

WOBBLE BOARD-BASED BALANCE TRAINING AND ITS EFFECT ON DYNAMIC STABILITY IN FEMALE SPRINTERS: A STAR EXCURSION BALANCE TEST STUDY

¹S.K.NIKIDA, ²PRIYANKA N.H.M, ³CEDRIC EUGENE FERNANDEZ,
⁴ USHA NANDHINI M, ⁵KAVITH K

^{1,4,5} Department of Physiotherapy, Thanthai Roever of College of Physiotherapy, Perambalur, Tamil Nadu, India

^{2,3}Assistant Professor, Department of Physiotherapy, Thanthai Roever of College of Physiotherapy, Perambalur, Tamil Nadu, India.

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ABSTRACT

Background: Balance, whether static or dynamic, plays a crucial role in sports performance, helping to reduce the risk of injuries. Incorporating balance training into sports routines is essential, and wobble board exercises have demonstrated effectiveness in minimizing the risk of falls and injuries.

Aim: This study aimed to evaluate the effectiveness of wobble board exercises on the Star Excursion Balance Test (SEBT) in female sprinters.

Method: A single-group pre-post experimental design was employed, involving 15 female sprinters. The SEBT was conducted before and after the intervention. The participants underwent wobble board training for four weeks, with three sessions per week.

Results: A statistically significant improvement was observed in the Star Excursion Balance Test (SEBT) reach distances across all eight directions post-intervention. The anterior direction of the right lower limb showed the greatest increase, while the medial direction of the left limb showed the least improvement.

Conclusion: The study concluded that four weeks of wobble board training effectively improved dynamic balance in all eight directions of the SEBT.

Keywords: Balance, Star Excursion Balance Test, Wobble Board, Sprinters.

INTRODUCTION

Sprinting is a fundamental method of terrestrial locomotion that enables humans to move rapidly on foot. It is one of the most recognizable and enduring sports across different cultures and eras. Foot racing, which encompasses various distances, has been a significant component of athletic competitions. Modern competitive running ranges from short sprints, which require sustained high speed and

remarkable endurance, to longer distances that test stamina [1].

Sprinting, as a form of running, typically covers short distances within a limited time frame. It plays a vital role in numerous sports where quick movement is essential, such as reaching a target or evading an opponent. At a professional level, sprinters usually start the race in a crouching position, using starting blocks to enhance their initial

push [2]. This crouched start position allows them to generate maximum power during the initial drive, eventually transitioning to an upright posture as speed and momentum increase [3].

The starting position varies depending on the race type, but the use of starting blocks optimizes force production. These blocks allow sprinters to perform an enhanced isometric preload, generating muscular pre-tension that contributes to a powerful forward thrust [4]. Proper body alignment is crucial, as it maximizes force production during the drive phase. Typically, athletes begin in a four-point stance, pushing off with both legs to achieve the greatest propulsion [5].

Sprinters must maintain their assigned lanes throughout most sprinting events, except in specific cases like the 400m or indoor races. Short-distance sprints, such as the 100m, mainly focus on accelerating to maximum speed [6]. Apart from competitive advantages, sprinting offers numerous health benefits, including improved aerobic fitness, metabolic function, and postural stability [7]. During the off-season, sprinters often maintain physical activity without the rigorous intensity required for competitive performance [8].

Balance plays a vital role in sprinting, as it enables athletes to maintain stability while moving at high speeds. Balance is the ability to sustain a stable position with minimal movement and is achieved when vision, proprioception, and vestibular functions work harmoniously [9]. Balance can be classified as either static or dynamic. Static balance refers to maintaining a stable state during stationary activities, while dynamic balance involves maintaining stability while the center of gravity and base of support are in motion [10].

Internal and external factors can impact balance. Internal factors include fatigue and injuries, while external factors may involve the surface texture and environmental conditions [11]. Running mechanics, such as speed, direction, and landing technique, also influence balance. Any impairment in the vestibular, visual, or proprioceptive systems can disrupt balance, leading to instability during sprinting [12].

Runners often experience balance issues due to their higher center of mass and muscle mass distribution [13]. Improper foot placement, muscle weakness, reduced joint mobility, and poor joint stability can all negatively impact balance [14]. Balance training

tools, like wobble boards, are commonly used to enhance lower limb stability, coordination, and strength [15]. Wobble boards challenge balance by requiring the athlete to maintain stability on an unstable surface, which helps strengthen the core, improve coordination, and enhance proprioceptive control [16].

The Star Excursion Balance Test (SEBT) is a dynamic balance assessment tool that evaluates lower limb stability. It involves performing reaching movements in multiple directions while standing on one leg, challenging the athlete's dynamic balance and control [17]. The test requires maintaining a single-leg stance while reaching as far as possible in eight designated directions, forming a star pattern. Measurements are taken based on how far the athlete can reach without losing balance [18].

This study aims to explore the impact of wobble board training on the SEBT scores of female sprinters. Dynamic balance is a critical factor in athletic performance and injury prevention [19]. However, limited research exists on the effectiveness of wobble board training among female sprinters. By assessing the role of wobble board exercises, this study seeks to determine their potential benefits for enhancing dynamic balance and reducing lower limb injury risk [20]. Sprinting not only requires speed and power but also demands optimal balance and stability. Incorporating balance training, especially through methods like the wobble board, can significantly improve athletic performance and minimize injury risks [21]. Understanding and enhancing dynamic balance are essential for sprinters aiming to maintain peak performance and reduce injury occurrences [22].

METHODOLOGY

The study employed a pre-and-post experimental design and was conducted at the Thanthai Roever College of Sports Academy to assess the effects of wobble board training on balance among female sprinters. The materials used in the study included a wobble board, pen, paper, stopwatch, and measuring tape, which were essential for conducting the balance training sessions and measuring the outcomes. The study setting provided a controlled environment suitable for athletic training and assessments. College-level athletes, specifically female sprinters who met the inclusion criteria, were selected as participants using a purposive sampling technique. The study had a sample size of 15 female

sprinters and was conducted over a period of four weeks. The inclusion criteria consisted of female sprinters aged above 18 years from various athletic forms. The exclusion criteria included individuals with neurological deficits, a history of lower limb surgery within the past six months, trauma or pain in the hip, knee, or ankle, mental illness, vestibular problems, or visual impairments. By carefully adhering to these criteria, the study ensured the inclusion of healthy and physically fit female sprinters while excluding those with factors that could affect balance outcomes.

PROCEDURE

A total number of female subjects were selected for the study based on the inclusion and exclusion criteria. Before data collection, the purpose of the study was thoroughly explained to the subjects, and informed consent was obtained from those who agreed to participate. The subjects underwent a structured warm-up session followed by star wobble board exercises.

Warm-Up Session:

The warm-up session lasted for 5 minutes and was conducted prior to the training program. It included activities such as jogging in place, trunk rotation, high knees, side shuttle, sprint back pedal, and general stretches for the lower limb, including hamstring stretch, quadriceps stretch, lunges, squats, and calf raises.

Star Excursion Balance Test:

The Star Excursion Balance Test was performed using a grid marked in eight directions: anterior, anterolateral, lateral, posterolateral, posterior, posteromedial, medial, and anteromedial. The subjects were instructed to stand barefoot at the center of the star to avoid measurement errors, with the right foot designated as the touch leg and the left foot for balance. The subjects were required to perform movements in both clockwise and anticlockwise directions, repeating the movement with the same foot across all eight directions before switching legs. Each leg completed three circuits in the anterior direction. The test administrator recorded the reach distances of each successful attempt, and the subjects were allowed to step away from the testing area afterward.

Wobble Board Training:

The training was performed using a wooden wobble board. Each training session lasted 25 to 30 minutes, with each exercise performed for 30 seconds, followed by a 10-second rest. The entire set was repeated five times.

Exercises:

Double Leg Stance with Eyes Open:

The wobble board was placed on a stable surface. The subjects stood with feet hip-width apart, knees slightly bent, and engaged their core. With eyes open, they focused on a fixed point in front while shifting weight slightly to balance the board. Each balance was maintained for 20-30 seconds, performing 3-5 sets with rest intervals between sets.

Rocking the Board Front and Back:

The subjects stood on the wobble board with both feet hip-width apart and knees slightly bent. They engaged their core and maintained focus on a fixed point. The movement involved slowly shifting weight forward to raise the back of the board, then shifting backward to raise the front. The exercise was performed for 20-30 seconds, followed by rest and repeated for 3-5 sets.

Rocking the Board from Side to Side:

Subjects stood with feet hip-width apart and knees slightly bent on the wobble board. They engaged their core and maintained focus on a fixed point with eyes open. Weight was shifted to one side to raise the opposite edge, followed by shifting to the other side. This exercise was performed for 20-30 seconds, with rest intervals, for 3-5 sets.

Rotating on Balance Board:

Subjects stood on the wobble board with feet hip-width apart, knees slightly bent, and core engaged. They maintained focus on a fixed point with eyes open. The movement involved rotating the hips and upper body in one direction, returning to the center, and rotating in the opposite direction. Rotations were performed for 20-30 seconds, followed by rest, for 3-5 sets.

Single Leg Stance on Balance Board:

Subjects stood on the wobble board with one foot while slightly lifting the other leg. They engaged their core, kept the knee slightly bent, and focused on a fixed point. The position was held for 20-30 seconds while maintaining balance. The exercise was performed with both legs for 3-5 sets.

Physical Activity (Squats):

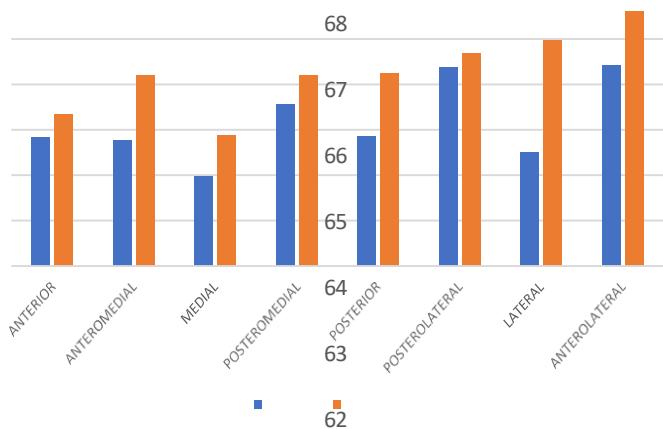
Subjects stood with feet shoulder-width apart and toes slightly turned out. They bent their knees and lowered their hips back while keeping their chest up and weight on their heels. The movement continued until the thighs were parallel to the ground or as deep as comfortable. The subjects then pushed through the heels to stand back up. Each set consisted of 10-15 repetitions, performed for 3 sets.

DATA ANALYSIS

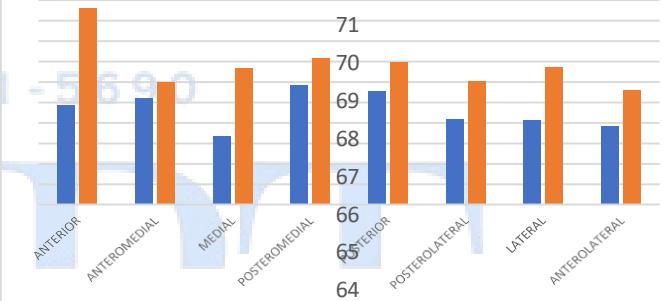
PRE AND POST MEAN VALUE OF STAR EXCURSION TEST

VARIABLE	RIGHT		LEFT	
	PRE TEST	POST TEST	PRE TEST	POST TEST
ANTERIOR	64.8 7	69.6 2	64.8 2	66.3 4
ANTEROMEDIAL	65.2 1	65.9 7	64.7 7	66.1 9
MEDIAL	63.3 7	66.6 7	63.9 8	64.8 8
POSTEROMEDIAL	65.8 4	67.1 8	65.5 5	66.1 9
POSTERIOR	65.5 7	66.9 7	64.8 6	66.2 5
POSTEROLATERAL	64.1 8	66.0 2	66.3 8	66.6 8
LATERAL	64.1 2	66.7 2	64.4 9	66.9 6
ANTEROLATERAL	63.8 3	65.5 8	66.4 1	67.6 1

STAR EXCURSION BALANCE TEST - LEFT



STAR EXCURSION BALANCE TEST - RIGHT



RESULTS

The four-week wobble board training proved to be effective in enhancing the reach distances in all eight directions of the Star Excursion Balance Test among female sprinters. Notably, the greatest improvement was observed in the anterior direction of the right lower limb, while the least improvement occurred in the medial direction of the left lower limb.

DISCUSSION

The present study aimed to investigate the effectiveness of wobble board training on dynamic balance in female sprinters, with a focus on the lower extremities. Previous research has indicated that balance abilities may vary among sprinters based on performance levels. In this context, the current study sought to assess the impact of wobble board training on the performance of the Star Excursion Balance Test (SEBT) in female sprinters.

Following a structured four-week training program, significant improvements were observed in the SEBT reach distances across all eight directions for

both lower limbs. The most notable enhancement was recorded in the anterior direction of the right lower limb, whereas the medial side of the left lower limb exhibited the least improvement. This outcome suggests that the wobble board training protocol effectively increased dynamic balance and stability, particularly in directions that are crucial for sprinting mechanics.

The SEBT is a widely recognized tool for assessing dynamic balance and lower limb stability. The improvements noted in this study imply that the wobble board training not only enhanced the participants' ability to perform the star excursion movements but also likely contributed to better overall athletic performance. By challenging proprioception and stability, the wobble board exercises facilitated neuromuscular coordination, allowing the sprinters to maintain balance while executing dynamic tasks.

This development is particularly relevant for sprinters, as maintaining optimal balance during rapid movements is essential for performance. The inclusion of 15 female sprinters as the sample size was deemed appropriate for observing the general effects of the intervention. However, it is acknowledged that a larger sample could provide more statistically significant data. The wobble board training protocol, focusing on instability exercises, was designed to target proprioceptive control and muscular coordination, thereby fostering improvements in balance and stability.

Enhanced balance following the intervention indicates improved neuromuscular adaptation, which is essential for sprinters, particularly during the gait cycle.

While short-term improvements in balance and coordination were evident, it is important to consider that long-term adaptations may require a more extended training period. The training program's duration and frequency are critical factors that could influence the observed outcomes. Although balance enhancement may not directly translate into increased sprint speed, it can indirectly support sprinting performance by reducing the risk of injuries and maintaining efficient running form. One of the key limitations of the study is its focus on balance rather than direct sprint mechanics, such as stride length, turnover rate, or force production. Consequently, the positive outcomes in balance may not immediately correspond to significant

improvements in speed. Moreover, the relatively small sample size and limited training duration may impact the generalizability of the findings. Future studies should consider incorporating a more diverse sample and extending the intervention period to evaluate sustained effects.

Wobble board training could serve as a complementary component in sprinters' conditioning routines, focusing on enhancing proprioception, joint stability, and injury prevention. Integrating balance exercises with sprint-specific training, such as plyometrics or resistance drills, may yield more comprehensive improvements. Additionally, incorporating sprint performance metrics in future research would help elucidate the direct impact of balance training on sprint outcomes.

The wobble board training appears to be a valuable tool for improving dynamic balance and stability in female sprinters. Although its direct effect on sprinting speed remains uncertain, the enhancement of neuromuscular control and proprioceptive awareness can contribute to better athletic performance and injury resilience. Further research with more robust methodologies is warranted to substantiate these findings and explore the long-term benefits of balance training in sprinting contexts.

CONCLUSION

The study on wobble board exercises and their impact on the Star Excursion Balance Test (SEBT) in female sprinters highlights the benefits of incorporating balance training into athletic routines. The exercises improved dynamic balance, proprioception, strength, and coordination, particularly in the anterior direction of the right lower limb. Although the short intervention period and small sample size may limit generalizability, the findings suggest that wobble board training can enhance stability and potentially reduce injury risk.

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