

## EFFECT OF PLYOMETRIC TRAINING ON EXPLOSIVE STRENGTH AND FLEXIBILITY AMONG NOVICE BADMINTON PLAYERS

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### ABSTRACT

This study aimed to assess the effect of plyometric training on explosive strength and flexibility among novice badminton players. Thirty novice badminton players, aged 9 to 12 years, were randomly assigned to two groups: a treatment group that participated plyometric training with regular badminton training, and a control group that engaged in regular badminton training only. The plyometric training program lasted for eight weeks, with sessions held three times per week. Pre- and post-test measurements were taken for explosive strength using the standing broad jump test and flexibility using the sit-and-reach test. The data were collected and analysed using the paired t-test, and the level of significance was set at 0.05. Results indicated that after eight weeks of training, the treatment group showed significant improvements in explosive strength (pre-test:  $138.67 \pm 12.57$ , post-test:  $146.07 \pm 9.79$ ;  $t = 6.15$ ,  $p = 0.000$ ) and flexibility (pre-test:  $30.13 \pm 4.49$ , post-test:  $33.4 \pm 2.92$ ;  $t = 2.64$ ,  $p = 0.019$ ). The control group showed no significant changes in either attribute (explosive strength:  $t = 1.5$ ,  $p = 0.156$ ; flexibility:  $t = 0.498$ ,  $p = 0.626$ ). These findings suggest that plyometric training is an effective method for enhancing key physical attributes, particularly explosive strength and flexibility, in novice athletes.

*Keyword:* - Plyometric, explosive strength, flexibility, badminton.

### INTRODUCTION

Badminton is a fast-paced, dynamic sport that demands a combination of speed, agility, strength, and flexibility from its players. The game involves rapid directional changes, quick sprints, high jumps, and powerful strokes, which all require a significant amount of explosive strength and flexibility. Explosive strength, defined as the ability to exert maximal force in the shortest time, plays a critical role in movements like jumping, sprinting, and lunging, all of which are essential for effective badminton performance. Flexibility, on the other hand, allows players to reach for and execute shots at a greater range of motion, thus contributing to enhanced performance and injury prevention. Recent studies have highlighted the significance of incorporating plyometric exercises into regular training routines to boost athletic performance by improving explosive strength and flexibility (Markovic, 2007; McBride et al., 2002). Plyometric training, known for its emphasis on rapid and powerful movements, has been shown to improve muscle power and speed, which are critical for sports performance (Chelly et al., 2009). Additionally, flexibility, often overlooked in strength-focused training programs,

is vital for improving range of motion, injury prevention, and overall performance in dynamic sports like badminton (Radziminski et al., 2014)

Plyometric training has emerged as one of the most effective methods to enhance these two attributes. Originating in the 1970s, plyometric training was initially used by Soviet athletes and coaches to improve performance in track and field sports. The term "plyometrics" is derived from the Greek word "plio," meaning more, and "metric," meaning measure, reflecting the concept of increasing the "power" or force production in muscles. Plyometric exercises involve explosive movements that rapidly stretch and then shorten the muscle, which enhances the muscle's ability to generate force quickly. Common plyometric exercises include jump squats, box jumps, depth jumps, and bounding, all of which focus on improving power, agility, and flexibility.

While plyometric training has been widely studied in various sports, its specific impact on novice badminton players remains underexplored. Novice athletes, who typically have less-developed physical capabilities, can particularly benefit from plyometric training to lay a strong foundation for future skill development. By improving key physical attributes such as explosive strength and flexibility, plyometric exercises can significantly enhance overall performance and provide a competitive edge, even at the beginner level. This study aims to investigate the effects of plyometric training on explosive strength and flexibility among novice badminton players, offering insights into how such training can benefit athletes in this fast-paced sport.

## METHODOLOGY

This study was conducted with 30 novice badminton players aged 9 to 12 years, enrolled in a badminton academy located in the Imphal West district of Manipur. The participants were selected using a random sampling method and were divided into two groups: Group I (treatment group) and Group II (control group). Both groups participated in regular badminton training, but only Group I engaged in additional plyometric training.

### Training Program

The plyometric training program for Group I consisted of three sessions per week, each lasting approximately 45 minutes. The program included exercises like jump squats, box jumps, and depth jumps, designed to target explosive strength. Additionally, flexibility exercises such as dynamic stretches and static stretches were added into the routine. Group II, the control group, participated only in regular badminton training, which focused on skill development and basic physical conditioning.

### Data Collection

To assess the impact of the training programs, both groups were tested twice: once before the start of the training (pre-test) and once after completing the eight-week program (post-test). Explosive strength was measured using the standing broad jump test, and flexibility was measured using the sit-and-reach test. The results from both tests were used to evaluate the effectiveness of the plyometric training program.

## Statistical Analysis

Data collected from pre- and post-test measurements were analysed using the paired sample t-test to compare the changes in explosive strength and flexibility within each group. A significance level of 0.05 was set, meaning that any p-value below this threshold would indicate a statistically significant change. The data were analyzed using SPSS software to compute the t-values and p-values.

## ANALYSIS OF DATA

The data collected from the pre- and post-test measurements on explosive strength and flexibility were analysed to assess the impact of the training programs on the participants. A paired sample t-test was used to compare the results within each group (Group I and Group II) and determine whether there were significant differences in explosive strength and flexibility after eight weeks of training. The significance level was set at 0.05, meaning any p-value below this threshold would indicate a statistically significant change. The analysis was conducted using SPSS software. The following tables - I present the results of the statistical analysis for both groups.

**TABLE – I**  
**ANALYSIS OF PAIRED SAMPLE T TEST**

| Variables          | Group           | Test      | N  | Mean   | S.D   | df | 't' value | Sig.  |
|--------------------|-----------------|-----------|----|--------|-------|----|-----------|-------|
| Explosive Strength | Treatment Group | Pre-test  | 15 | 138.67 | 12.57 | 14 | 6.15      | .000* |
|                    |                 | Post-test | 15 | 146.07 | 9.79  |    |           |       |
|                    | Control Group   | Pre-test  | 15 | 139.13 | 11.16 | 14 | 1.5       | .156  |
|                    |                 | Post-test | 15 | 140.93 | 8.77  |    |           |       |
| Flexibility        | Treatment Group | Pre-test  | 15 | 30.13  | 4.49  | 14 | 2.64      | .019* |
|                    |                 | Post-test | 15 | 33.4   | 2.92  |    |           |       |
|                    | Control Group   | Pre-test  | 15 | 29.25  | 5.19  | 14 | .498      | .626  |
|                    |                 | Post-test | 15 | 28.61  | 3.37  |    |           |       |

*\*Significant level at 0.05 level.*

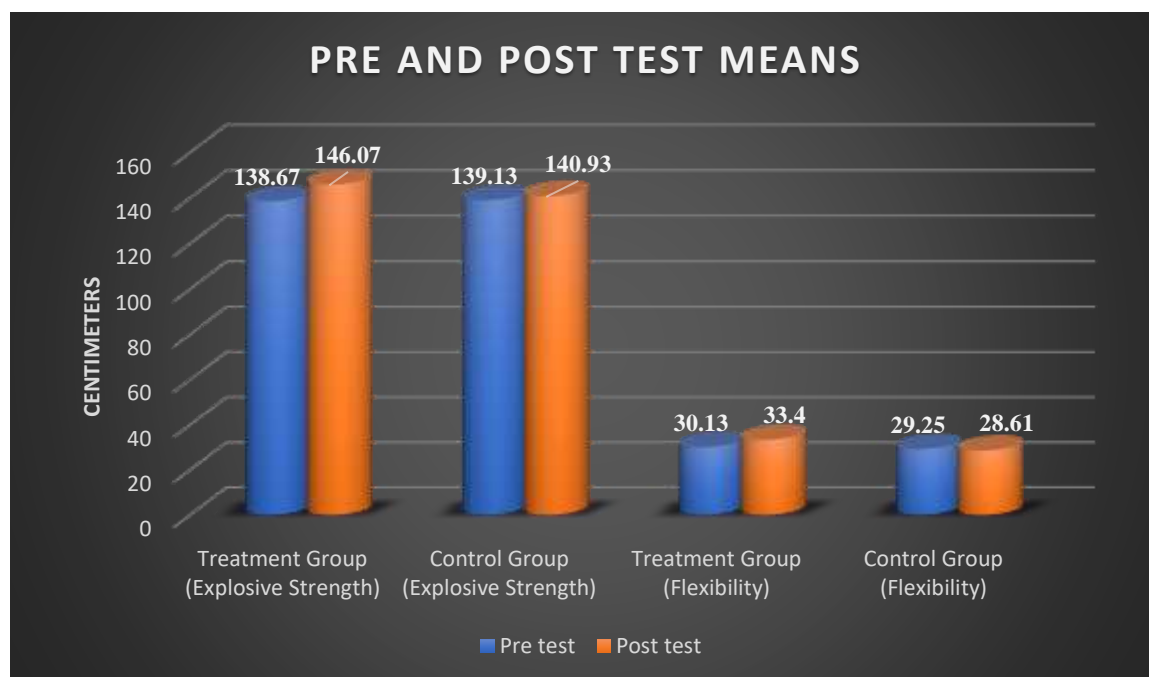
For explosive strength, the treatment group had a pre-test mean of 138.67 (SD = 12.57), and the post-test mean of 146.07 (SD = 9.79). The t-value for the comparison of the pre- and post-test results was 6.15, with a p-value of 0.000, which is below the significance level of 0.05, indicating a statistically significant improvement in explosive strength. In contrast, the control group had a pre-test mean of 139.13 (SD = 11.16) and a post-test mean of 140.93 (SD = 8.77). The t-value was 1.5, with a p-value of 0.156, which is greater than 0.05, indicating that the control group did not experience a statistically significant improvement in explosive strength. This suggests that the combination of plyometric training and regular badminton training had a positive impact on explosive strength after eight weeks of training.

For flexibility, the treatment group had pre-test mean at 30.13 (SD = 4.49) and the post-test mean of 33.4 (SD = 2.92). The t-value was 2.64, with a p-value of 0.019, which is below the significance level of 0.05, indicating a statistically significant improvement in flexibility. In contrast, the control group had a pre-test mean of 29.25 (SD = 5.19) and a post-test mean of 29.87 (SD = 4.39). The t-value was 0.498, with a p-value of 0.626, which is greater than 0.05, indicating no statistically significant improvement in flexibility. This suggests that the addition

of plyometric training, alongside regular badminton training, effectively enhanced flexibility after eight weeks of training.

For better understanding the graphical representation of pre and post test means of both groups were presented in figure – I.

**FIGURE – I**  
**GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEANS**



## DISCUSSION

Explosive strength is the ability to exert maximal force in the shortest time, which is crucial for movements like jumping, sprinting, and lunging, all of which are essential for badminton performance. In this study, the treatment group, which underwent plyometric training in addition to regular badminton practice, showed significant improvements in explosive strength. This was demonstrated by the pre-test and post-test results for explosive strength, measured through the standing broad jump, which showed a significant improvement after eight weeks of plyometric training ( $t = 6.15$ ,  $p = 0.000$ ).

These results are consistent with previous research, which suggests that plyometric training enhances muscle power and speed, both key components of explosive strength. For instance, Markovic (2007) conducted a meta-analysis that examined the effects of plyometric training on vertical jump height, which is directly related to explosive strength. Markovic concluded that plyometric exercises significantly improve vertical jump performance, reinforcing the idea that plyometric training enhances explosive power. Similarly, McBride et al. (2002) found that plyometric exercises, especially those involving rapid, explosive movements, result in significant gains in strength and speed, both of which are essential for high-performance athletes.

Additionally, Chelly et al. (2009) reported that plyometric training significantly improved strength, power, and agility in young male athletes. This aligns with the idea that plyometric exercises are an effective way to improve the explosive strength needed for sports like badminton. The exercises in this study, such as jump squats, box jumps, and bounding, focus on improving the ability to exert force quickly, which translates into better on-court performance, including speed, agility, and overall explosiveness.

It is important to note that the control group, which only participated in regular badminton training, did not show any significant changes in explosive strength. This further supports the idea that plyometric exercises, specifically designed to target explosive movements, are more effective than traditional training alone for improving explosive strength. These findings are in line with other studies (McBride et al., 2002; Chelly et al., 2009), which suggest that adding plyometric exercises to sport-specific training programs results in a greater improvement in explosive strength than traditional training methods.

Flexibility plays a crucial role in sports performance, especially in badminton, where players need to execute a wide range of movements like lunges, jumps, and quick changes of direction. Flexibility not only enhances performance but also reduces the risk of injury. In this study, the treatment group showed a significant improvement in flexibility after eight weeks of plyometric training ( $t = 2.64$ ,  $p = 0.019$ ), as measured by the sit-and-reach test. This emphasizes the importance of incorporating flexibility exercises into a well-rounded training program.

Radziminski et al. (2014) support the notion that flexibility is essential for athletes, particularly in dynamic sports like badminton, where flexibility allows players to execute shots more effectively by giving them a greater range of motion. Flexibility also plays a role in injury prevention by reducing muscle stiffness and improving overall movement efficiency. In this study, the combination of plyometric exercises and regular badminton training effectively improved flexibility, possibly due to the dynamic and stretching components of plyometric movements. Exercises such as jump squats and bounding may naturally enhance flexibility by stretching and lengthening the muscles during explosive, rapid movements.

Moreover, Behm and Chaouachi (2011) discussed how dynamic stretching (often part of plyometric exercises) positively affects flexibility and prepares muscles for explosive movements. By incorporating dynamic stretching exercises into their plyometric training, the treatment group in this study likely benefited from both improved flexibility and increased muscle elasticity, which contributed to their enhanced badminton performance. This highlights the value of plyometric training for improving flexibility, which is often overlooked in traditional strength-focused training regimens.

In contrast, the control group did not show significant improvements in flexibility ( $p = 0.626$ ), further supporting the idea that plyometric training, with its dynamic movements, is more effective at improving flexibility than traditional training methods. This is consistent with the research by Kumar and Tiwari (2018), which pointed out the benefits of plyometric training for improving both strength and flexibility in athletes. By stimulating muscles through explosive and dynamic movements, plyometric exercises can lead to improved flexibility, which in turn enhances overall performance and reduces the risk of injury.

Plyometric training improves both explosive strength and flexibility, two attributes crucial for effective badminton performance. This study's results demonstrate that plyometric training can significantly enhance these physical attributes in novice athletes, providing them with a solid foundation for further skill development. The combination of improved explosive strength and

increased flexibility creates a synergistic effect, as players can not only generate more force in their movements but also execute a broader range of motions.

Previous research has shown similar results, suggesting that plyometric training enhances both strength and flexibility in athletes across various sports. For example, McBride et al. (2002) found that plyometric training led to improvements in explosiveness, while Chelly et al. (2009) showed that young male athletes experienced gains in strength, power, and agility. This study adds to the literature by providing evidence that plyometric training is effective in enhancing both explosive strength and flexibility in novice badminton players.

## CONCLUSION

In conclusion, this study shows that plyometric training helps improve both explosive strength and flexibility in novice badminton players. The group that did plyometric exercises alongside their regular badminton practice saw significant improvements in these areas. This supports previous research that shows plyometric training can boost muscle power, speed, and flexibility. The results highlight the value of adding plyometric exercises to training routines for beginner athletes, as it can improve their physical abilities, enhance their performance, and reduce the chances of injury. Future studies could look into the long-term effects of plyometric training, how it impacts different age groups and skill levels, and how it can be used in training for other sports.

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