ISSN: 2321-5690
IJOPT
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
editor.ijopt@gmail.com

# EFFECT OF A STRUCTURED BALANCE TRAINING PROGRAM ON FOOTWORK IN BEGINNER BADMINTON PLAYERS

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DOI: https://doi.org/10.63299/ijopt.0060481

## ABSTRACT

**Background:** Badminton is a racket sport that needs good footwork. Footwork consists of starting, moving, braking, and returning. For performing all these activities balance plays a crucial role as it helps in quick directional movements across the court and therefore balance training must be integrated in the training on regular basis.

**Objective:** To assess the effect of a structured balance training program on beginner badminton players in the domain of footwork using shuttle run test.

**Methods:** The study included male and female beginner badminton players aged 6-14 years who had 1-2 years of playing experience and engaged in regular practice for approximately 1 hour/day and 5 hours/week. Players with any recent injury to the ankle, knee, or hip, as well as those undergoing advanced balance training, were excluded. This experimental study was conducted over a period of 6 months in Pune. Total sample of 98 participants allocated alternately into 2 groups of 49 each using convenient sampling. The shuttle run test was used as the outcome measure. A pre-shuttle run test was done for both the groups. A structured balance training program was given for 3 days/week for 4 weeks to the participants in the interventional group which consisted of various static and dynamic balance activities. A post shuttle run test was done for both the groups after 4 weeks and data analysis was performed using paired and unpaired t-test to derive the results.

**Results:** The interventional group demonstrated a statistically significant improvement in shuttle run performance following the structured balance training program.

**Conclusion:** The study concluded that the structured balance training program significantly improved footwork performance in beginner badminton players. Therefore, balance training can be considered an effective, practical, and low-cost addition to conventional badminton training, particularly for beginners as it represents an effective and evidence-based strategy for both performance optimization and injury prevention.

**Keywords:** Footwork, balance, shuttle run test, badminton.

## INTRODUCTION:

Balance is also known as postural control, is the capacity to keep the body's center of gravity (COG) vertical on a base of support.[1,2] It can be classified into static and dynamic balance. Static balance involves

maintaining a stable base of support with minimum movement. Whereas, dynamic balance refers to the ability to maintain a stable position while executing certain tasks or activities.[1]

Regular balance assessments, both static and dynamic for athletes, are an essential instrument to set and tailor the right training program by considering the sport specific.[1] Balance training is an underappreciated component of badminton training protocols, despite the fact that balance is vital for injury prevention and performance improvement.[3] Apart from the sport-specific role of balance in badminton, the general importance of balance training for injury prevention is also well established.[3] Overall, balance plays a significant part in injury prevention in badminton and other sports.[4,5]

Badminton is a racket sport that needs skilled postural shifts and movements such as hops, lunges, and quick arm movements. [3] According to both the International Federation of Sport for All and the Madison Beach Volley Tour, badminton ranks as one of the world's most popular sports, with over 200 million people participating since it was registered for the 1992 Olympics. This sport, which features five events (men's and women's singles, men's and women's doubles, and mixed doubles), is known for its high-intensity intermittent action, for which specific preparation is required in terms of technique, psychological control and physical fitness. [4,6]



Footwork can be classified into three types based on on-court location: frontcourt steps, midcourt steps, and backcourt steps. Specifically, frontcourt net footwork refers to the method of pushing the shuttle across the net or taking off to a greater height. Midcourt footwork involves footwork in the mid-court when opposing players smash the shuttle, as well as the 'jump' movement between take-off and landing. Backcourt footwork often consists of reverse receiving the shuttle as it crosses the high court in the backcourt and taking off in the backcourt.[7] While traveling around the court, the footwork should be modified according to the exact location of the hitting distance and the distance that exists between the shuttle and the player.[7]

In badminton, the player must have adequate footwork in order to reach the shuttle swiftly and score a point.[8] Athletes with quick movements and accurate footwork can take advantages over their opponents while still conserving energy throughout the game. An athlete's physical features and ability are determined from conception, and hard training will generate moderate increases in performance, which is required for success. A badminton player's ability to move quickly is also an indicator of his or her overall physical health.[8] Footwork is a crucial component of Badminton technology; learning and mastering the rapid and accurate approach is essential for laying the foundation of Badminton[8]

## METHODOLOGY:

**Study Design:** Experimental

**Participants:** Inclusion criteria: (i) Beginners (ii) Age group: 6-14 (iii) Play experience: 1 to 2 years (iv) Play hour per session: 1 hour/day (5 hours/week) (v) Both genders were included. Exclusion criteria: (i) Any recent injury to hip, knee or ankle affecting the balance (ii) Taking any advanced balance training

**Intervention:**

## STRUCTURED BALANCE TRAINING PROGRAM

### A. Unanticipated Hop to Stabilization

Participants stood in the middle of a nine-marker grid.

Sequence of number was told to them. As the progression of numbers changed, the participant would hop to a new target position.

Participants were allowed to use any combinations of hops (Anteroposterior, Mediolateral, Anteromedial/Posterolateral or Anterolateral/Posteromedial).

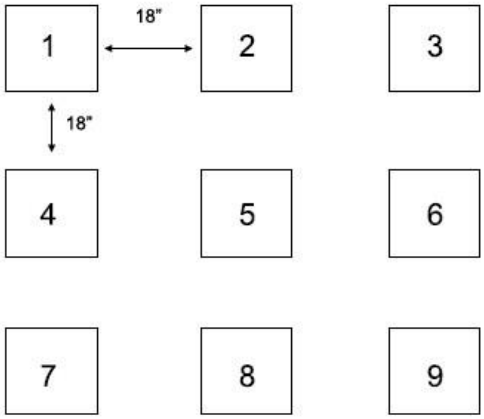
In each session, participants performed 3 sequences of numbers.

Each sequence of numbers was random such as 9,7,1,6,4,5,3,8,2.

a) 5s per move

b) 3s per move

c) 1s per move




### B. Horizontal lunge to balance

Participant was instructed to stand with both feet hip width apart & keep both the hands on the waist.

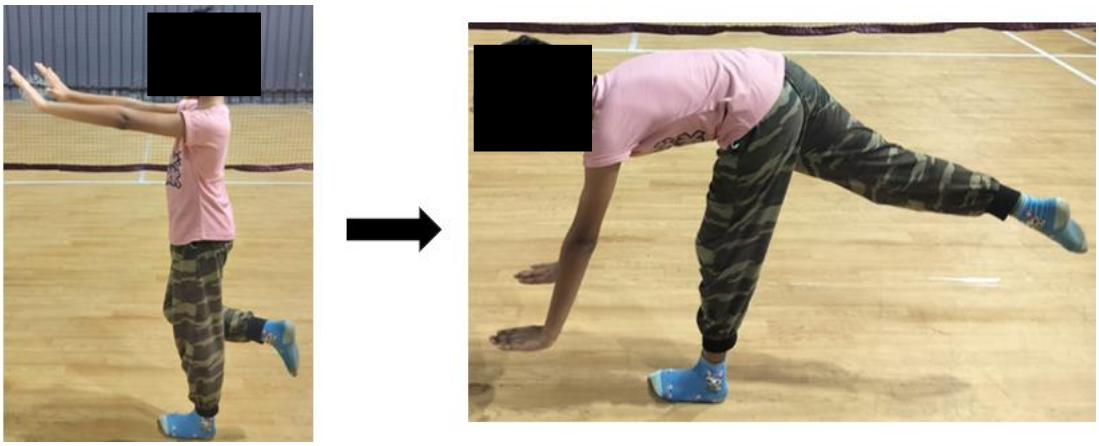
Then were asked to step one foot sideways into a lunge position and come back to the starting position.

Then repeat the same with other leg.

(10 repetitions of each direction i.e. left and right; 30s rest at end of 10 repetitions)

### C. Single leg dead lift and reach

Participant was instructed to stand straight with both feet and arms holding straight to 90°. He was then asked to shift the weight to the supporting leg, as he slides his non-supporting leg back, allowing his upper body to move forward as the hinge. Then was instructed to keep bending forward until it was almost parallel to the floor while keeping his arms straight. Participant was expected to keep the support leg and the non-supporting leg straight while doing the exercise. Then the participant was instructed to do the same procedure with the opposite leg.



**D. Single leg skater jumps**

Participant was standing with both legs hip-width apart. Then the participant was instructed to bend one leg behind the supporting leg at a slight angle, while maintaining weight and balance on the supporting leg. He was then asked to simultaneously swing his arms out and jump laterally and land over on the opposite side shifting his weight and allowing the unsupported leg to cross behind the supported leg. The participant was expected to land on the forefoot with his hips and knees bent slightly. Participant was instructed to repeat this side-to side motion, transferring the weight each time.

(20 repetitions with 30 seconds of rest at the completion of 10 repetitions)

**E. Single leg rotational skater jumps**

Participant was standing with both legs hip-width apart. Participant was instructed to bend the leg behind the supporting leg at a slight angle, while maintaining weight and balance on the supporting leg. Then the participant was asked to simultaneously swing his arms out and jump laterally, land over on the opposite side. As the participant jump to the opposite side, he was asked to rotate the upper body shifting his weight and allowing the non-supported leg to cross behind the supported leg. The participant was instructed to land on the forefoot with his hips and knees bent slightly. Participant was instructed to repeat this side-to-side motion, transferring the weight each time.

(20 repetitions with 30 seconds of rest at the completion of 10 repetitions)



**F. Hitting shuttlecocks while standing on exercise mat**

**G. Hitting shuttlecocks while standing on balance disc**

a) While standing with double limb stance

b) While standing with single limb stance

**H. Single limb stance activities**

a) Single limb stance eyes open:

i) Arms across chest on hard floor for 60s.

ii) Arms across chest for 30s on foam pad /exercise mat.

iii) Arms across chest for 60s on foam pad /exercise mat.

iv) Arms across chest for 90s on foam pad /exercise mat.

Ball toss on foam (20 throws for each)

v) for 30s

vi) for 60s

vii) for 90s

b) Single limb stance eyes closed:

i) Arms out on hard floor for 30s.

ii) Arms across chest on hard floor for 30s.

iii) Arms across chest on hard floor for 60s.

iv) Arms out on foam pad /ex. mat for 30s.

v) Arms across chest for 30s on foam pad /exercise mat

vi) Arms across chest for 60s on foam pad /exercise mat.

vii) Arms across chest for 90s on foam pad /exercise mat.

Participants performed 3 repetitions of single limb stance activities.

**I. Hop to stabilization and reach**

Participants hopped to the target position (18, 27 & 36) from the starting position, then stabilized using single limb stance & hopped back to start. 5 repetitions should be performed.

Participants were not able to advance to next until 5 repetitions were demonstrated error-free.

a) Anterior/Posterior and Medial/Lateral.

i) 18-inch hop; Allowed to use arms as aid to stabilize.

ii) 18-inch hop; with hands on hip while stabilizing after landing.

iii) 27-inch hop; Allowed to use arms as aid to stabilize.

iv) 27-inch hop; with hands on hip while stabilizing after landing.

v) 36-inch hop; Allowed to use arms as aid to stabilize.

vi) 36-inch hop; with hands on hip while stabilizing after landing

b) Anteromedial/Posterolateral and Anterolateral/Posteromedial.

i) 18-inch hop; Allowed to use arms as aid to stabilize.

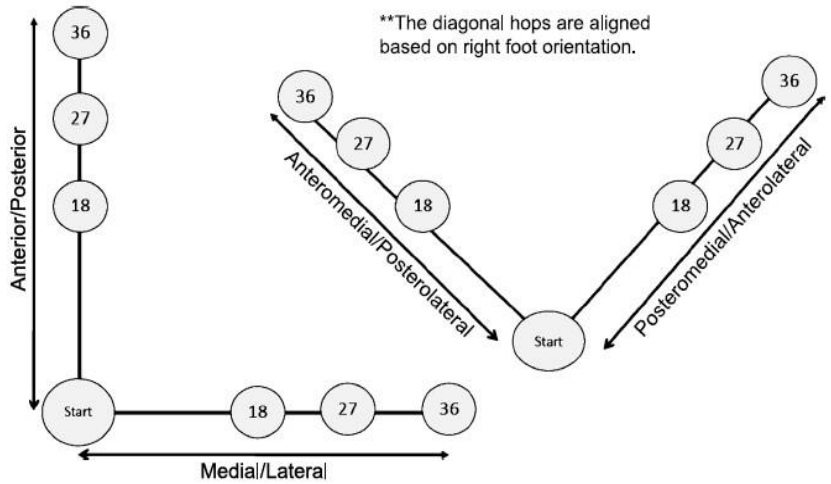
ii) 18-inch hop; with hands on hip while stabilizing after landing.

iii) 27-inch hop; Allowed to use arms as aid to stabilize.

iv) 27-inch hop; with hands on hip while stabilizing after landing.

v) 36-inch hop; Allowed to use arms as aid to stabilize.

vi) 36-inch hop; with hands on hip while stabilizing after landing.



**J. Stance activity using balance disc**

a) Double limb stance on the balance disc.

b) Single limb stance on the balance disc.

c) Throwing & catching ball in double limb stance on the balance disc.

d) Throwing & catching a ball in single limb stance on the balance disc.

45s of exercise

**K. On BOSU Ball**

a) Flat side on floor - double limb stance on the BOSU ball

b) Flat side on floor - single limb stance on the BOSU ball

c) Dome side on floor - double limb stance on the BOSU ball

d) Dome side on floor – single limb stance on the BOSU ball

**(a)** **(b)** **(c)** **(d)**

**L. Lunging in longitudinal, diagonal & transverse directions on BOSU**

a) Longitudinal lunge on dome side.

b) Diagonal lunge on dome side.

c) Transverse lunge on dome side.

10 repetitions each right and left leg and 30s break after completion of 10 repetitions.



**(a)** **(b)** **(c)**

**WEEK 1**

- A. Unanticipated hop to stabilization (a)
- F. Hitting shuttlecock while standing on an exercise mat
- H. Single limb stance activities: a) i, ii, iii, iv
  b) i, ii, iii, iv
- J. Stance activity using balance disc (a)
- L. Lunging in longitudinal, transverse and horizontal directions on BOSU (a, b, c)

**WEEK 2**

- A. Unanticipated hop to stabilization (b)
- B. Horizontal lunge to balance
- C. Single leg dead lift and reach
- D. Single leg skater jumps
- I. Hop to stabilization and reach: a) i and ii
  b) i and ii
- J. Stance activity using balance disc (b)

**WEEK 3**

- A. Unanticipated hop to stabilization (c)
- E. Single leg rotational skater jumps
- G. Hitting shuttlecock while standing on an exercise mat (a) Double limb stance
- I. Hop to stabilization and reach: a) iii and iv
  b) iii and iv
- J. Stance activity using balance disc (c)
- K. On BOSU ball (a) and (b)

**WEEK 4**

- G. Hitting shuttlecock while standing on an exercise mat (b) Single limb stance
- H. Single limb stance activities: a) v, vi, vii
  b) v, vi, vii
- I. Hop to stabilization and reach: a) v and vi
  b) v and vi

- J. Stance activity using balance disc (d)
- K. On BOSU ball (c) and (d)

**Outcome Measures:** Shuttle run test

**Statistical Analysis:** Paired and unpaired t-test

## RESULTS

**TABLE 1 : COMPARISON OF THE MEAN OF DIFFERENCE OF POST SHUTTLE RUN TIME OF CONTROL AND INTERVENTIONAL GROUP**

| GROUP | MEAN ± SD | MEAN DIFFERENCE ± SD DIFFERENCE | t-VALUE | p-VALUE | EFFECT SIZE |
|---|---|---|---|---|---|
| INTERVENTION | 17.88 ± 5.64 | 16.78 ± 0.78 | 15.76 | <0.001 | 3.18 |
| CONTROL | 1.10 ± 4.86 | | | | |

**GRAPH 1 : COMPARISON OF THE MEAN OF DIFFERENCE OF POST SHUTTLE RUN TIME OF CONTROL AND INTERVENTIONAL GROUP**

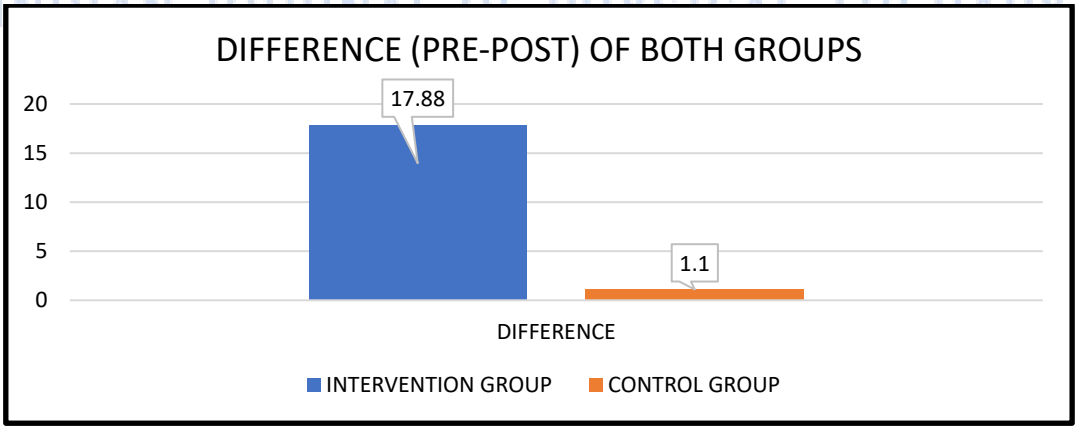



**TABLE 2 : COMPARISON OF PRE AND POST SHUTTLE RUN TIME OF INTERVENTION GROUP**

| GROUP | TIME | MEAN ± SD | MEAN DIFFERENCE ± SD DIFFERENCE | t-VALUE | p-VALUE | EFFECT SIZE |
|---|---|---|---|---|---|---|
| INTERVENTION | PRE | 173.73 ± 35.37 | 17.87 ± -1.55 | 22.17 | <0.0001 | 3.17 |
| | POST | 155.86 ± 36.92 | | | | |

**GRAPH 2 : COMPARISON OF PRE AND POST SHUTTLE RUN TIME OF INTERVENTION GROUP**

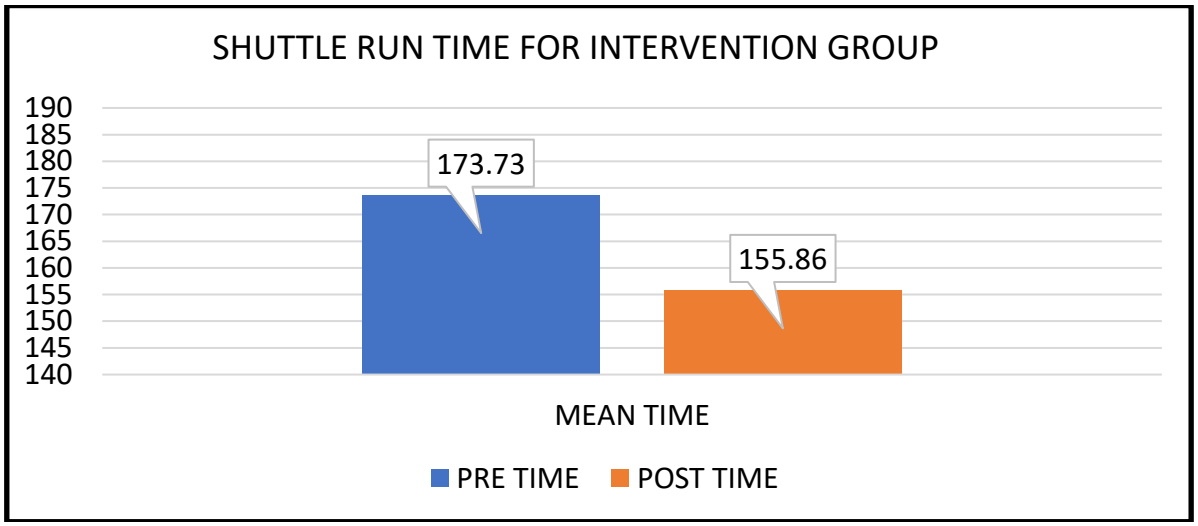
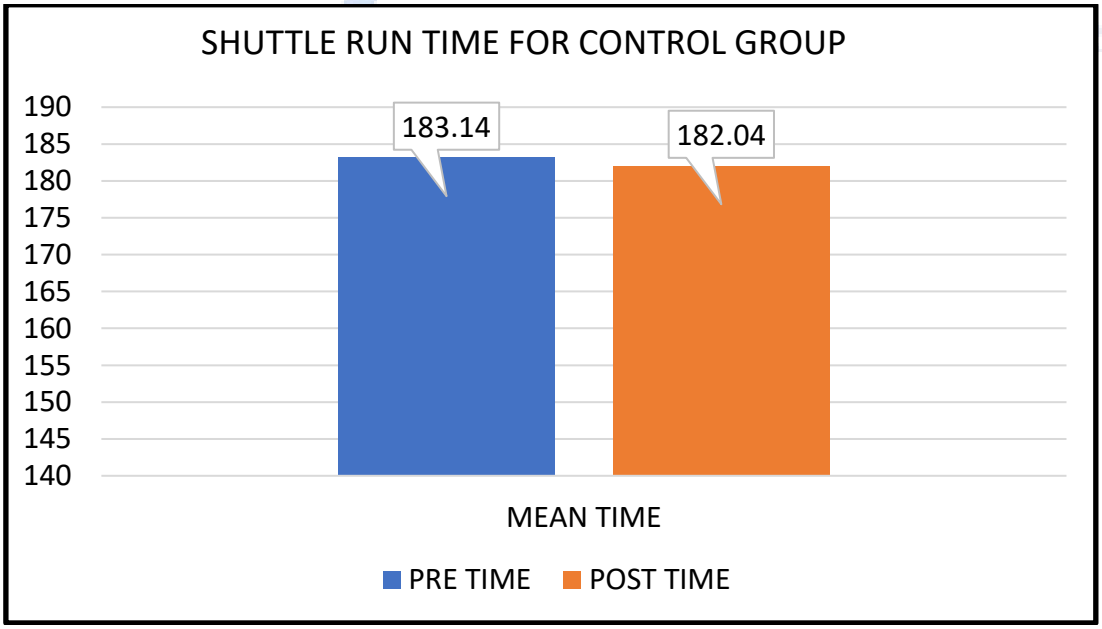



**TABLE 3 : COMPARISON OF PRE AND POST SHUTTLE RUN TIME OF CONTROL GROUP**

| GROUP | TIME | MEAN ± SD | MEAN DIFFERENCE ± SD DIFFERENCE | t-VALUE | p-VALUE | EFFECT SIZE |
|---|---|---|---|---|---|---|
| CONTROL | PRE | 183.14 ± 42.71 | 1.1 ± -1.94 | 1.59 | 0.119 | 0.23 |
| | POST | 182.04 ± 44.65 | | | | |

**GRAPH 3 : COMPARISON OF PRE AND POST SHUTTLE RUN TIME OF CONTROL GROUP**



## DISCUSSION

In this study, it was found that the balance training program was highly effective, as the time required to reach all six corners of the badminton court significantly decreased.[3,4] Prior to the intervention, participants required more time to cover the six corners; however, following the balance training program, they completed the task in substantially less time.[3] Footwork performance was assessed using the Shuttle Run Test, which measures the time taken to reach each corner of the court. Notably, only the experimental group demonstrated a significant improvement in footwork time. In contrast, participants in the control group showed mixed results—some improved slightly, others showed no change, and a few exhibited a decline compared to their pre-training times. Balance training not only improves static stability but also enhances the ability to maintain balance during rapid, sport-specific movements as badminton involves frequent multidirectional changes that require lower-limb coordination and core stability.[1,2,8]

The exercises prescribed to the experimental group included both static and dynamic balance activities. These consisted of hop to stabilization and reach, horizontal lunge to balance, single leg dead lift and reach, and single leg skater jumps. Each exercise was designed to enhance specific components of balance and postural control. For instance, the unanticipated hop to stabilization prepares the participant to respond to unpredictable visual cues and improves dynamic postural stability during rapid directional changes.[8] The horizontal lunge to balance develops lateral stability and controlled movement while shifting weight sideways, strengthening the hip abductors. The single leg dead lift and reach improves unilateral stability and trains control during forward bending while maintaining balance on a single leg.[5,8] Single leg skater jumps train the participant to perform quick side movements essential in badminton. Single leg rotational skater jumps train the same with the addition of upper body rotation which can be incorporated in backhand side movement. Hitting shuttlecock while standing on an exercise mat and balance disc train the ankle for maintain balance on an unstable surface while coordinating with the upper limb for hitting the shuttlecock.[5,6] Hop to stabilization and reach was done in all directions namely anterior, posterior, medial, lateral, anteromedial, posterolateral, anterolateral and posterolateral because this mimic the exact footwork required while playing badminton. Stance on BOSU ball provides multidirectional instability thus promoting ankle proprioception when the dome side is up and hip control and core engagement when the flat side is up. Lunging in longitudinal, diagonal and transverse directions on BOSU ball improve multiplanar balance and improve hip, knee and ankle stability.

The physiological basis for performance enhancement lies in increased activation and synchronization of stabilizing muscles around the ankle, knee, and hip joints.[2,5,8] Balance exercises stimulate mechanoreceptors in muscles and joints, enhancing proprioceptive feedback loops. This adaptation reduces postural sway and improves anticipatory control during rapid directional changes. Additionally, improvements in core stability and intermuscular coordination contribute to smoother force transfer between limbs, which may explain the improved shuttle run times observed post-intervention. Another mechanism is cognitive adaptation—balance training challenges the central nervous system, promoting better attention, focus, and motor planning. In

badminton, where split-second decisions are required, enhanced cognitive-motor integration may further support quicker footwork responses.

Therefore, this study concludes that a structured balance training program leads to significant enhancement in footwork performance among beginner badminton players, as evidenced by improved shuttle run times. The results underscore the importance of incorporating balance and proprioceptive exercises into foundational training programs to improve agility, coordination, and overall performance efficiency in court-based sports.

**CLINICAL IMPLICATIONS:**

From a clinical perspective, balance training represents an effective and evidence-based strategy for both performance optimization and injury prevention. By improving dynamic balance and lower-limb stability, athletes can achieve quicker directional transitions and maintain better postural control during play, thereby reducing the likelihood of ankle sprains and other overuse injuries commonly observed in badminton.

Practically, coaches and sports physiotherapists can readily integrate balance-oriented exercises such as single-leg stance drills, balance disc and BOSU ball training—into regular warm-up or conditioning sessions. These exercises are simple, low-cost, and adaptable across skill levels, making them feasible for widespread application in sports and rehabilitation environments.

**LIMITATIONS:**

The intervention period was limited to four weeks, which may not be enough to fully capture long-term adaptations.

Additionally, only one outcome measure that is shuttle run test was used to assess footwork performance.

Only one domain i.e. footwork was assessed.

**CONCLUSION:**

This study concludes that a structured balance training program significantly improves footwork performance in beginner badminton players. Regular incorporation of balance exercises enhances postural control, proprioception, and movement efficiency, leading to faster and more coordinated footwork on the court.

Participants who underwent balance training demonstrated faster shuttle run times and better movement control compared to those who received conventional training.

Therefore, balance training can be considered an effective, practical, and low-cost addition to conventional badminton training, particularly for beginners. Future research should focus on long-term effects, performance transfer to gameplay, and optimization of balance training protocols for different skill levels.

**FUTURE SCOPE OF STUDIES:**

A study with longer duration can be done.

Implementation of this result into actual match performance can be examined.

An addition of agility component along with balance training can be assessed.

An addition of core muscle strength component along with balance training can be assessed.

**CONFLICT OF INTEREST:** None

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