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Effect of shadow shuttle training on improving agility performance in badminton players

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Abstract: This study aimed to examine the effectiveness of shadow shuttle training in improving agility performance among university badminton players. A quantitative experimental design using a one-group pretest–posttest approach was employed. Twelve active badminton club members participated in a six-week structured shadow shuttle training program conducted three times per week. Agility performance was measured using the SEMO Agility Test before and after the intervention. Data were analyzed using descriptive statistics, Shapiro–Wilk normality test, and paired sample t-test with a significance level of 0.05. The results revealed a significant reduction in agility time from 13.04 ± 0.75 seconds at pretest to 11.95 ± 0.63 seconds at posttest ($p < 0.05$). The mean improvement of 1.09 seconds indicates that shadow shuttle training effectively enhances change-of-direction ability. These findings suggest that shadow shuttle exercises, when applied progressively and systematically, can serve as an evidence-based training method for improving agility performance in badminton players. The study supports the integration of structured shadow shuttle training into regular badminton practice programs.

Keywords: shadow shuttle training, agility, badminton, footwork, SEMO Agility Test

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Introduction

Badminton is a sport that requires high levels of speed, precision, and coordination (Al Fathi et al., 2022). The characteristics of this game are marked by rapid movement intensity, sudden changes of direction, and quick transitions to various court areas within a short period of time (Ihsan et al., 2023). Therefore, one of the most critical physical components determining performance in badminton is agility. Agility is not merely the ability to move quickly, but also the ability to change direction explosively without losing balance and body control (Niyati Mukesh et al., 2021).In badminton, players must move efficiently to the front, back, left, and right areas of the court to reach the shuttlecock while maintaining optimal body positioning during strokes (Burhan et al., 2023). Insufficient agility may lead to delayed responses, decreased stroke quality, and increased risk of losing points (Labib Siena Ar Rasyid et al., 2023). Consequently, agility development plays a crucial role in badminton training programs.

Physiologically, agility is influenced by neuromuscular coordination, muscle strength, dynamic balance, and reaction speed (Ahmad Saleh et al., 2022). Adaptation to these components can only be achieved through structured and systematic training programs. One commonly used training method to improve agility in badminton is shadow shuttle training (Wismanadi et al., 2020). This form of training emphasizes footwork simulation without directly hitting a shuttlecock, where players repeatedly perform movement patterns toward various court directions in a controlled manner.

Shadow shuttle training is considered effective because it focuses on movement patterns specific to badminton, particularly coordination of footwork, control of the body's center of gravity, and smooth transitions between positions (Wismanadi et al., 2020). According to the principle of training specificity, physiological adaptations are more optimal when the training stimulus closely resembles actual game movements. Thus, shadow shuttle training has the potential to directly enhance agility performance in badminton players (Ayu Tri Widhiyanti et al., n.d.).

Several previous studies have reported that shadow-based training can improve agility performance in badminton athletes. Research by Suharti et al. (Suharti et al., n.d.) demonstrated significant improvements in agility following shadow training interventions. Similarly, Rahman et al (Rahman & Warni, n.d.) found improvements in movement coordination and agility test time after implementing shadow shuttlecock training (Permainan Bulu Tangkis terhadap Daya Tahan Kardiovaskuler Atlet Kusuma Jaya Jayapura Baharuddin Hasan et al., 2022). However, some of these studies applied limited research designs and did not specifically evaluate the effectiveness of a structured experimental training program within the context of university badminton clubs.

At the university club level, training programs are often conducted routinely without systematic scientific evaluation of physical performance improvements. Quantitative data-based assessments remain relatively limited, resulting in insufficient academic documentation regarding the effectiveness of specific training methods (Arnando et al., 2024). This situation highlights the need for research that directly examines the impact of shadow shuttle training on agility improvement using a structured experimental design.

Therefore, this study aims to analyze the effectiveness of shadow shuttle training in improving agility performance among badminton players using a one-group pretest–posttest experimental approach. The findings are expected to contribute to evidence-based training development and provide practical references for coaches and sports practitioners in enhancing badminton performance.

Materials and Methods

Participants

This study employed a quantitative experimental approach using a one-group pretest–posttest design. The participants consisted of 12 male university students who were active members of a university badminton club. All participants had been regularly involved in badminton training for at least three months prior to the study.

The sampling technique used was total sampling, as the entire population of active club members met the inclusion criteria. Inclusion criteria included: (1) active participation in regular training sessions, (2) absence of musculoskeletal injuries during the study period, and (3) willingness to complete the entire training program. Participants had a mean age of 20.3 ± 1.2 years.

Prosedure

The intervention consisted of a structured shadow shuttle training program conducted over six weeks, with a frequency of three sessions per week (18 sessions in total). Each training session included three phases: warm-up (10 minutes), core training (20–25 minutes), and cool-down (5–10 minutes).The shadow shuttle exercise focused on footwork movements toward four primary court directions (front-left, front-right, back-left, and back-right). Players started from the center position and moved quickly to designated points before returning to the starting position. Training intensity was progressively increased from 40% to 90% throughout the program following the overload principle. Each session consisted of 3–4 sets with 5–10 repetitions per set and a 2-minute recovery interval between sets (Silva et al., 2024).

Agility performance was measured using the SEMO Agility Test before (pretest) and after (posttest) the intervention. The test required participants to perform forward sprinting, diagonal backward running, lateral movement, and diagonal forward return. Performance time (in seconds) was recorded using a digital stopwatch. The best score from two trials was used for analysis.(Fitrianingsih, n.d.)

Statistical Analysis

Data were analyzed using IBM SPSS software. Descriptive statistics (mean and standard deviation) were calculated to summarize pretest and posttest results.Prior to hypothesis testing, the normality of data distribution was assessed using the Shapiro–Wilk test due to the small sample size ($n < 50$). Homogeneity of variance was examined using Levene's test (Rachman et al., 2024)To determine the effectiveness of the shadow shuttle training program, a paired sample t-test was conducted to compare pretest and posttest agility scores. Statistical significance was set at $p < 0.05$. The magnitude of improvement was interpreted based on the mean difference between pretest and posttest scores.

Ethics Committee

All participants were informed about the purpose and procedures of the study prior to data collection. Participation was voluntary, and informed consent was obtained from each participant. The study procedures were conducted in accordance with ethical standards for human research and approved by the Faculty of Teacher Training and Education, Universitas PGRI Adi Buana Surabaya.

Results and Discussion

Descriptive Statistics

Descriptive statistics of agility performance before and after the intervention are presented in Table 1.

Table 1. Descriptive Statistics of SEMO Agility Test

Variable	Mean (s)	SD	Minimum	Maximum
Pretest	13.04	0.75	11.95	14.25
Posttest	11.95	0.63	11.20	13.00

The results indicate a decrease in mean agility time from 13.04 ± 0.75 seconds at pretest to 11.95 ± 0.63 seconds at posttest, showing an average improvement of 1.09 seconds.A paired sample t-test was conducted to compare pretest and posttest agility scores. The results are presented in table 2.

Table 2. Paired Sample t-Test Results

Comparison	Mean Difference	t	df	p-value
Pretest – Posttest	1.09	17.664	11	0.000

The analysis revealed a statistically significant improvement in agility performance following the six-week shadow shuttle training program ($p < 0.05$).

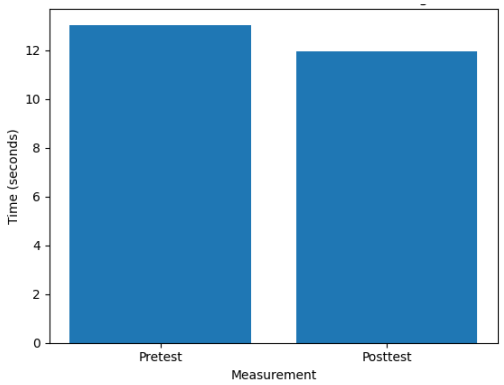


Figure 1. Comparison of SEMO Agility Test Results

The figure 1 above illustrates the comparison of the mean SEMO Agility Test times before and after the shadow shuttle training program. A decrease in time is observed from 13.04 seconds (Pretest) to 11.95 seconds (Posttest). Since lower time values in agility tests indicate better performance, the graph demonstrates an improvement in agility following the training intervention.

Discussion

The purpose of this study was to examine the effectiveness of shadow shuttle training in improving agility performance among university badminton players. The findings demonstrated a significant reduction in SEMO Agility Test time following six weeks of structured training. The average improvement of 1.09 seconds indicates that the intervention had a meaningful impact on change-of-direction performance. These results confirm that shadow shuttle training is effective in enhancing agility in badminton players.

The improvement observed in this study can be explained through neuromuscular adaptations. Shadow shuttle training emphasizes repetitive multidirectional movements that stimulate coordination between the nervous and muscular systems (Sitorus & Siahaan, n.d.). Repeated footwork patterns enhance motor unit recruitment efficiency, improve dynamic balance, and optimize acceleration–deceleration control. According to the principle of training specificity, physiological adaptations are more effective when the movement patterns practiced closely resemble those performed during competition (Riza Agustian et al., n.d.). Since shadow shuttle drills replicate real badminton footwork patterns, they directly contribute to agility enhancement.

The present findings are consistent with previous studies reporting positive effects of shadow-based training on agility performance. Farhana et al (Bintang Putra Arisandi et al., 2024) found significant improvements in agility following shadow training interventions in badminton athletes. Similarly, Lumintuarso et al (Lumintuarso et al., 2025) reported enhanced movement coordination and reduced agility test time after shadow shuttlecock exercises. The current study strengthens these findings by applying a structured progressive overload program over six weeks, demonstrating that systematic training can yield measurable performance gains even at the university club level.

From a practical perspective, shadow shuttle training offers an efficient and low-cost method for agility development. It does not require complex equipment and allows athletes to focus on technical footwork refinement without external distractions. Coaches may incorporate structured shadow shuttle sessions into regular training programs to improve players' court coverage and movement efficiency (De França Bahia Loureiro & De Freitas, 2016).

Despite its positive findings, this study has several limitations. The absence of a control group limits the ability to compare the intervention with other training methods. Additionally, the relatively small sample size may restrict the generalizability of the results. Future research should employ randomized controlled designs with larger samples and consider measuring effect size and long-term retention of agility improvements.Overall, this study provides empirical evidence supporting the effectiveness of shadow shuttle training as an evidence-based method to enhance agility performance in badminton players.

Conclusion

This study demonstrates that a six-week shadow shuttle training program significantly improves agility performance among university badminton players. The reduction in SEMO Agility Test time from 13.04 seconds to 11.95 seconds indicates a meaningful enhancement in change-of-direction ability following the intervention.The findings suggest that shadow shuttle training is an effective and practical method for developing agility due to its specificity to badminton footwork patterns and its ability to stimulate neuromuscular adaptation. The structured and progressive nature of the program contributed to measurable performance improvements.These results support the integration of shadow shuttle exercises into regular badminton training programs, particularly at the university club level. Future research is recommended to employ controlled experimental designs with larger sample sizes to strengthen the generalizability of these findings.

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Conflicts of Interest

The authors declare no conflict of interest.

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