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Research Article

Effectiveness Of Traditional Balance Training Versus Dynadisc Balance Training On Sports Performance In Recreational Badminton Players

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ABSTRACT

Introduction: Balance is vital for badminton performance, influencing stability, agility, and athleticism. Both traditional balance training and Dynadisc training enhance balance through perturbations that improve neuromuscular capabilities, readiness, and reaction times. To the best of our knowledge, there is a notable lack of comparative studies among Indian players; thus, assessing the effectiveness of these two training methods is crucial for developing optimal training strategies in the sport.

Objective: The objective of this study is to investigate the effects of traditional balance training and Dynadisc balance training on badminton players. Additionally, it aims to compare the effectiveness of the traditional balance training program with the Dynadisc balance training approach.

Methodology: Thirty patients were divided into two groups: one received traditional balance training, while the other underwent Dynadisc training. A pre-post analysis was conducted on the data collected after 8 weeks of training, and the results were subjected to statistical analysis using SPSS version 20 software.

Results: Within-group analyses for Group A (traditional balance training) and Group B (Dynadisc training) revealed statistically significant improvements across all outcome measures. The Traditional Balance Test produced p-values of A = 0.0227 and B < 0.0001. Both Y Balance Tests showed significant results (A < 0.0001, B < 0.0001), while the Hexagon Agility Test and sports performance outcomes yielded A = 0.0325, B = 0.0002, and A = 0.0146, B = 0.0002, respectively. Notably, the Hexagon Agility Test (p = 0.0012) and sports performance (p = 0.051) were the only assessments that did not demonstrate statistical significance.

Conclusion: The study concluded that while both traditional balance training and Dynadisc training equally improved balance, agility, and sports performance measures, Dynadisc demonstrated significantly greater improvements in agility and sports performance compared to traditional balance training.

Keywords: *Recreational Badminton Players, Dynadisc, hexagon agility test, Y balance test, sports performance.*

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INTRODUCTION

Badminton is a globally popular sport known for its rapid and powerful shots, with racket smashes reaching speeds of up to 30 m/s. Agility, defined as the ability to move quickly and efficiently, is crucial throughout the game. As a multidirectional and fast-paced activity, badminton requires high levels of coordination, including reaction time and balance. [(1)] Maintaining the center of gravity within the base of support during gameplay is essential for skill advancement, enhanced performance, and injury prevention.

Badminton training emphasizes strength, power, endurance, and particularly balance, which can be categorized into static and dynamic forms. A study by Towel K.K.W. et al. highlights the multidimensional impact of balance on athletic performance, engaging multiple muscle groups, including the calves, hamstrings, gluteals, shoulders, and arm muscles. Balance results from neuromuscular activity that responds to feedback from visual, vestibular, and somatosensory systems, and balance training enhances the co-contraction of agonist and antagonist muscles, improving joint stability. [(2,3)]

Balance training programs should be carefully designed to ensure safety while presenting appropriate challenges, incorporating multiple planes of motion and a multisensory approach. They should be grounded in fundamental movement skills relevant to the activity and follow a progressively integrated continuum, including external resistance and proprioceptive progression. Con H. suggested that improvements in balance could decrease the proportion of muscle activity devoted to stabilization, enabling these muscles to contribute more effectively to generating motive force. [(4]Traditional balance programs have included various exercises aimed at enhancing balance performance, focusing on single and double-leg stance activities on diverse surfaces while engaging in distracting tasks. This approach stimulates reflexive joint stabilization, essential for effective sports performance in response to sudden changes in joint positioning. Unstable surfaces create these abrupt changes, making the training more dynamic and relevant to competitive sports contexts. [(2, 5)] The Dynadisc is a flexible air-filled cushion designed to facilitate multiaxial ankle movement, regardless of foot position. It stabilizes and strengthens core and spinal muscles, helping to prevent unwanted movements. Its use enhances balance and postural control, increases mobility, and reduces the risk of ankle injuries and recurrences. The primary goal of Dynadisc balance training is to improve balance through perturbations that enhance neuromuscular capabilities, readiness, and reaction times.[6]

Balance being the one of the major components of the Badminton game crucially involves entire body. In addition, Balance has been identified as a basic and fundamental skill to apply most dynamic movements to the ground surface. Repetitive movements of limbs can affect them causing limb injury. Few studies suggest the positive effect of core strengthening on balance. Literature shows traditional balance training and dynadisc balance training both are effective in improving balance. But there is paucity of comparative studies in India proving the impact of traditional balance training vs dynadisc balance training programme in badminton players. Hence it becomes essential to evaluate the effectiveness of traditional balance training versus dynadisc balance training programme in badminton players.

This study aims to evaluate the effectiveness of traditional balance training versus Dynadisc balance training in badminton players. The specific objectives include assessing the impact of both training methods on the same group and conducting a comparative analysis of their outcomes.

METHODOLOGY

Participants:

Ethical clearance for this study was obtained from the institutional committee, with approval number 039/2021-2022. A sample size of 30 participants (15 in each group) was determined based on previously published data on balance in recreational badminton players. Inclusion criteria included individuals aged 18 to 30 years, both male and female, who were recreational badminton players and willing to participate. Exclusion criteria encompassed those unwilling to play badminton, individuals with recent injuries requiring medical attention, those engaged in other sports, and those with neurological conditions affecting balance.

Participants were recruited through convenience sampling, with random allocation using an envelope method. The study population was selected from the outpatient department of physiotherapy at Krishna Institute of Medical Sciences in Karad, Maharashtra, India. All participants were informed about the study and provided written informed consent before recruitment, which was conducted based on the specified criteria, and subjects were subsequently divided into groups.

Experimental Procedures:

Demographic details, including age, height, weight, and body mass index (BMI), were collected alongside outcome measures such as the Y Balance Test, Single Leg Balance Test, Hexagon Agility Test, and Sports Performance assessment. These measures were recorded before and after the intervention to evaluate the impact of the training programs on participants' balance and badminton performance.

Intervention and frequency of the intervention:

I. Pre-therapy intervention for both the groups:

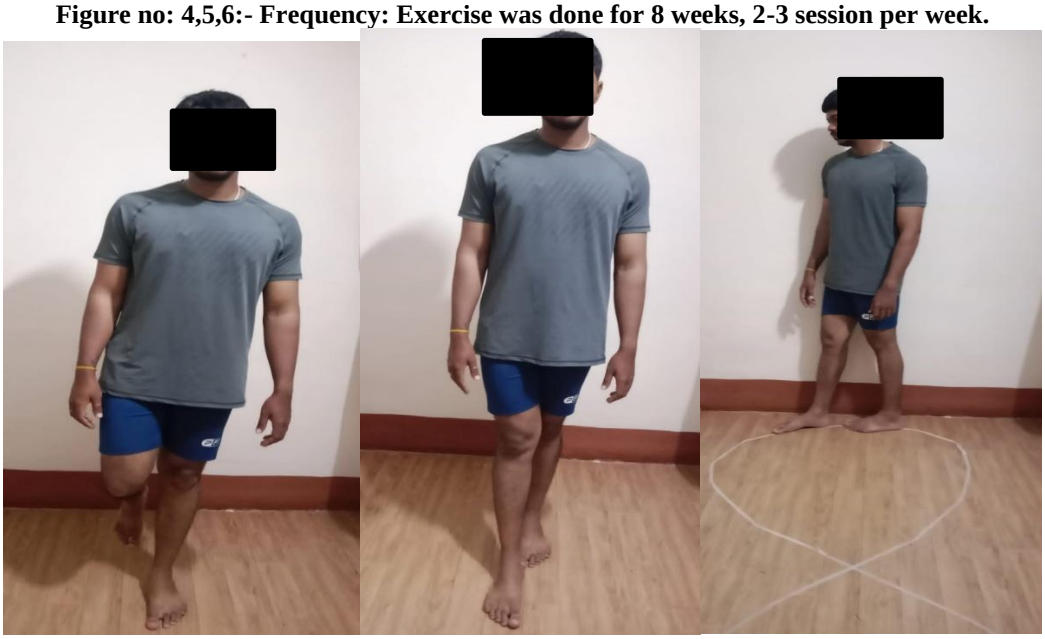
Participants had 10-12 minutes of full body warm- up, free exercises, stretching along with 2-3 minutes of rest period.

II. Group A: **Traditional balance exercises**.

The subject is asked to perform the gradual progressive movements in standing position with variations in base of support.

i. Wide base of support (with eyes open and close)
ii. Narrow base of support (with eye open and close)
iii. Standing on only one leg (with the eyes and eyes close)
iv. Stepping on stair (forward, backward and sideways)
v. Reach out exercise with sitting on medium swiss ball
vi. Perturbation in all directions

Figure no: 4,5,6:- Frequency: Exercise was done for 8 weeks, 2-3 session per week.



III. Group B: **Dynadisc balance training** (10-20repetition / session)

The subject is asked to perform the gradual progressive movements in standing position with variations in base of support.

i. Standing with double support (with eyes open and close)
ii. Standing on one leg (with eyes open and closed)
iii. Lunges (forward and reverse)
iv. Tree pose hold for 10-15sec

❖ Squats
❖ Reach-outs (sit on disc)

v. Donkey kick

Figure no: 4,5,6:- Frequency: Exercise was done for 8 weeks, 2-3 session per week.

Outcome Measures

❖ **Y balance test:-**

It required participants to remove their shoes and stand on the central footplate while maintaining a single-leg stance. They reached as far as possible with the contralateral leg in three directions—anterior, posteromedial, and posterolateral—over three trials for each leg. Maximum reach distances were recorded, and a composite score was calculated using the formula: composite score = [(sum of maximum reach distances) / (3 × limb length)] × 100, providing a standardized

measure of functional balance and stability relative to limb length.

❖ **Single leg balance test –.**

The subject is instructed to remove their footwear and assume a one-leg stance, during which a therapist times the duration. The procedure is repeated for the contralateral leg, with the elevated leg chosen randomly. Timing starts when the foot is lifted off the floor and stops when the foot returns, hands are removed from the hips, the standing foot is repositioned, or the opposite foot braces against the standing leg. Each leg undergoes three trials to ensure reliable assessment of balance stability.

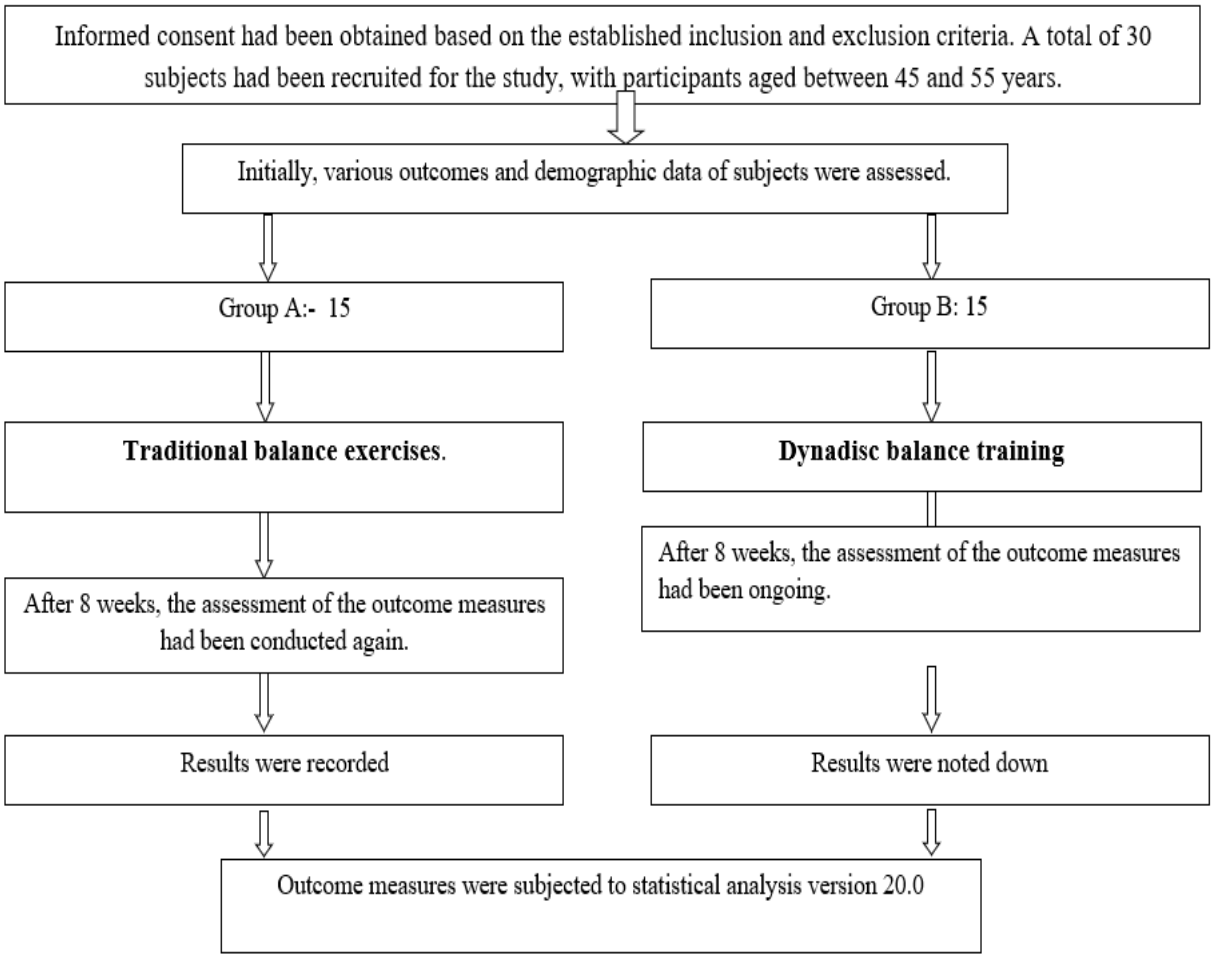
❖ **Hexagon Agility test**–

A hexagon with 24-inch sides and 120° angles was marked on the floor using tape, featuring a central 12-inch strip for the starting position. Participants stood barefoot on this strip facing the front line and, upon the command "go," jumped forward across the line before returning to the center. They then jumped outside the hexagon and back in, completing three trials. A stopwatch recorded the duration of each revolution, and the average completion times were used for analysis.

Sports performance –

In badminton, players must serve a minimum distance of 396 cm, making shuttlecock travel distance and accuracy essential for performance assessment. This study quantified performance by counting the number of times a shuttlecock landed within a target area (400–420 cm from the player) after ten serves, using a standardized racket and ten shuttlecocks. The number of successful landings was recorded for analysis, with performance measurements taken pre- and post-therapy to evaluate intervention effectiveness.

CONSORT



RESULTS

The demographic data was subjected to normality tests which was found to be having normal distribution.

1. GENDER DISTRIBUTION IN THE STUDY

A total of 30 subjects had been included in the study, comprising 16 males and 14 females (table and graph 1).

Grpah no: - 1:- Gender distribution in the study.

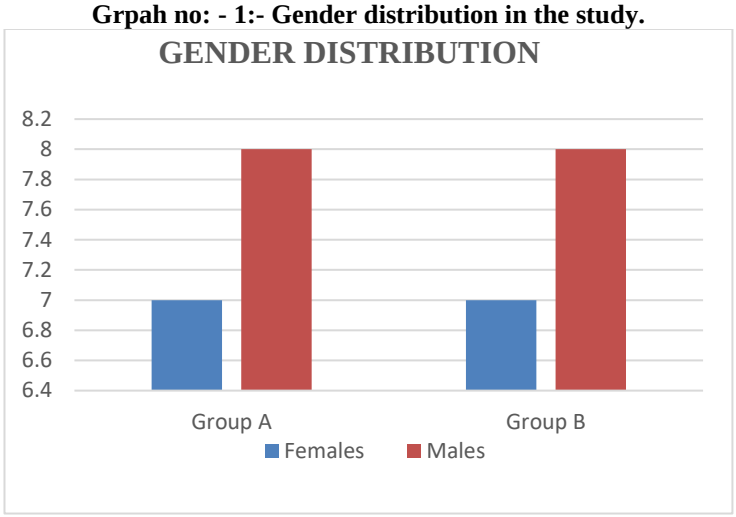


Table no:- 1:- Gender distribution in the study.

Groups	Group A	Group B	Total
Males	7	7	14
Females	8	8	16
Total	15	15	30

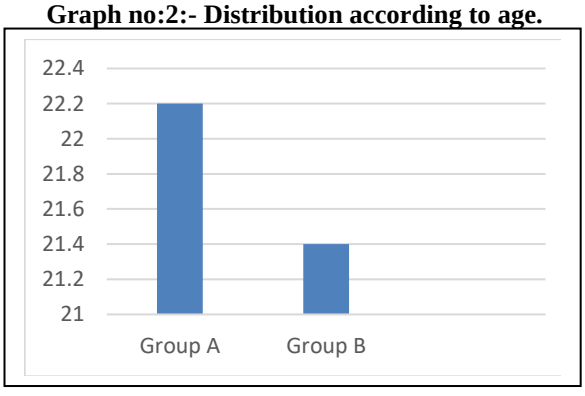
2. AGE DISTRIBUTION

Age group of all subjects ranged between 18-30 years. The mean age of Group A was 22.2 and that of Group B was 21.4. (table and graph 2)

Table no: -2:- Age distribution.

Groups	Mean Age (years) ±SD
Group A	22.2±2.7
Group B	21.4±2.2

Graph no:2:- Distribution according to age.



3. OUTCOME MEASURES

Table 3: SINGLE LEG BALANCE TEST - Intra-Group comparison (within Group) using Paired T test.

The Single Leg Balance Test showed significant improvement in Group A (p = 0.0227) and a highly significant change in Group B (p = 0.0001) from pre- to post-assessment. (table and graph 3)

Groups	Single Leg Balance Test	Mean± SD	p value
A	Pre	18.6±5.6	0.0227
	Post	20.17±5.8	
B	Pre	20±6.6	0.0001
	Post	24.1±6.9	

Graph 3:- SINGLE LEG BALANCE TEST - Intra-Group comparison (within Group) using Paired T test

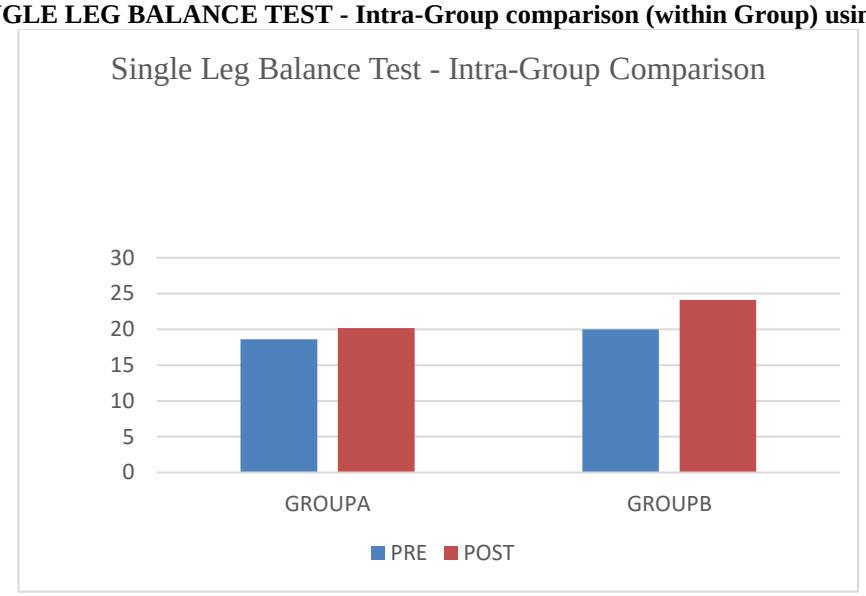


Table no: 4: - Y BALANCE TEST - Intra-Group comparison (within Group) using Paired T test.

Groups	Y balance test	Mean± SD	p value
A(Right)	Pre	87.3±5.6	<0.0001
	Post	87.4±5.0	
A (Left)	Pre	90.3±4.6	<0.0001
	Post	89.4±4.4	
B(Right)	Pre	88.8±6.0	<0.0001
	Post	91.4±5.1	
B (Left)	Pre	87.6±5.5	<0.0001
	Post	90.3±4.6	

The Y Balance Test showed statistically significant improvements within both groups (A and B) for right and left sides ($p < 0.0001$), indicating enhanced balance post-intervention. (table and graph 4)

Graph 4:- Y BALANCE TEST – Intra-Group comparison (within Group) using Paired T test.

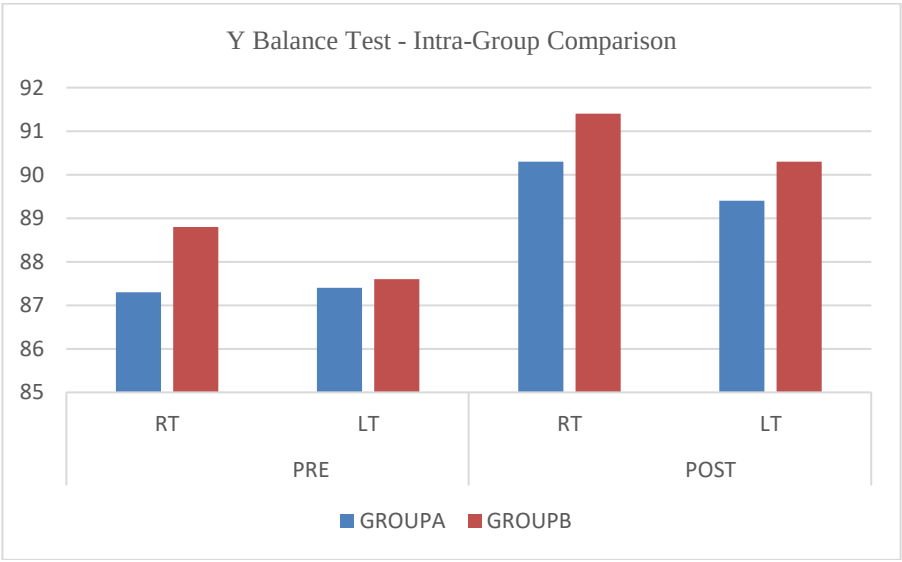
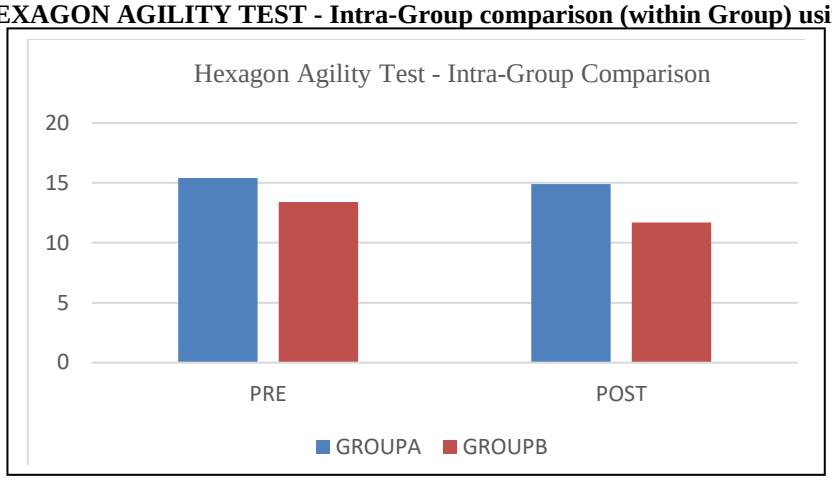


Table no: 5:- HEXAGON AGILITY TEST – Intra-Group comparison (within Group) using Paired T test.

Groups	Hexagon Agility Test	Mean± SD	p value
A	Pre	15.4±3.0	0.0325
	Post	14.99±3.1	
B	Pre	13.4±3.7	0.0002
	Post	11.7±3.1	

The Hexagon Agility Test showed significant improvement within both groups, with Group A (p = 0.0325) and Group B (p = 0.0002) demonstrating faster post-intervention times. (table and graph 5)

Graph no:5:- HEXAGON AGILITY TEST - Intra-Group comparison (within Group) using Paired T test.

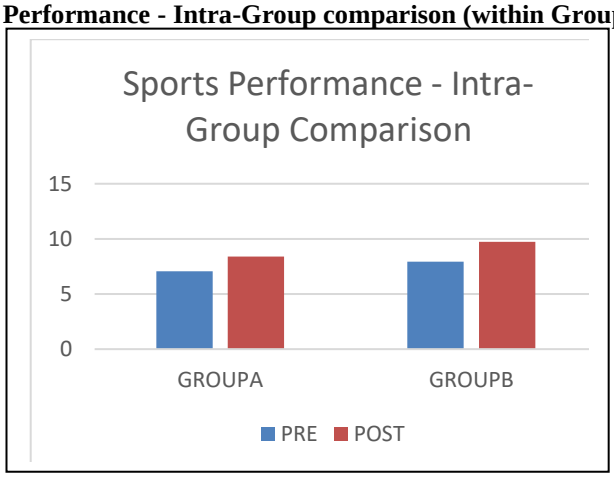


Sports performance significantly improved within both groups, with Group A (p = 0.0146) and Group B (p = 0.0002) showing higher post-intervention scores. (table and graph 6)

Table no: 6:- Sports Performance - Intra-Group comparison (within Group) using Paired T test.

Groups	Sports Performance	Mean± SD	p value
A	Pre	7.06±1.8	0.0146
	Post	8.4±0.99	
B	Pre	7.9±1.4	0.0002
	Post	9.7±0.59	

Graph no:6 :- Sports Performance - Intra-Group comparison (within Group) using Paired T test.

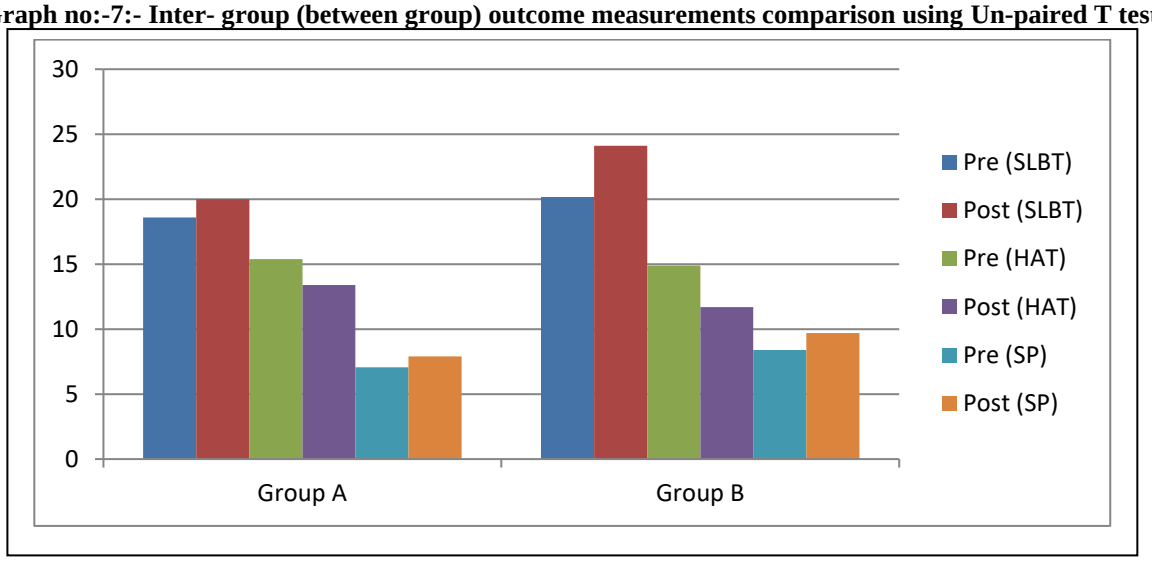


The inter-group comparison revealed no significant differences between Groups A and B in most outcomes (p > 0.05), except for the Hexagon Agility Test post-intervention, where Group B performed significantly better (p = 0.0012). (table and graph 7).

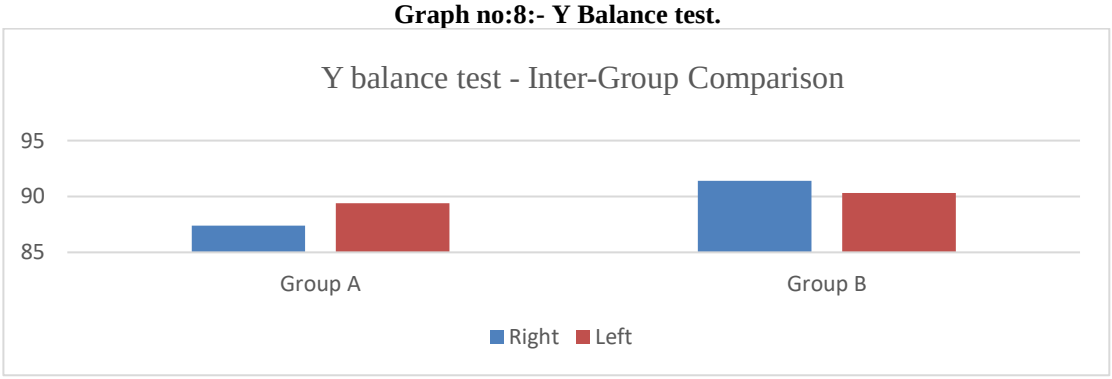
Table no: 7:- Inter- group (between group) outcome measurements comparison using Un-paired T test.

Outcome	Time point		Group		Mean difference ± SD error	p value
			Group A	Group B		
Single leg balance test	Pre		18.6±5.6	20±6.6	1.4±1	0.1596
	Post		20.17±5.8	24.1±6.9	3.93±1.1	0.1901
Y balance test	Pre	Rt	87.3±5.6	88.8±6.0	1.5±0.4	0.1578
		Lt	90.3±4.6	87.6±5.5	2.7±0.9	0.2152
	Post	Rt	87.4±5.0	91.4±5.1	4±0.1	0.5578
		Lt	89.4±4.4	90.3±4.6	0.9±0.2	0.6077
Hexagon agility test	Pre		15.4±3.0	13.4±3.7	2±0.7	0.9019
	Post		14.9±3.1	11.7±3.1	3.2±0	0.0012
Sports performance	Pre		7.06±1.8	7.9±1.4	0.84±0.4	0.9189
	Post		8.4±0.99	9.7±0.59	1.3±0.4	0.051

Graph no:-7:- Inter- group (between group) outcome measurements comparison using Un-paired T test.



Graph no:8:- Y Balance test.



DISCUSSION

This study aimed to compare the effectiveness of traditional balance training versus Dynadisc balance training in enhancing sports performance among recreational badminton players. We hypothesized that participants would experience greater improvements in balance and athletic performance after an 8-week Dynadisc program compared to traditional training. [7] Recreational badminton players require a combination of strength, power, endurance, and balance for optimal performance. Research by Towel K.K.W. et al. emphasized the need for athletes to rapidly and continuously adjust their posture in response to shuttlecock movements. Key factors such as reaction time, stride length, and balance are vital for improving athletic skills and preventing injuries. [8]

Traditional balance programs have aimed to enhance balance through single and double-leg stance activities

on various surfaces, often with distracting tasks. A study by Trecroci A et al. compared 12 weeks of traditional balance training to slack training in young soccer players, finding that traditional balance training led to similar improvements in the Balance Error Scoring System, Star Excursion Tests, and sprint performance with 900-degree turns.[9] The authors concluded that such exercises effectively improved balance by enhancing muscle flexibility and endurance, both vital for athletic performance. Consistent with these findings, the present study showed significant within-group improvements in single-leg stance, Y balance test, sports performance, and hexagon agility, while between-group analysis revealed distinct differences in outcomes between the training regimens.

A 2010 study by Tracey C. E. et al. examined the effects of multiaxial versus uniaxial unstable surface balance training on 36 male and female college soccer players. Participants were randomly assigned to Control, Rocker Board, or Dynadisc groups, with training conducted three times per week for four weeks. Within-group pre-post analysis showed no significant p-values; however, combined therapies yielded significant effects. The authors concluded that integrating both training methods, along with increased physical activity, improved balance scores.[2] In contrast, the current study found significant within-group improvements in the Single Leg Balance Test, Y Balance Test, Hexagon Agility Test, and sports performance. Between-group analysis indicated that only the Hexagon Agility Test and sports performance improved significantly, suggesting no notable difference in the overall effects of traditional versus Dynadisc training, likely due to the exercises enhancing muscular strength, agility, and coordination. According to statistical analysis, the results supported the there is a significant difference between the effectiveness of traditional balance training and dynadisc balance training on sports performance of recreational badminton players. The results showed that there is more improvement in the group B which is dynadisc balance training program.

CONCLUSION

The current analysis concluded that both traditional balance training and Dynadisc balance training are equally effective in enhancing balance among recreational badminton players. However, Dynadisc training provides additional benefits, significantly improving agility and overall sports performance, suggesting it extends beyond mere balance enhancement.

AUTHORS CONTRIBUTION

The authors have contributed equally to content designing, writing and editing of manuscript

AUTHOR FUNDING

The study is self- funded study

CONFLICT OF STUDY

The author declared that there are no conflicts of interest concerning the content of present study.

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