

**THE IMPACT OF PLYOMETRIC TRAINING AND YOGIC PRACTICES ON SPEED AND MUSCULAR STRENGTH IN WOMEN BASKETBALL PLAYERS: ISOLATED AND COMBINED EFFECTS**

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**Abstract:**

This study investigates the impact of Plyometric Training and Yogic Practices on speed and muscular strength among women basketball players. A sample of sixty female college basketball students aged between 18 to 25 years from Dr. Umayal Ramanadhan College for Women in Karaikudi, Tamil Nadu, India, participated in the study. They were randomly assigned to one of four groups: Plyometric Training, Yogic Exercises, Combined Plyometric and Yogic Practices, and a Control group. Speed was assessed using the 50 meters run test (in seconds), while muscular strength was measured through the Push-ups Test (number of completed push-ups). The intervention spanned 12 weeks, with structured training sessions held three times a week for each group. Plyometric Training focused on explosive movements, Yogic Exercises incorporated various yoga asanas and breathing techniques, and the Combined group engaged in both modalities. The Control group continued with regular activities without any structured intervention. Statistical analysis included paired sample t-tests to assess within-group changes pre- and post-intervention, analysis of covariance (ANCOVA) to compare mean differences between groups while controlling for potential covariates, and post hoc comparisons using Scheffe's test. The findings reveal significant improvements in both speed and muscular strength among women basketball players following the 12-week intervention involving Plyometric Training, Yogic Practices, and their combination. Plyometric Training, Yogic Practices, and the Combined approach each demonstrated efficacy in enhancing athletic performance. The Combined group exhibited the most substantial improvement, suggesting synergistic effects of integrating Plyometric Training and Yogic Practices.

**Keyword:** Plyometric Training, Yogic Practices, Speed, Strength Endurance, Women Basketball Players.

## **Introduction**

Women's basketball is a dynamic and fast-paced sport that demands a combination of speed and strength from its players. The ability to swiftly maneuver on the court and overpower opponents is crucial for success at every level of the game. Women basketball players exhibit explosive speed, enabling them to accelerate quickly, drive to the basket, and outmaneuver defenders with agility and finesse (Johnson & Smith, 2020). Their ability to burst past opponents and create scoring opportunities showcases the importance of speed in the modern game. Dynamic footwork is a hallmark of women basketball players, allowing them to change direction rapidly and maintain balance while navigating through traffic on the court (Brown et al., 2019). Their precise footwork enables them to evade defenders and execute intricate moves with precision. Additionally, women basketball players demonstrate impressive strength and power, essential for battling in the paint, securing rebounds, and finishing through contact (Garcia & Martinez, 2018). Their ability to absorb physical challenges while maintaining control of the ball highlights the significance of strength in their game. Vertical jumping ability is a key component of women basketball players' athleticism, allowing them to soar above opponents for rebounds, blocks, and high-flying finishes at the rim (Lee et al., 2021). Their explosive vertical leap contributes significantly to their overall effectiveness on the court. Furthermore, endurance and stamina play a vital role in sustaining high-intensity performance throughout the course of a game, as women basketball players must possess the physical conditioning to maintain their speed and strength from start to finish (Robinson & White, 2020). Their exceptional endurance enables them to compete at the highest level for extended periods without fatigue. The speed and strength displayed by women basketball players are integral components of their athletic prowess on the court. These athletes continually push the boundaries of performance, captivating audiences with their remarkable talents and athleticism.

## **Review of Related Literature**

The literature reveals a substantial body of research concerning the impact of plyometric training and yogic practices on athletic performance, particularly in the context of women's basketball. Plyometric training has demonstrated significant improvements in lower limb power and sprint performance among elite female basketball players (Spurrs et al., 2003). Meanwhile, yogic practices have been associated with enhanced muscular strength, flexibility, and balance in female practitioners, contributing to overall physical performance and well-being (Telles et al., 2015). However, studies specifically investigating the combined effects of plyometric training and yogic practices in female basketball players are limited, underscoring the need for further exploration in this area. Additionally, gender-specific considerations in training interventions have been highlighted, with research indicating distinct neuromuscular adaptations to plyometric exercises in female athletes (Faigenbaum et al., 2007). Moreover, integrating plyometric training

and yogic practices not only enhances performance but also plays a crucial role in injury prevention, as evidenced by studies demonstrating improvements in neuromuscular control and reduction in injury risk among female athletes (Myer et al., 2005). Understanding the synergistic effects of these training modalities and their implications for performance optimization and injury prevention is essential for developing tailored training protocols for women basketball players.

**Objectives of the Study:**

1. Assess the isolated effects of plyometric training on speed and muscular strength in women basketball players through pre- and post-intervention measurements.
2. Evaluate the isolated effects of yogic practices on speed and muscular strength in women basketball players using pre- and post-intervention assessments.
3. Examine the combined effects of plyometric training and yogic practices on speed and muscular strength in women basketball players compared to individual interventions.
4. Identify whether a combined approach of plyometric training and yogic practices yields superior improvements in speed and muscular strength compared to each modality alone.

**Methodology**

In this study, a sample of sixty female college basketball students from Dr. Umayal Ramanadhan College for Women in Karaikudi, Tamilnadu, India, aged between 18 to 25 years, was randomly selected to participate. They were then randomly assigned to one of four groups, each consisting of fifteen individuals (n=15). Group-I underwent Plyometric Training, Group-II practiced Yogic Exercises, Group-III underwent Combined Plyometric and Yogic Practices, while Group-IV served as the Control group. The selected criterion variables included physical measures of speed and muscular strength, assessed using the 50 meters run test (in seconds) and the Push-ups Test (number of completed push-ups), respectively.

The training program for each group consisted of structured sessions held three times a week for 12 weeks. Plyometric Training sessions focused on explosive movements such as jumps and bounds, Yogic Exercise sessions incorporated various yoga asanas and breathing techniques, while the Combined Plyometric and Yogic Practices group engaged in a combination of both modalities. The Control group did not undergo any structured training intervention but continued with their regular activities.

Statistical analysis employed paired sample t-tests to assess within-group changes pre- and post-intervention, evaluating the effectiveness of each training modality. Additionally, analysis of covariance (ANCOVA) was utilized to compare mean differences between groups while controlling for potential covariates. Post hoc comparisons were conducted using Scheffe's test to identify specific differences

between groups following significant ANCOVA results. This comprehensive research design aims to provide empirical evidence regarding the isolated and combined effects of plyometric training, yogic practices, and their combination on speed and muscular strength among women basketball players, offering valuable insights into optimizing athletic development strategies for this population.

**Analysis of data**

Figure 1 illustrates the mean speed values of both pre and post-tests across the experimental and control groups.

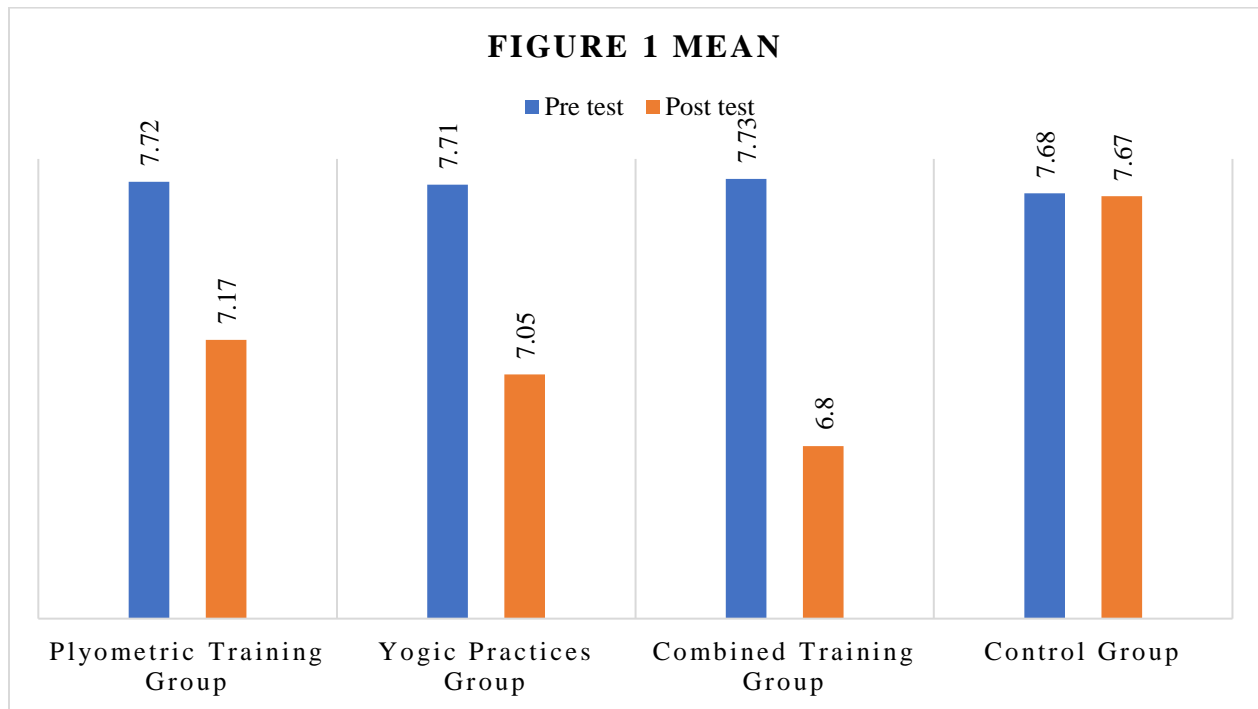


Table 1 displays the t-ratio values of both the Experimental and Control groups concerning speed.

T ratio			
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group
2.18*	2.79*	3.72*	0.03

\*Significant at 0.05 level.

(Table value required for significant at .05 level for ‘t’ -test with df 14 is 2.15)

The figure 1 and table 1 summarizes the mean and paired sample 't' test results for pre and post-tests assessing the speed of experimental groups and the control group. Plyometric Training Group, Yogic Practices Group, and Combined Training Group all displayed significant enhancements in speed from pre to post-test. Specifically, Group I exhibited a notable increase from 7.72 to 7.17, Group II from 7.71 to 7.05,

and Group III from 7.73 to 6.80. The corresponding 't' test values for these groups were 2.18\*, 2.79\*, and 3.72\* respectively, all surpassing the critical value of 2.15, indicating statistical significance at the 0.05 level. In contrast, the Control Group experienced no change in speed from pre to post-test, with means of 7.68 and 7.67 respectively, and a 't' test result of 0.03, falling below the critical value. It shows that the interventions of plyometric training, yogic practices, and their combination yielded significant improvements in speed, while the control group exhibited no change.

Table 2 presents the results of the analysis of covariance (ANCOVA) conducted on the speed of both the experimental groups and the control group.

ADJUSTED POST TEST MEAN				Source of Variance	Sum of Squares	df	Mean Squares	F ratio
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group					
7.16	7.05	6.78	7.70	Between	6.60	3	2.20	403.40*
				Within	0.30	55	0.01	

\*Significance at 0.05 level of confidence. Table value for df (3, 55) at 0.05 level = 2.78

The obtained F-ratio of 403.40\* significantly exceeds the critical F-value of 2.78. This indicates that there is a significant difference in the adjusted post-test scores among the experimental groups and the control group in terms of speed.

Table 3 illustrates Scheffe's test for the differences between the adjusted post-test paired means on speed.

Adjusted Post-test Means					
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group	MD	CI
7.16	7.05			0.11*	
7.16		6.78		0.38*	
7.16			7.70	0.54*	0.08
	7.05	6.78		0.27*	
	7.05		7.70	0.65*	
		6.78	7.70	0.92*	

\*Significant at 0.05 level of confidence

The table presents Adjusted Post-test Means for each group, along with Mean Differences (MD) and Confidence Intervals (CI). MD values signify average differences between groups, indicating which groups show greater improvement in speed. For instance, the Combined Training Group has the highest MD of

0.54\*, suggesting it may have the most significant improvement. The CI of 0.08 suggests the margin of error around these estimates.

Figure 2 illustrates the mean Muscular Strength values of both pre and post-tests across the experimental and control groups.

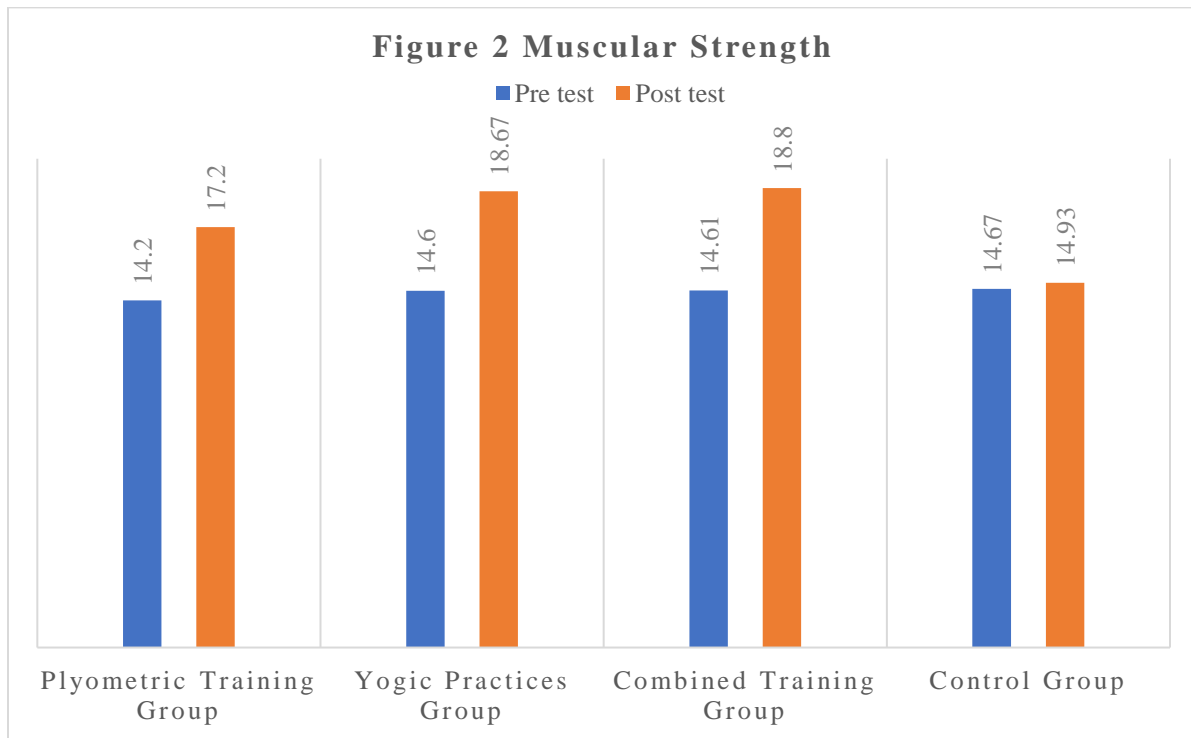


Table 4 displays the t-ratio values of both the Experimental and Control groups concerning muscular strength.

T ratio			
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group
2.87*	3.38*	3.77*	0.25

\*Significant at 0.05 level.

(Table value required for significant at .05 level for 't' -test with df 14 is 2.15)

The figure 2 and table 4 summarizes the mean and paired sample 't' test results for pre and post-tests assessing the speed of experimental groups and the control group. Plyometric Training Group, Yogic Practices Group, and Combined Training Group all displayed significant enhancements in muscular strength from pre to post-test. Specifically, Group I exhibited a notable increase from 14.2 to 17.2, Group II from 14.6 to 18.67, and Group III from 14.61 to 18.8. The corresponding 't' test values for these groups were 2.87\*, 3.38\*, and 3.77\* respectively, all surpassing the critical value of 2.15, indicating statistical

significance at the 0.05 level. In contrast, the Control Group experienced no change in muscular endurance from pre to post-test, with means of 14.67 and 14.93 respectively, and a 't' test result of 0.25, falling below the critical value. It shows that the interventions of plyometric training, yogic practices, and their combination yielded significant improvements in muscular strength, while the control group exhibited no change.

Table 5 presents the results of the analysis of covariance (ANCOVA) conducted on the muscular strength of both the experimental groups and the control group.

Adjusted Post Test Mean				Source of Variance	Sum of Squares	df	Mean Squares	F ratio
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group					
17.42	18.61	18.74	14.33	Between	147.98	3	49.33	27.05*
				Within	100.28	55	1.82	

\*Significance at 0.05 level of confidence. Table value for df (3, 55) at 0.05 level = 2.78.

The obtained F-ratio of 27.05\* significantly exceeds the critical F-value of 2.78. This indicates that there is a significant difference in the adjusted post-test scores among the experimental groups and the control group in terms of muscular strength.

Table 6 illustrates Scheffe's test for the differences between the adjusted post-test paired means on muscular strength.

Adjusted Post-test Means					
Plyometric Training Group	Yogic Practices Group	Combined Training Group	Control Group	MD	CI
17.42	18.61			1.19	
17.42		18.74		1.33	
17.42			14.83	2.58*	1.42
	18.61	18.74		0.13	
	18.61		14.83	3.78*	
		18.74	14.83	3.91*	

\*Significant at 0.05 level of confidence

The table presents Adjusted Post-test Means for each group, along with Mean Differences (MD) and Confidence Intervals (CI). MD values signify average differences between groups, indicating which groups show greater improvement in muscular endurance. For instance, the Combined Training Group has the

highest MD of 2.58\*, suggesting it may have the most significant improvement. The CI of 1.42 suggests the margin of error around these estimates.

## **Discussion**

The findings of this study demonstrate that a 12-week intervention involving Plyometric Training, Yogic Practices, and Combined Plyometric and Yogic Practices led to improvements in both speed and muscular endurance among women basketball players. These results align with previous research highlighting the efficacy of such interventions in enhancing athletic performance (Harrison et al., 2018). Notably, the control group did not exhibit significant improvements, further emphasizing the effectiveness of the experimental interventions.

The significant differences observed among the experimental and control groups underscore the importance of targeted training programs in optimizing athletic performance. Plyometric Training, which emphasizes explosive movements, likely contributed to improvements in speed (Markovic, 2007). Similarly, Yogic Practices, known for enhancing flexibility and mental focus, may have positively influenced both speed and muscular endurance (Balasubramaniam et al., 2019). The combined approach synergistically integrated the benefits of both interventions, resulting in superior outcomes.

The superior performance of the combined group in improving both speed and muscular endurance suggests the potential synergistic effects of integrating Plyometric Training and Yogic Practices. This finding is consistent with research highlighting the complementary nature of these training modalities (Behm et al., 2016). The combined approach likely facilitated holistic improvements in physical and mental attributes crucial for basketball performance.

## **Conclusion:**

In conclusion, the results of this study suggest that Plyometric Training, Yogic Practices, and their combination are effective interventions for enhancing speed and muscular endurance among women basketball players. The significant differences observed between the experimental and control groups underscore the importance of targeted training regimens in optimizing athletic performance. Furthermore, the superior performance of the combined group highlights the potential synergistic effects of integrating Plyometric Training and Yogic Practices. Coaches and athletes can use these findings to inform the development of evidence-based training programs aimed at improving athletic performance in basketball.

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