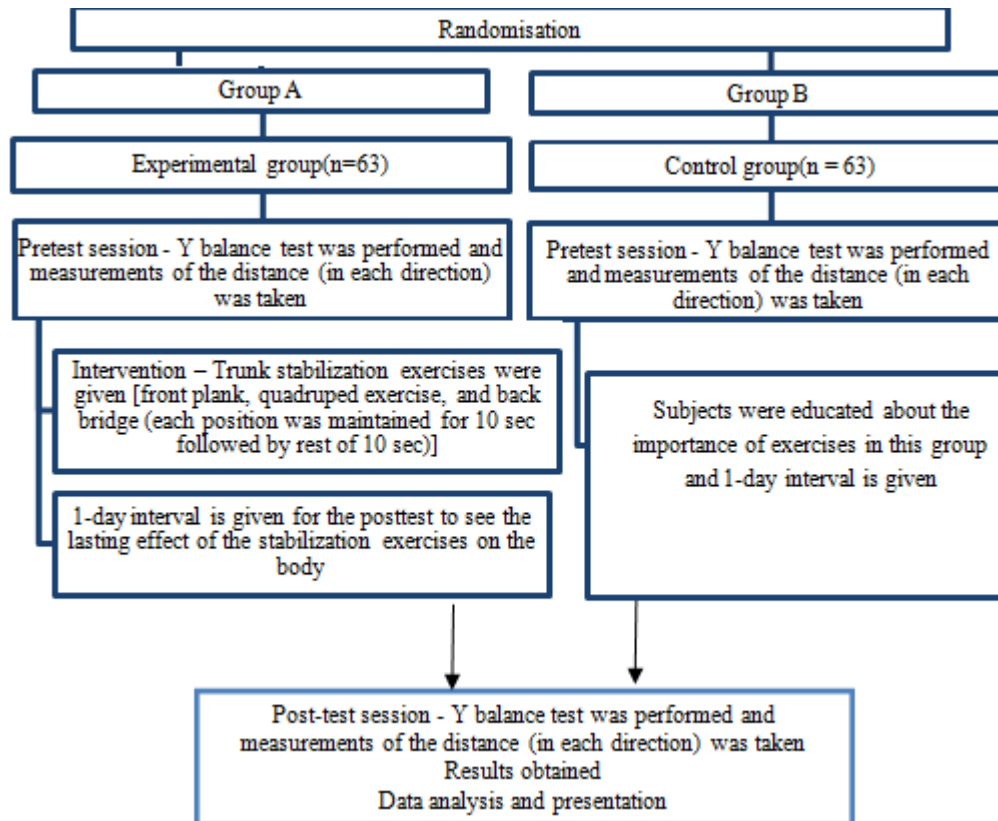
C) For the back bridge, participants lie supine on the floor with their feet flat, knees bent at 90 degrees, toes facing forward, and hands folded across their chest. They lifted their pelvis to obtain and maintain a neutral angle of hip flexion, then lifted one leg from the floor and straightened the knee. This position remained in place for five seconds. Then, they held the position for five seconds with the opposing leg lifted. Then, they took a 10-second break. This procedure was carried out five times.^[11]



Statistical analysis and results: Data analysis:

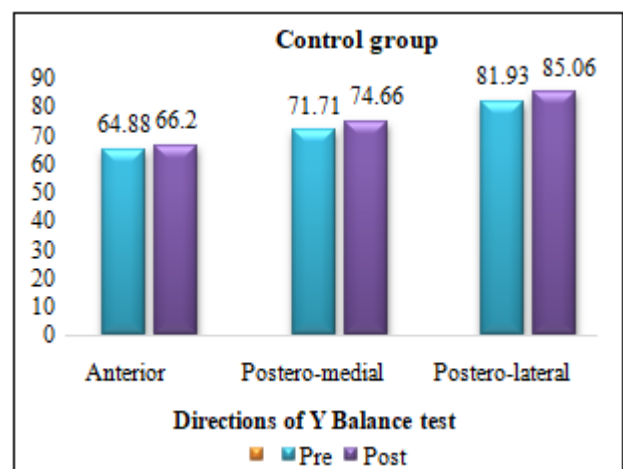
All statistical analysis was done using SPSS version 16.0. The level of significance of <math><0.05</math> was considered to be statistically significant at a 95% confidence interval. In the present study, the effect of SE on the Y balance test was

seen in two different groups (Experimental group and Control group) of male adolescent mallakhamb players. The data was compared in 3 directions with pre and posttest results in 2 groups. The p value was set at 0.05 to determine statistical significance. All the data is mentioned in the form of a mean and standard deviation. Data sampled from populations had identical standard deviations. This assumption is tested using the method of Bartlett. The one-way Anova test was used to extract metric data from both groups.



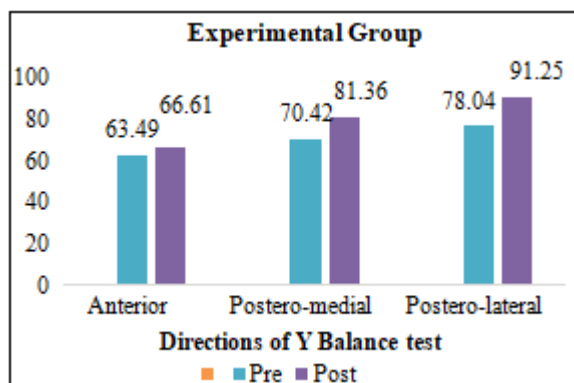
Control group				
Direction	Pre	S.D	Post	S.D
Anterior	64.88	3.3	66.2	3.4
Postero-medial	71.71	5.8	74.66	5.9
Postero-lateral	81.93	5.2	85.06	5.1

Inferences: P value is statistically significant in control group in the postero-lateral direction ($p<0.05$). P value is statistically significant in control group in the postero-medial direction ($p<0.05$). P value is statistically non-significant in control group in the anterior direction ($p>0.05$).



Experimental group				
Direction	Pre	S.D	Post	S.D
Anterior	63.49	7.2	66.61	8.01
Postero-medial	70.42	7.9	81.36	8.05
Postero-lateral	78.04	5.9	91.25	5.9

Inferences: P value showed statistically significant value in experimental group in the anterior direction ($p < .05$). P value showed extremely significant value in experimental group in the postero-medial direction ($p < .001$). P value showed extremely significant value in experimental group in the postero-lateral direction ($p < .001$).



3. Results

The Y balance test score was significantly improved in the Anterior direction ($p < .05$), Postero-medial direction ($p < .001$) and Postero-lateral direction ($p < .001$) of the Experimental group; and in the Postero-medial direction ($p < .05$) and Postero-lateral direction ($p < .05$) of the Control group but did not change significantly in the Anterior direction ($p > .05$) of the Control group.

4. Discussion

This study compared the immediate effects of stabilization type of trunk exercises on the performance of the Y balance test in male adolescent mallakhamb players. The results indicate that the stabilization type of trunk exercises has immediate effects concerning the improvement of dynamic balance. A Previous study has demonstrated the immediate effects of the SE on dynamic balance in soccer players. But this is the first study to show evidence of an immediate effect of SE on dynamic balance in Mallakhamb players.

Regarding reach direction, the results indicate that the reach distance improved in the posteromedial and posterolateral directions, but did not alter much in the anterior direction. For the posterior directions, the hip flexion range of motion of the stance leg is important. A previous study suggested that improvements in the Postero-medial and Postero-lateral directions of the Y balance test may not be due to strength or core stability, but to increased knee and hip flexion on the stance limb.¹¹ Another reason maybe due to increased neuromuscular control of the back extensors and lower extremity muscles and dynamic balance. As the trunk leans forward in the Y balance test position, eccentric muscle contraction of the hamstrings and low back muscles, such as the erector spinae and multifidus, is required to maintain balance.^[12,13] Therefore, both the function of the local muscles as monitors and the function of the global muscles as controllers of trunk motion are essential. Using local and global muscles, the trunk posture was maintained and altered during the prescribed SE programme.^[14] After the SE, participants may have improved their ability to

manage their trunk posture during the posterior directions of the Y balance test. Previous research has demonstrated that the arm and leg lifts utilized in this study elicit a significant amount of external oblique activity, which may aid in the control of trunk rotation.^[14] Therefore, an increase in trunk rotation control may aid in the control of the lower extremities during the posteromedial direction of the Y balance test. In contrast, the direction of the front was not considerably altered. This confirms the results of a prior study that examined the effects of eight weeks of training. Hock et al.^[15] reported that the dorsiflexion range of motion affected the anterior direction more than the posterior direction. This finding could be attributed to decreased proprioception or quadriceps strength, as the quadriceps of the stance limb had to work eccentrically while taking the leg forward.

To maximize the results of physical training, it is necessary to adhere to certain fundamental principles of physical training.^[16] Specific adaptation to imposed demands (SAID) is one of these fundamental principles. According to the SAID principle, the human body will uniquely adapt in response to demands and pressures.^[16] The SE programme comprises of closed kinetic chain positions that exert unilateral load on the hip extensors, with the movement task consisting of maintaining and controlling these positions. In the posteromedial and posterolateral orientations, this tension resembles the stress of the Y balance test. A 24-hour interval was taken to examine the immediate effects of a single bout of stabilizing exercises on the grounds of previous studies which indicate that the lasting effect of a single bout of SE stays for at least 24 hours.^[17]

5. Study Limitations

Several limitations of this study must be taken into account. First, all of the participants were male adolescents who played Mallakhamb. Therefore, further confirmation of these results must be conducted with older subjects. Second, this study was unable to determine the duration of the immediate effect on the Y balance test. It only indicates that the effects endure for around 24 hours. Also, more research needs to be done to find out if the SE lowers the risk of injury.

6. Future Scope

There should be a study which will investigate how long the result will last. Long term core training can be introduced for better results.

7. Clinical Application

Stabilization exercises are simple exercises, easy to perform, understand, with no risk involved, require no supervision, and can be performed as a warm up programme once learned by the individual. These exercises would help improve the balance of an individual as well as help in preventing injuries.

8. Conclusion

This study revealed that the posteromedial and posterolateral directions of the Stability exercise and balance training improved immediately following the Stability exercise, but the anterior direction did not improve significantly. The results of this study indicate that the SE programme utilized in this study is beneficial for improving dynamic balance immediately.

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