Original Article

The Effectiveness of Core Stability Exercise and Plyometrics Balance and Agility in Badminton Players

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Abstract

Background: Exercises including plyometrics can boost lower extremity strength. According to a different study, teenage badminton players' dynamic balance, endurance, and agility are improved after 6 weeks of core training. The development of core muscles may improve athletic performance.

Objective: To evaluate the effectiveness of core stability exercise and plyometrics balance and agility in badminton players in terms of pain using Illinois test and Star Excursion Balance Test.

Methodology: It is an experimental study with random sampling technique. Sample size consists of 30 members in total where they are split randomly into 2 groups (15 in each group). Players in Group A received Core strengthening training in addition which includes Leg-up. Similarly Group B received Plyometrics training along with Leg up. Exercises to calm down were performed at the end of the session. Both the groups received intervention for 30 minutes thrice a week for 6 consecutive weeks.

Results: According to the intra-group analysis, treatments A and B are equally successful in lowering the Agility Score and raising nearly all of the SEBT scores for the left and right legs, with the exception of the medial and lateral scores for the left leg. The results of the inter-group analysis revealed that Treatment B is more successful than Treatment A in terms of mean Agility Score decrease, whereas Treatment A is more effective than Treatment B in terms of mean Anterior scores for the right Leg improvement. With the exception of Agility and the anterior score for the right leg, both treatments were shown to be equally effective across the board.

Conclusion: When compared to Core Stability Exercise, plyometrics help badminton players become more agile and balanced.

Keywords: Plyometrics, core stability, Agility, Balance, Illinois test, SEBT

Introduction

Badminton is a non-contact, solitary activity that calls for leaps, lunges, quick direction changes, and quick leg actions from various postural postures. High-intensity rallies take place on the court frequently throughout a game of badminton. There are 650 teams with more than 170,000 participants total. The strange and perplexing flight path of the shuttle requires exceptional skill to hit the target [1].

Two- or four-player racquet sport called badminton has a temporal structure characterized by bursts of intense action. It is generally accepted

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that success in top badminton requires a combination of mathematical, tactical, anthropometric, physical, and cerebral talent. It is a strenuous physical activity that demands endurance, strong control, and agility when moving fast around the court[2].

Agility and dynamic control are critical motor skills for hitting a shuttlecock in a badminton game[3]. Badminton players must also do repeated motions such as skipping, squatting, and moving positions. The capacity to shift course swiftly and effectively is known as agility[4]. In badminton, players need to move rapidly in all directions to reach the shuttlecock and respond to their opponent's shots effectively[5].

Good agility allows players to cover the court efficiently and be in a better position to make successful shots. Dynamic control involves the ability to maintain body stability and balance during rapid movements. In badminton, players must be able to adjust their body position quickly while hitting shots, especially during lunges, jumps, and overhead strokes[6] .

This skill helps in generating power and accuracy during shots while preventing injuries caused by awkward landings or overexertion. Repetition of Motions: Badminton is a game that demands repetitive actions like skipping, squatting, and frequent changes in positions. These repetitive movements enhance muscle memory and enable players to execute various strokes more effectively. Regular practice of these motions helps players build strength, endurance, and precision in their game[7]. Skipping or jump rope exercises are common in badminton training as they improve footwork, coordination, and cardiovascular fitness. Skipping drills help players develop quick and light foot movements, which are essential for swift court coverage and rapid changes in direction. Squatting: Squatting is crucial for maintaining a low center of gravity, especially during defensive movements and powerful shots[8].

A lower stance allows players to be more stable and agile on the court, enabling them to react faster to the shuttlecock and perform dynamic shots like smashes and drops. Moving Positions: Continuous movement and quick changes in position are fundamental in badminton. Players need to transition smoothly between different areas of the court to anticipate their opponent's shots and create better attacking opportunities [9].

Practicing various footwork patterns helps players become more adept at moving efficiently on the court. Overall, the combination of agility, dynamic control, and repeated motions enhances a badminton player's overall performance and contributes to their success in the game. Training these motor skills regularly can significantly improve a player's on-court capabilities and contribute to their competitive edge. Muscle strength, muscular stamina, capacity, pace, stability, balance, and coordination are all essential factors for badminton players[10] .

There are some crucial factors that contribute to a badminton player's performance and success. Muscle strength is essential for generating power in badminton shots, such as smashes and clears. Strong muscles allow players to hit the shuttlecock with more force, making it challenging for opponents to return the shots. Additionally, strength is crucial for maintaining stability during lunges and other dynamic movements. Muscular Stamina: Badminton matches can be physically demanding, lasting for extended periods with frequent bursts of high-intensity movements[11].

Muscular stamina refers to the ability of muscles to sustain prolonged activity without fatigue. Good muscular stamina ensures that players can maintain their performance level throughout the match. Capacity: Capacity here likely refers to cardiovascular fitness or aerobic capacity. Badminton is an aerobic sport that requires players to have good cardiovascular endurance. A strong cardiovascular system enables players to endure the fast-paced nature of the game and recover quickly between points. Pace: Pace in badminton refers to the speed at which a player can move around the court and react to shots[12]. Plyometric training is a dynamic method of strengthening that involves quick (such as a drop leap) or slow (such as a countermovement jump) actions during the stretch-shortening cycle while doing vertical and horizontal jumps and center-of-gravity displacements[16].

Aim

The aim of this study is to evaluate the impact of plyometrics and core stability exercises on badminton players' dynamic balance and agility.

Materials and Methodology

This is a pilot study carried out in a private Sports Academy in Chennai during the period of August 2022 to November 2022. Based on the selection criteria used in this investigation, 30 samples were selected. Following receipt of the patient's consent form, the Illinois and Pre-Star excursion balancing tests were conducted. They were split up into two groups of 15, each with their own members.

The individual's prior consent was obtained. Players were then informed of the process and the significance of the study. The Star Excursion Balance Test (SEBT), which measures balance in four directions (anterior, posterior, medial, and lateral), was used in a previous examination of an individual's agility, along with the Illinois T test. Two groups of participants were randomly assigned. One group does core stability exercises, and the other does plyometric exercises. Exercises were done by both groups for 6 weeks.

Inclusion criteria:

Competent amateur badminton players Male players aged 18 to 25 were chosen, and they had to play badminton four days a week without taking part in any regular abdominal or plyometric training.

Exclusion criteria:

Players with recent injuries, including lower limb fractures, those who have experienced low back discomfort within the last month, those who have had a lower limb fracture within the past four months, and those who have suffered from chronic ligament sprains are also excluded.

Outcome Measures

The study used Illinois Agility Test and Star Excursion Balance Test (SEBT)

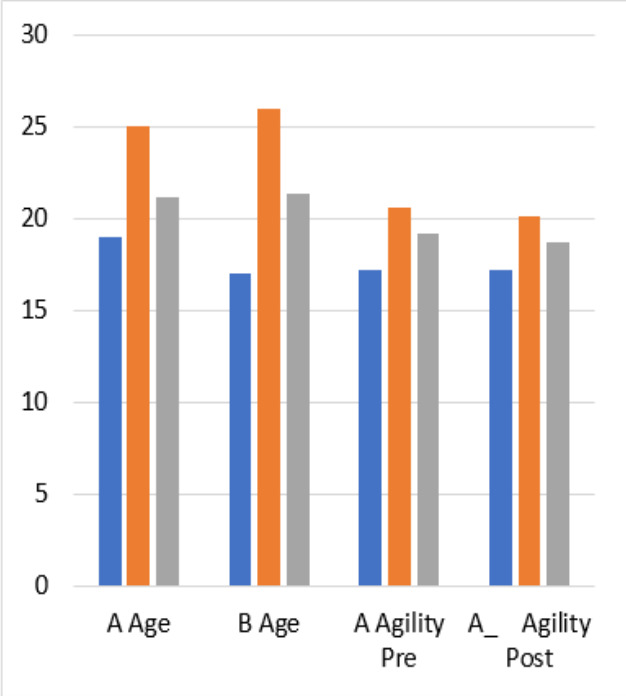
Procedure

The Illinois T test was used to evaluate agility performance. Four subjects were positioned in the centre of the 10-by-5-meter test area, spaced 3.3 metres away from one another. The test volunteers were told to complete the course as rapidly as they could. Stopwatch was used to record the value.

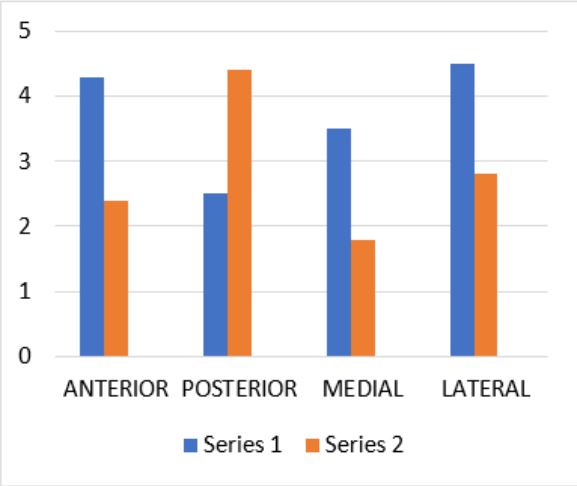
With SEBT, dynamic balance performance was evaluated. The player took the SEBT while standing in the middle of an 8-line, properly measured grid that had been laid out on the ground. The eight lines were labelled Anterior (A), Anterio-Lateral (AL), Antero-Medial (AM), Medial (M), Posterior (P), Postero-Medial (PM), and Lateral (L) depending on the direction of the excursion in relation to the stance leg. The players maintained a single-leg posture while doing the SEBT. A centimeter-long measuring tape was used to calculate the distance from the grid's centre to the point of contact.

Additionally, players in Group A got instruction in Core Stability Exercises, which included Leg-ups. Similar to Group A, Group B also received instruction in Leg up and plyometrics. Cool-down exercises brought the programme to a close. For six weeks straight, both groups got intervention for 60 minutes three times a week.

Data Analysis

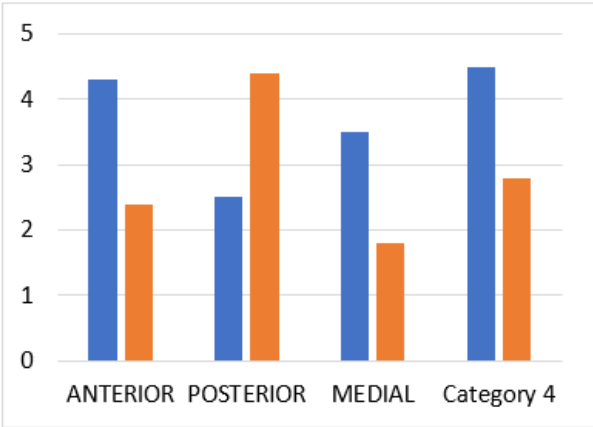


GRAPH 1: Pre- and Post-test agility.



GRAPH 2: Pre- and Post-test for SEBT group

Treatment A results in a substantial decrease in the Agility score (t = 4.01, p = 0.001 0.05). Additionally, the mean results show that Treatment A caused the mean Agility score to drop from 19.20 (before) to 18.68 (post).



GRAPH 3: Pre and Post value for SEBT group B

Treatment B significantly lowers the Agility score (t = 6.08, p = 0.000 to 0.05). Additionally, the mean results show that Treatment B caused the mean Agility score to drop from 19.10 (pre) to 16.98 (post).

Result

The intra-group analysis revealed that, with the exception of the medial and lateral SEBT scores for the left leg, both treatments A and B are successful in lowering Agility Score and boosting nearly all SEBT scores for left and right.

The results of the inter-group analysis revealed that Treatment B is more successful than Treatment A in terms of mean Agility Score decrease, whereas Treatment A is more effective than Treatment B in terms of mean Anterior scores for the right Leg improvement.

With the exception of Agility and the right leg's anterior score, both treatments were shown to be equally effective across the board.

Discussion

In this study, the efficiency of plyometrics Group B and Core Stability Exercise Group A in enhancing the dynamic balance and agility of badminton players was compared. This study demonstrates that Group A is more successful than Group B in terms of mean improvement in anterior scores for the right leg, whereas Group B is more effective in terms of mean reduction in Agility Score. The intra-group analysis revealed that, with the exception of Medial and Lateral for the Left Leg, both Groups A and B are successful in lowering Agility Score and raising nearly all SEBT scores for the left and right. In terms of the mean drop in Agility Score, the intergroup analysis reveals that Group B is more effective than Group A. In contrast, Group A outperforms Group B in terms of the average improvement in anterior leg scores for the right leg the same result in their research and hypothesis that plyometric exercises might aid in enhancing agility because they take use of the neuromuscular system's adaptation to the stretch-shortening cycle to strengthen the legs and enhance agility

The study concluded that combined Plyometric Training and weight training significantly enhances hip and thigh power production, as measured by the vertical jump, than weight training program.[13].

By enhancing the dynamic balance and agility of badminton players, the study intended to determine the efficacy of Core Stability Exercise and Plyometrics. Age baselines for the study's participants were available. The findings of this study supported the hypothesis that badminton players had better balance and agility. In terms of motor and action controls, badminton demands a certain level of physical training; key motor demands in this sport are response time, foot striding, and static or dynamic balance[14].

Plyometric exercises include rapidly extending a muscle, which is followed by an action that shortens or constricts the same muscle and connective tissue. The primary goal of the study is to contrast how plyometric and Core Stability Exercise affect badminton players' agility and balance. The majority of research indicates that athletes who participated in plyometric and Core Stability Exercise training programmes showed improvements in their agility and balance. However, there isn't much research that contrasts the benefits of training with plyometric and core stability exercises. However, all of the assessments, with the exception of the anterior score for the right leg, indicated that both treatments were equally beneficial[15].

Conclusion

This study demonstrates that plyometric training rather than core stability exercises benefits badminton players' agility and balance since it rejects the null hypothesis. With the exception of the anterior score for the right leg, both treatment groups A and B were shown to be equally beneficial across all metrics. As a result, this may be included into a therapeutic plan for more research and injury prevention.

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