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Effectiveness of the Backhand Netting Technique in Badminton: A Performance Analysis

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Keywords

Badminton; Backhand netting; Technical effectiveness; Playing skills; Student athletes

Abstract

Backhand netting is an essential skill in badminton, helping players control the pace of play while creating scoring opportunities. Its effectiveness depends on shuttlecock placement accuracy, trajectory quality over the net, and its ability to land where the opponent struggles to reach it. This study aimed to describe the effectiveness of the backhand netting technique among athletes of the Badminton Student Activity Unit (UKM) at Universitas Negeri Semarang and identify its contributing biomechanical factors. A descriptive-correlational quantitative approach was used, involving ten male athletes selected through purposive sampling. Data were collected through a backhand netting skill test with three assessment indicators and 2D kinematic video analysis using Kinovea software, then analyzed using descriptive statistics and Pearson correlation. Results showed a mean effectiveness score of 10.10 out of 12, with eight athletes (80%) classified as very effective and two (20%) as effective. Kinematic analysis further revealed a significant, strong positive correlation between the final elbow angle during follow-through and effectiveness score ($r = 0.692$, $p = 0.027$). Overall, the athletes' backhand netting technique was highly effective, driven mainly by optimal elbow extension during follow-through, offering coaches valuable insight for evaluating technical performance through biomechanical technology.

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INTRODUCTION

Currently, the sport of badminton has evolved far beyond a mere contest of physical strength. At the competitive level, players are required to possess high-level precision to dictate the rhythm of the game. One highly crucial tactical element in the forecourt is the netting technique. Unlike the smash shot, which relies on muscular explosive power, the execution of netting purely depends on fine motor sensitivity, footwork stability, and proximal control when the racket strings make contact with the shuttlecock (Adi et al., 2022). High placement accuracy in this technique allows athletes to place the ball precisely in the opponent's blind spot, automatically providing a massive tactical advantage to control the flow of the match (Alviyana et al., 2025).

However, the reality at the coaching and development level, as observed in the Badminton Student Activity Unit (UKM) at Universitas Negeri Semarang, presents its own challenges. During routine observations at GOR UNNES, researchers captured an interesting phenomenon: although these student-athletes are physically well-trained, unforced errors during the execution of the backhand netting still occur frequently. These failures generally stem from unrecognized mechanical issues, such as an overly stiff arm or a swing that deviates by a few degrees (Islam, S., & Muhyi, 2024). On the court, coaches' instructions are often merely subjective guidance like "improve your feeling" an abstract directive that is difficult for the athlete's muscles to translate precisely.

Upon reviewing the existing sports biomechanics literature, a clear imbalance is found. Although kinematic studies have recently begun to be applied to other badminton techniques such as the mechanical analysis of the short backhand serve by Irawan et al. (2022) or the dissection of aggressive shots like the jump smash Guo & Lin (2026), movement mechanics guidelines for fine-control-based tactical shots like netting remain extremely minimal. This gap in the literature is what causes the evaluation of netting techniques in Indonesia to still frequently rely on mere visual guesswork.

Considering these problems, this study aims to bridge the gap between coaches' instincts and objective data. Through the utilization of 2D video analysis technology based on Kinovea software, the researchers attempt to dissect the athletes' joint postures frame-by-frame (Liu et al., 2026). The two primary objectives are: to evaluate the level of effectiveness of the backhand netting technique of the UNNES Badminton UKM athletes, and to empirically prove which body posture variable (elbow angle or knee angle) actually acts as the determinant of shot accuracy. The findings of this study are expected to offer a more practical, modern, and evidence-based evaluation approach for coaches at the university level.

METHODS

An observational quantitative approach with descriptive and correlational designs was applied in this study. The selection of this design was based on the need to capture the natural movement of athletes on the court without artificial intervention. Ten male singles-specialist athletes from the Badminton UKM at Universitas Negeri Semarang were involved as research samples through a purposive sampling technique. This sample size of 10 individuals is highly ideal for sports biomechanics studies, considering that the analysis requires the researcher to precisely dissect the video at every frame of joint movement.

The data collection process combined two main instruments. The first instrument was a netting skill test to assess the effectiveness score. Shots were evaluated using a rubric with a scale of 1–4 across three main indicators:(1) Accuracy of placement direction (2) Height of the shuttlecock trajectory (3) Quality of the landing target point The accumulation of these three indicators resulted in a maximum score of 12. To interpret the raw scores into meaningful categories, the researchers adopted the assessment norms from Mustafa dan Masgumelar (2022), which are presented in **Table 1.**

Table 1. Effectiveness Categories of the Backhand Netting Technique

Total Score	Percentage (%)	Effectiveness Category
10–12	83–100%	Very Effective
7–9	58–75%	Effective
4–6	33–50%	Moderately Effective
1–3	8–25%	Less Effective

The second instrument involved evaluating the athletes' movement mechanics. The athletes' movements were recorded using a Samsung Galaxy M15 5G smartphone with a video resolution of 1920 × 1080 pixels (Full HD) at 60 frames per second (fps). The smartphone was mounted on a tripod and positioned 5 m from the athlete, 1 m above the floor, and perpendicular (90°) to the sagittal plane to minimize perspective distortion. Before data collection, a 1-m calibration object with a known length was placed within the recording area to establish the measurement scale. The recorded videos were then analyzed using Kinovea version 0.9.5, a software that has demonstrated good validity and reliability for two-dimensional kinematic measurements (Puig-Diví et al. 2019). Kinematic variables, including movement velocity, elbow angle, and knee angle, were extracted during the initial, core, and final phases of the backhand netting technique. The same camera position, recording settings, and calibration procedure were maintained throughout all testing sessions to ensure the consistency and reliability of the measurements.

All collected data were then managed using IBM SPSS Statistics version 27. After the data passed the Shapiro-Wilk normality test Kamath et al. (2025) and proved to be normally distributed, the researchers applied the Pearson Product-Moment Correlation test to identify the strength of the relationship between the athletes' posture and their shot accuracy (Karch et al., 2024).

RESULTS AND DISCUSSION

Effectiveness Achievement of the Backhand Netting Technique

Field testing showed highly impressive results. On average, the subjects managed to secure an effectiveness score of 10.10 ± 1.10 out of the maximum score of 12. To see the detailed distribution of individual abilities, the frequency distribution of athletes based on the assessment criteria is presented in **Figure 1.**

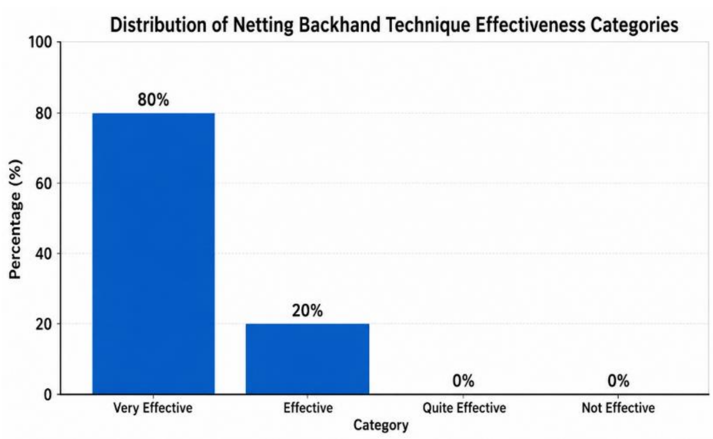

Figure 1. Distribution of Backhand Netting Technique Effectiveness Categories

Figure 1 displays an absolute dominance: 80% of the athletes qualified for the "very effective" category. This high score is highly rational when linked to the athletes' training experience. Since all samples were required to have a minimum of 3 years of training experience, their nervous systems have adapted to develop muscle memory. This mature neural adaptation acts as the primary foundation when athletes execute closed skills under match pressure (Agustian et al., 2022).

Kinematic Movement Profile

To understand the mechanics behind this high accuracy, the researchers analyzed the video recordings using Kinovea software. The division of the critical movement phases of the backhand netting evaluated in this study is visually illustrated in **Figure 2.**

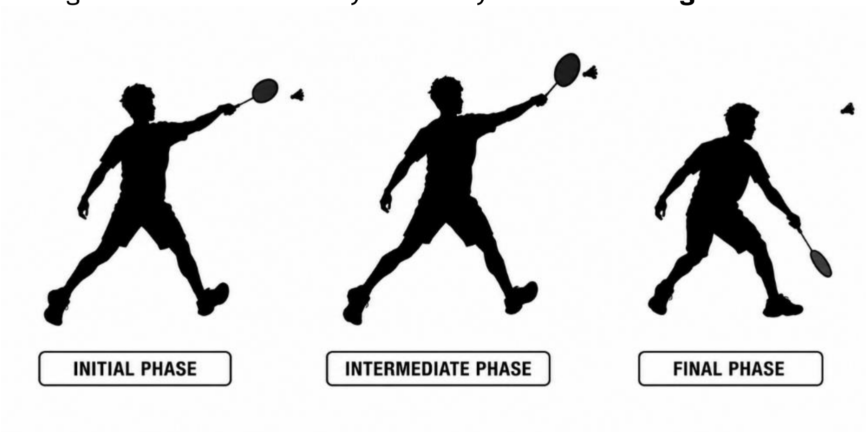

Figure 2. Visualization of Movement Phases in Backhand Netting Kinematic Analysis

The characteristics of kinematic movement changes experienced by the athletes at each phase transition above are comprehensively summarized in **Table 2.**

Table 2. Kinematic Characteristics of the Backhand Netting Technique

Kinematic Variable	**itial Phase (Mean ± SD)**	**re Phase (Mean ± SD)**	**Final Phase (Mean ± SD)**
vement Velocity (m/s)	0.82 ± 0.15	1.13 ± 0.29	1.72 ± 0.49
Elbow Angle (°)	158.05 ± 9.30	160.64 ± 10.60	168.13 ± 6.72
Knee Angel (°)	174.73 ± 4.02	169.09 ± 6.09	158.85 ± 10.49

To facilitate understanding of the fluctuations in the main joint angles (elbow and knee) from the preparation to the follow-through phase, the data trend is presented in **Figure 3.**

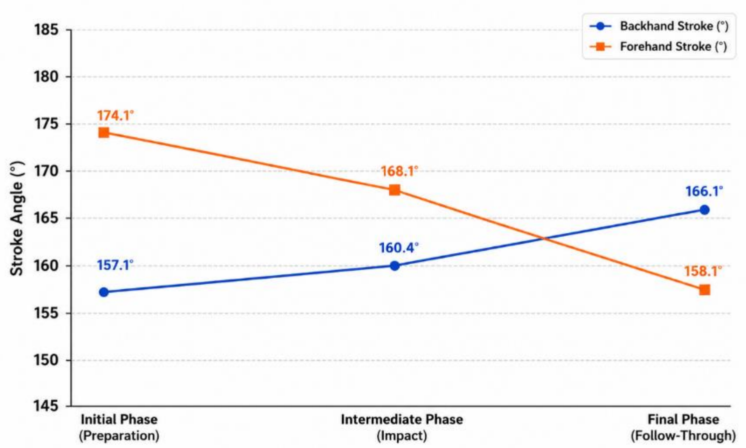

Figure 3. Trend of Joint Angle Variations Across Backhand Netting Phases

Based on the data in **Table 2** and **Figure 3**, the most significant finding is the progressive and systematic movement acceleration pattern. The arm swing velocity begins in the preparation phase at 0.82 m/s, then increases to reach a peak velocity of 1.72 m/s in the follow-through phase. This consistent escalation of velocity empirically validates the successful application of the kinetic chain principle in the research subjects. This indicates that the transfer of kinetic energy flows efficiently from the proximal segment (shoulder) to the distal segment (wrist) without significant energy dissipation (Guo & Lin, 2026).

Mechanical Correlation to Shot Effectiveness

The study then proceeds to the most essential analytical stage, which is the correlation test. The objective is to definitively prove which of the many moving joints is most responsible for the accuracy of the shuttlecock's landing direction.

Based on the Pearson correlation test results, the main finding in this study indicates that the elbow angle in the final phase (follow-through) is the only kinematic parameter that has a significant positive linear relationship with the shot effectiveness level ($r = 0{,}692$; $p = 0{,}027 < 0{,}05$). Practically, the direction of this positive correlation indicates that the more optimal the extension or straightening of the athlete's elbow post-contact, the higher the precision of the shuttlecock landing in the target area.This empirical finding simultaneously provides a review of technical evaluation habits on the court.

Up to this point, coaches' corrections have generally tended to rely on naked-eye visual observations centered solely on the accuracy of the racket position during the impact phase (Barasa et al., 2024). However, software-based motion analysis such as Kinovea provides a more objective evaluation tool Hudha (2025), proving that the follow-through phase is not merely a passive remnant of the arm swing momentum. Instead, elbow extension after racket contact actively functions like a rudder that maintains the consistency of the thrust direction so that the shuttlecock trajectory does not deviate from the target (Harahap, 2023).

Furthermore, the absence of a significant relationship in the knee angle and swing velocity variables can be explained by the characteristics of the research sample. Because the subjects are athletes with relatively homogeneous experience, their footwork lunge patterns tend to be well-established and stable, thus no longer acting as a primary differentiating factor between individuals. At an advanced skill level, netting shot accuracy is dominated more by fine motor control in the wrist and elbow areas (Pambudi et al., 2025). Therefore, executing an overly fast swing (overspeeding) actually risks disrupting touch sensitivity, which culminates in decreased accuracy.

CONCLUSION

Based on the results of the analysis, it can be concluded that the effectiveness level of the backhand netting technique among the UNNES Badminton UKM athletes is in a very high category, with an average score of 10.10 and 80% of the research subjects classified as "very effective." This finding proves that this high accuracy is not merely a matter of chance, but rather the result of measurable body posture mechanics. Specifically, the elbow extension angle during the follow-through phase was identified as the dominant kinematic variable significantly associated with shot accuracy ($r = 0.692$, $p = 0.027$).

The practical implication of this research is the importance of shifting the focus within the coaching process. Technical evaluation can no longer be fixated solely on swing power or the impact phase; instead, it must encompass movement precision during the completion phase (follow-through). Therefore, the use of technology-based motion tracking instruments like Kinovea is highly recommended for integration into routine training sessions. This aims to allow coaches to provide objective data-driven feedback capable of ensuring the long-term stability and consistency of the athlete's arm movements.

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