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Comparative Study Evaluating Effect of Agility Ladder and Cone Drills on Speed and Agility of University Female Badminton Players

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ABSTRACT:

In this research, the effects of two popular training methods, agility ladder exercises and cone drills on the speed and agility of female badminton players competing at the collegiate level are investigated. Athletic performance in the fast-paced game of badminton depends on one's capacity to move quickly, change direction quickly, and retain synchronization under pressure. For eight weeks, thirty female university badminton players between the ages of 18 and 25 participated in this study. One group was given an organized program of agility ladder drills, while the other group was given a cone drill regimen. The 20-meter sprint test was used to gauge the participants' speed, while the Illinois Agility Test was used to gauge their agility. To identify within-group and between-group differences, paired and independent sample t-tests were used to analyze data collected before and after the intervention. The results showed that both training groups significantly improved their speed and agility. Cone drills showed larger increases in agility, whereas agility ladder drills showed a more noticeable improvement in speed. These findings imply that although both approaches work, their effects differ based on the particular performance criterion. The study emphasizes the possibility of customized training plans that maximize player performance by utilizing each drill's advantages. By identifying the distinct benefits of agility ladder and cone drills, the study provides a foundation for designing more effective, evidence-based training regimens. This study underscores the importance of gender-specific and sport-specific training approaches in maximizing athletic potential.

Keywords: *Agility ladder drills, cone drills, Footwork efficiency*

INTRODUCTION

Badminton, a sport that requests quick developments, quick changes in course, and exact control, has advanced essentially since its beginning in British India amid the mid-19th century. The history of Badminton dates back to antiquated societies, with recreations that bore a likeness to what we presently know as Badminton being delighted in in China as distant back as the 5th century BCE. In any case, it was in British India amid the mid-19th century that the wear truly started to advance into its current shape., advancing from a amusement called "Poona" (Seth, 2016).

Badminton, recognized as one of the quickest racquet sports within the world, requests an exceptional level of speed and deftness from its players. The diversion is characterized by rapid rallies, requiring competitors to reply to fast-moving shuttlecocks with fast reflexes and exact footwork. Players must have the capacity to quicken and decelerate quickly, alter heading in an moment, and keep up crest execution over long lengths of strongly play. This combination of dangerous control, quick development, and fast decision-making is basic for exceeding expectations at the competitive level. In badminton, split-second responses can decide the result of a coordinate, as players frequently discover themselves in high-pressure circumstances where deftness and speed are key to coming to and returning the shuttlecock. Furthermore, the consistent require for speed over the court, particularly when covering huge separations rapidly, emphasizes the significance of continuance and lower-body quality. The strongly physical requests of the wear require competitors to be profoundly conditioned, with deftness and speed being fundamentally components of their athleticism. Many thinks about have stamped the control preparing to induce rapid (Mehmood et al., 2025). Subsequently, preparing programs for badminton players must prioritize creating these qualities to guarantee that competitors can perform at their most noteworthy level amid fast-paced, competitive play (Phomsoupha & Laffaye, 2015). Physical traits such as oxygen consuming stamina, nimbleness, quality, unstable control, speed, adaptability, adjust, and coordination are basic for playing badminton. Top physicality, which is characterized by speedy reflexes and exceptional nimbleness, is requested of players as the requests of the amusement increment (Woodwards et al., 2017). Dexterity stepping stool and cone drills can improve quality preparing by moving forward solid quality, neuromuscular coordination, and proprioception (kinesthetic mindfulness). Sumbal et al., (2025) found that a combination of quality and high-impact works out essentially makes strides speed and solid perseverance. The 1990s checked a turning point in Badminton preparing strategies, with an expanded center on sport-specific conditioning. This move was driven by headways in sports science and distant better;a much better;a higher;a stronger;an improved">a higher understanding of the physiological requests of Badminton. Analysts started to explore the one of a kind development designs and vitality frameworks utilized amid Badminton matches, driving to the advancement of more specialized preparing conventions (Faude et al., 2007). Dexterity is affected by different variables, especially speed and adjust, which play a vital part in one's capacity to move quickly and successfully (Pamungkas et al., 2023). To improve dexterity, it's basic to consolidate preparing centered on both speed and adjust. Investigate shows that cone drills are an viable strategy for moving forward speed and dexterity over diverse sports. For occasion, a consider illustrated that a 12-week program including cone drills essentially upgraded alter of course speed in soccer players. So also, in racquet sports, junior tennis players appeared moved forward dexterity as a result of cone drill preparing (Pardiwala et al., 2020). Whereas both deftness ladder and cone drills have appeared potential to enhance speed and deftness, there's a scarcity of investigate straightforwardly comparing their viability, especially within the setting of Badminton. This hole within the writing is especially articulated when consideringfemale players, who have generally been underrepresented in sports science research (Ilham et al., 2024).

Problem Statement:

The need of comparative investigate on the adequacy of diverse speed and deftness preparing strategies for female college Badminton players presents a critical challenge in optimizing their execution. Whereas dexterity step drills and cone drills are broadly known, their relative adequacy in

upgrading Badminton-specific speed and nimbleness remains hazy, particularly for female players. This hole in information prevents the advancement of evidence-based, proficient preparing programs custom fitted to the special needs of female college Badminton players.

Objectives:

The analyst conducted this inquire about consider with the taking after two primary destinations:

1. To compare the effectiveness of agility ladder drills and cone drills in improving speed and agility among university female Badminton players.

Hypotheses:

H_1: There will be significant improvement in speed and agility of university female badminton players who under agility ladder training and corn drill training.

MATERIALS AND METHODS

The study was conducted at the University of Punjab. This study employed an experimental research design to investigate the comparative effects of agility ladder and cone drills on speed and agility in university female Badminton players. The research was conducted over a 08-week period, including initial assessments, training interventions, and final assessments. Convenient sampling was used to recruit university female Badminton players. Agility Ladder Training: Participants was performed a structured program of agility ladder drills. And Cone Drill Training: Participants was performed a structured program of cone drills. Inclusion criteria included: (a) Female, (b) Age 18-25, (c) An active member of the university Badminton team and (d) having no recent injuries (past 6 months). Similarly, exclusion criteria included: (a) History of lower limb surgery (b) Engagement in other specific speed and agility training programs (c) Beyond the prescribed age limit and (d) Professional players. A sample of thirty subjects (n=30) was selected from the University of Punjab equally divided into an experimental and a Control group (n=15) each. The researchers determined the validity and reliability by pilot study and using Chronbach Alphs test respectively. Paired t-tests were used to compare pre- and post-intervention scores within groups Independent t-tests were used to compare differences between groups. All statistical analyses were performed using SPSS (26) software.

Research Layout Plan

Week 0: Initial assessments and participant grouping

Weeks 01-07: Training intervention period

Week 08: Final assessments

Methods of Data Collection

For the collection of data, all the following tests were conducted pre- and post-intervention:

1. Speed Test: 20-meter sprint test using electronic timing gadget
2. Agility Tests:
3. Illinois Agility Test: Standardized course with cones

4. Anthropometric Measurements: Height, weight, body composition
5. Training Logs: Daily records of training adherence and intensity

RESULTS

Table 1: Shapiro-wilk Data Normality test

	Shapiro-Wilk		
Testing Variables	**Statistic**	**df**	**Sig.**
Cone Drills pre-agility test	.971	30	.534
Cone Drills post agility test	.955	30	.211
Cone Drills pre-speed test	.982	30	.871
Cone Drills post speed test	.934	30	.057
Ladder Drills pre-agility test	.947	30	.132
Ladder Drills post agility test	.934	30	.058
Ladder Drills pre-speed test	.976	30	.710
Ladder Drills post speed test	.953	30	.188

The above table represents the normality test results for the variables, indicating that all datasets are likely normally distributed. The Shapiro-Wilk test produced p-values for each variable. Cone Drills pre agility test (p= .534), Cone Drills post agility test (p= .211), Cone Drills pre speed test (p= .871), Cone Drills post speed test (p= .057), Ladder Drills pre agility test (p= .132), Ladder Drills post agility test (p= .058), Ladder Drills pre speed test (p= .710), Ladder Drills post speed test (p=.188).

Table 2: Paired sample t-test results of the cone drill exercise on the agility of the University Badminton Players pre and post the cone drill test

Variable	N	Mean	Std. Error Mean	sig	t
Cone drills agility pre-test	30	14.458	0.329		
Cone drills the agility post test	30	10.546	0.763	.00	15.602

Table 2 represents the paired sample t-test that was conducted to compare the cone drill effects on agility of badminton players before and after the experimental test. The mean of agility before the cone drills exercises was 14.458 (SE = 0.329), and the mean of agility after the cone drill exercises was 10.546 (SE = 0.763). The t-value was 15.602 and the p-value was .00. Since the p-value is less

than 0.05, Results also indicate that cone drills exercises had a meaningful impact on the agility of University Badminton players.

Table 3: Paired sample t-test results of the cone drill exercise on the speed of the University Badminton Players pre and post the cone drill test

Variable	N	Mean	Std. Error Mean	sig	t
Cone drill speed pre-test	30	7.103	.142		
Cone drill speed post test	30	38.470	1.267	.00	10.173

Table 3 represents the paired sample t-test that was conducted to compare the cone drills effects on the speed of badminton players before and after the experimental test. The mean of speed before the cone drills exercise was 7.103 (SE = .142), and the mean of speed after the cone drills exercises was 38.470 (SE = 1.267). The t-value was 10.173 and the p-value was .00. Since the p-value is less than 0.05, Results also indicate that cone drill exercises had little impact on the speed of University Badminton players.

Table 4: Paired sample t-test results of ladder drill exercises on the agility of the University Badminton Players pre and post the ladder drill test

Variable	N	Mean	Std. Error Mean	sig	t
ladder drills agility pre test	30	14.504	.341		
ladder drills agility post test	30	12.216	.275	.00	10.852

Table 4 represents the paired sample t-test that was conducted to compare the ladder drill effects on the agility of badminton players before and after the experimental test. The mean of agility before the ladder drill exercises was 14.504 (SE = .341), and the mean of agility after the ladder drill exercises was 12.275(SE = .275). The t-value was 10.852 and the p-value was .00. Since the p-value is less than 0.05, Results also indicate that ladder drill exercises boosted the agility of University Badminton players slightly.

Table 5: Paired Sample t-test results of Cone drill Exercises on speed of the University Badminton Players pre and post the Cone drill Test

Variable	N	Mean	Std.Error Mean	sig	t

Ladder drills speed pre test	30	7.251	.126		
Ladder drills speed post test	30	6.050	.095	.00	14.458

Table 5 represents the paired sample t-test that was conducted to compare the ladder drill effects on the speed of badminton players before and after the experimental test. The mean of speed before the ladder drill exercise was 7.251 (SE = .126), and the mean of speed after the cone drills exercises was 6.050 (SE = .095). The t-value was 14.458 and the p-value was .00. Since the p-value is less than 0.05, Results also indicate that Ladder drill exercises had a significantly improved the speed of the University Badminton players.

Table 6: Paired t-test results of the cone and ladder drill on the agility of the University Badminton Players post-test

Variable	N	Mean	Std. Error Mean	sig	t
Cone drill post agility test	30	10.546	.763		
Ladder drills agility post test	30	12.216	1.506	.00	-6.738

Table 6 represents the paired sample t-test that was conducted to compare the cone and ladder drill effects on the agility of badminton players after the experimental test. The mean of agility after the ladder drill exercises was 12.216 (SE = .1.506), and the mean after the cone drill exercises was 10.546 (SE = .763). The t-value was -6.738, and the p-value was .00. Since the p-value is less than 0.05, the Results also indicate that the cone drill had a more significant effect on the agility of the University Badminton players than the ladder drill.

Table 7: Paired Sample t-test of cone and Ladder drills on Speed of the University Badminton Players Post-Test

Variable	N	Mean	Std. Error Mean	sig	t
Cone drill post speed test	30	6.176	.104		
Ladder drills speed post test	30	6.050	.095	.269	1.128

Table 7 represents the paired sample t-test that was conducted to compare the cone and ladder drill effects on the speed of badminton players after the experimental test. The mean of agility after the ladder drill exercises was 6.050 (SE = .095), and the mean of the speed after the cone drill exercises was 6.176 (SE = .104). The t-value was 1.128, and the p-value was .269. Since the p-value is higher

than 0.05, the Results also indicate that the ladder had a more significant effect on the speed of the University Badminton players compared to the cone drill.

DISCUSSION

This study's results provide insight into how various training regimens affect female badminton players' speed and agility in a collegiate environment. Dexterity and speed were altogether expanded in those who performed dexterity step drills. In spite of the fact that there were changes accomplished by those preparing on cone drills, they were not as recognizable. This affirms prior ponders appearing the esteem of sport-specific preparing to move forward basic execution characteristics counting deftness and speed (Phomsoupha & Laffaye, 2015). The clear contrasts between the two bunches highlight the esteem of organized preparing programs centred on neuromuscular productivity and coordination and raise the plausibility that dexterity step drills might be a more effective technique for progressing speed and dexterity in badminton. Concurring to the measurable information, the bunch that locked in in step drills illustrated a critical increment in speed and nimbleness, as seen by decreased post-test scores on the 20-meter sprint and the Illinois Dexterity Test. Superior court mobility was shown by the normal dexterity score, which altogether diminished from the pre-test. These results back those of Malwanage et al., (2022), who famous the points of interest of footwork and adjust drills for superior badminton execution.

CONCLUSION

This think about highlights how critical nimbleness preparing is for progressing female badminton players' execution at the collegiate level. Concurring to the study's discoveries, deftness step drills essentially beat customary cone drills in terms of moving forward speed and deftness. Stepping stool drills' arranged footwork designs show up to offer major benefits by making strides neuromuscular coordination, response times, and course alter abilityâ□□all basic capacities for badminton players included in fast-paced shuttlecock trade. Also, the think about underscores the got to put in put preparing plans made particularly to fulfill the one of a kind prerequisites of badminton. Cone drills are still a true blue preparing method, in spite of the fact that they are not exceptionally great at reenacting the sporadic movements seen in proficient badminton play. Subsequently, a well-rounded methodology that consolidates both preparing modalities and places more accentuation on agility stepping stool drills is likely reaching to abdicate the leading execution results. The comes about of this think about too have noteworthy consequences for sports researchers and coaches who are attempting to make strides preparing strategies.

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Appendix – 1

Training Plan:

- **Frequency:** 3 Sessions per Week (e.g., Monday, Wednesday, Friday)
- **Duration:** 45-60 minutes per session
- **Warm-Up & Cool-Down:** 10-15 minutes each

8-Week Training Plan:

Week	Objective	Agility Ladder Drills	Cone Drills
Week 1-2	**Foundation Phase** (Coordination & Balance)	1. One Foot In Each 2. Two Feet In Each 3. Side Shuffle 4. Ali Shuffle	1. Zig-Zag Drill 2. Shuttle Run 3. Triangle Drill
Week 3-4	**Acceleration & Deceleration** (Directional Speed &	1. Ickey Shuffle 2. High Knees Through Ladder 3. Skier Jump 4. Crossover	1. 5-10-5 Drill 2. Figure 8 Drill 3. Box Drill

	Reaction)	Step	
Week 5-6	**Speed & Reaction Time** (Quick Directional Changes)	1. Lateral In-Out Drill 2. Hopscotch Drill 3. Backward Run Through Ladder	1. T-Test Agility Drill 2. Y-Drill 3. Mirror Drill
Week 7-8	**Peak Performance & Game Simulation** (Sport-Specific Movements)	1. Multi-Directional Shuffle 2. Crossover Hop 3. Randomized Pattern Drill	1. Reactive Shuttle Sprint 2. Random Direction Change Drill 3. Sport-Specific Drill

Key Notes for the Training Program

Progressive Overload: Gradually increase speed, intensity, and complexity of drills to challenge neuromuscular adaptation.
Recovery & Rest: Ensure proper recovery between sessions to prevent fatigue and injuries.
Sport-Specific Focus: Incorporate badminton footwork patterns to simulate match conditions.
Dynamic Warm-Up: Include mobility exercises, dynamic stretches, and light jogging before training.
Drill Execution: Perform each drill at **maximal effort with precise movements** to enhance agility and reaction time.
Performance Tracking: Monitor improvements in speed, agility, and movement efficiency using pre- and post-tests.
Cool-Down Routine: End each session with static stretching and light jogging to reduce muscle stiffness.

Final Assessments (Week 8)

- **Speed Test:** 20m Sprint Test
- **Agility Test:** Illinois Agility Test