



HJSE

Holistic Journal of Sport Education

E-ISSN: 2809-9974

<https://journal.uniga.ac.id/index.php/penjas>

DOI: 10.52434/penjas.v5i2.42239



THE EFFECT OF DRILL TRAINING USING CARDBOARD TARGETS ON BADMINTON SMASH ACCURACY AT THE UNIMUDA SORONG BADMINTON CLUB

*Nova Dwi Ramadani^{1-ABCDE}, Saiful Anwar^{1-ACD}, Leo Pratama^{1-ABC}

¹Department of Physical Education, Universitas Pendidikan Muhammadiyah Sorong, Indonesia

Keywords:

Badminton; drill training; smash accuracy; target-based training; experimental study

Abstract

Smash accuracy is a key determinant of performance in badminton, as it directly influences the ability to score points during competition. Drill-based training combined with target-oriented practice is considered an effective approach to improving technical precision and consistency. Therefore, this study aimed to examine the effect of a drill training method using cardboard targets on badminton smash accuracy among members of the UNIMUDA Sorong Badminton Club. This study employed a quantitative experimental approach using a one-group pretest-posttest design. The population consisted of 74 UKM badminton members, from which 13 participants were selected as the research sample. Smash accuracy was measured before and after the intervention. Data normality was assessed using the Shapiro-Wilk test, while the effectiveness of the intervention was analyzed using a paired-samples *t*-test with the aid of SPSS software. Furthermore, the paired-samples *t*-test revealed a statistically significant improvement in smash accuracy after the implementation of the drill training program using cardboard targets ($p = 0.002 < 0.05$). These findings indicate that the intervention effectively enhanced the smash accuracy of the participants. In conclusion, the drill training method using cardboard targets significantly improves badminton smash accuracy among members of the UNIMUDA Sorong Badminton Club. The findings suggest that target-based drill training can serve as an effective and practical training strategy for coaches to improve technical performance in badminton.

Received: March 4,
2026

Accepted: June
14, 2026

Published: June
30, 2026

Authors' contribution:

A - Conception and design of the study; B - Acquisition of data; C - Analysis and interpretation of data; D - Manuscript preparation; E - Obtaining funding

Correspondence:

Nova Dwi Ramadani

Email: ramadaninova928@gmail.com



INTRODUCTION

Badminton is one of the most popular racket sports worldwide and requires the integration of technical, tactical, physical, and psychological abilities to achieve optimal performance (Cabello-Manrique et al., 2022; Liang, 2022). Among the fundamental techniques, the smash is considered the primary offensive stroke because it enables



players to generate high shuttlecock velocity and downward trajectories, thereby increasing the probability of winning rallies. The effectiveness of a smash, however, is determined not only by power but also by its accuracy in directing the shuttlecock toward strategic target areas that are difficult for opponents to anticipate and return. Consequently, improving smash accuracy has become an important objective in badminton coaching programs (Alsaudi, 2020; S. Ma et al., 2024; Salleh et al., 2021).

Previous studies have demonstrated that badminton performance can be enhanced through various training approaches, including drill-based practice, multishuttle training, target training, and game-based learning. Drill training is widely recognized as an effective method because repetitive practice promotes motor learning, movement automation, and technical consistency (Ichsan et al., 2023; Zulhendri & Sukoco, 2021). Repeated execution of identical movement patterns strengthens neuromuscular coordination, reduces technical errors, and improves movement precision. Nevertheless, the effectiveness of drill training depends largely on the design of the practice, the availability of feedback, and the use of appropriate target media to guide movement accuracy (Donie, Yudi et al., 2020; Hulu et al., 2020).

Although numerous studies have reported the effectiveness of drill training in improving badminton skills, most investigations have focused on increasing stroke consistency, movement speed, footwork, or overall technical performance. Comparatively fewer studies have specifically examined smash accuracy using simple, low-cost target media that can be implemented in university sports clubs or institutions with limited training facilities (Chandra et al., 2023; C. Ma et al., 2021; Pooja Beniwal, Rajesh Dhauta, 2023). Furthermore, previous research generally employed commercial target equipment or sophisticated training aids, limiting the applicability of the findings in resource-constrained settings. Therefore, evidence regarding the effectiveness of cardboard-based target drills for improving smash accuracy remains limited, particularly among university badminton athletes in Indonesia (van de Water et al., 2017; Yu & Mohamad, 2022).

Initial observations conducted at the Badminton Student Activity Unit (UKM) of Universitas Pendidikan Muhammadiyah (UNIMUDA) Sorong revealed that many members were able to generate sufficient smash power; however, their shuttlecock placement remained inconsistent. Shuttlecocks frequently landed outside the intended target area or lacked the steep downward trajectory required to produce effective attacking shots. These findings indicate that the primary limitation lies not in physical capacity but in technical accuracy, suggesting the need for a training approach that systematically emphasizes target-oriented repetition.

From a motor learning perspective, repetitive practice directed toward specific targets facilitates the development of movement precision through continuous sensorimotor adaptation and error correction (Dewantara et al., 2024; Septianto et al., 2024; Sumantri et al., 2023; Suryadi et al., 2022; Umar et al., 2023). Incorporating visual targets during drill exercises enables athletes to receive immediate intrinsic



feedback regarding shot placement, thereby accelerating technical refinement (Donie et al., 2023; Marani et al., 2024; Santoso et al., 2019; Subarkah et al., 2020). Cardboard targets offer a practical, inexpensive, and easily accessible training medium that can be adopted by schools, universities, and community badminton clubs without requiring specialized equipment. Despite these practical advantages, empirical evidence supporting the effectiveness of cardboard-target drills remains scarce.

Accordingly, this study addresses two important research gaps. First, it extends previous studies by specifically evaluating smash accuracy rather than general badminton performance. Second, it investigates the effectiveness of a low-cost cardboard-target drill that has received limited empirical attention despite its high practical potential for grassroots coaching. The novelty of this study lies in integrating repetitive drill training with a simple target-based medium to provide an affordable, evidence-based intervention for improving smash accuracy among university badminton players. Therefore, this study aims to examine the effect of a drill training method using cardboard targets on smash accuracy among members of the UNIMUDA Sorong Badminton Student Activity Unit. The findings are expected to contribute to the development of evidence-based badminton training methods and provide practical recommendations for coaches and physical education practitioners seeking effective and economical strategies to enhance technical performance.

RESEARCH METHODS

Research Design

This study employed a quantitative experimental approach using a one-group pretest–posttest design. This design was selected to evaluate the effect of a drill training program using cardboard targets on badminton smash accuracy by comparing participants' performance before and after the intervention. The research was conducted in February 2026 at Sejahtera Badminton Court, Sorong, Indonesia.

Prior to the intervention, all participants completed a pretest to assess baseline smash accuracy. Subsequently, participants underwent a structured drill training program consisting of 14 training sessions. Each session included a standardized warm-up, target-based smash drills using cardboard targets, and game-based practice emphasizing smash execution. During the drill component, participants performed three sets of ten smash attempts directed toward predetermined cardboard targets. At the completion of the intervention, participants completed an identical posttest under the same testing conditions as the pretest.

Smash accuracy was evaluated using a target-based accuracy test. Each participant executed 10 smash attempts following standardized overhead feeds provided by the researcher. A successful attempt was awarded one point when the shuttlecock directly struck the cardboard target, whereas unsuccessful attempts received zero points. Therefore, the maximum obtainable score for each participant was 10 points, with higher scores indicating greater smash accuracy.



Participants

The study population consisted of 74 members of the Badminton Student Activity Unit (UKM) at Universitas Pendidikan Muhammadiyah (UNIMUDA) Sorong. Participants were recruited using purposive sampling based on predefined inclusion criteria to ensure that the intervention targeted players experiencing difficulties in smash accuracy.

The inclusion criteria were: (1) active membership in the badminton club, (2) regular participation in training sessions, (3) demonstrating relatively low smash accuracy during the preliminary observation, and (4) willingness to participate throughout the study. Based on these criteria, 13 participants (male and female university students) were included in the experiment.

Before data collection, all participants received information regarding the objectives and procedures of the study and voluntarily agreed to participate. Throughout the intervention, all participants completed the same training protocol under identical environmental and coaching conditions to minimize potential confounding variables.

Data Analysis

Descriptive statistics were calculated to summarize participants' smash accuracy scores before and after the intervention. Data normality was examined using the Shapiro–Wilk test, as the sample size was fewer than 50 participants. A significance level greater than 0.05 indicated that the data were normally distributed.

To determine the effectiveness of the drill training program, a paired-samples t-test was performed to compare pretest and posttest smash accuracy scores. Statistical analyses were conducted using IBM SPSS Statistics with the significance level set at $p < 0.05$. In addition to statistical significance testing, the magnitude of the intervention effect should be reported using Cohen's d effect size to provide practical interpretation of the training effectiveness. Effect sizes of approximately 0.20, 0.50, and 0.80 were interpreted as small, medium, and large effects, respectively. Reporting both p -values and effect sizes provides a more comprehensive evaluation of the practical impact of the drill training intervention.

RESULTS AND DISCUSSION

Results

The intervention was conducted over 16 sessions, consisting of one pretest session, fourteen drill training sessions, and one posttest session. During the pretest and posttest, each participant performed ten smash attempts directed toward a cardboard target under identical testing conditions. The posttest was administered immediately after completion of the training program to evaluate changes in smash accuracy. Prior to hypothesis testing, the normality of the data was assessed using

the Shapiro–Wilk test, as the sample size was fewer than 50 participants. The results are presented in Table 1.

Table 1.
Shapiro–Wilk Normality Test

Variable	Statistic	df	<i>p</i> -value	Interpretation
Pre-test	0.820	13	0.012	Not normally distributed
Post-test	0.931	13	0.356	Normally distributed

The Shapiro–Wilk test indicated that the pretest scores were not normally distributed ($p = 0.012$), whereas the posttest scores followed a normal distribution ($p = 0.356$). These findings suggest that the assumption of normality was only partially satisfied. To determine whether the drill training using cardboard targets significantly improved smash accuracy, a paired-samples *t*-test was performed. The results are summarized in Table 2.

Table 2.
Paired-Samples *t*-Test Results

Variable	Mean Difference	<i>t</i>	df	<i>p</i>	95% CI
Pre-test vs Post-test	-0.846	-3.811	12	0.002	-1.330 to -0.362

The paired-samples *t*-test revealed a statistically significant difference between pretest and posttest smash accuracy scores ($t(12) = -3.811$, $p = 0.002$). The negative mean difference indicates that posttest scores were higher than pretest scores, demonstrating an improvement in smash accuracy following the intervention. These findings indicate that the drill training method using cardboard targets produced a significant positive effect on badminton smash accuracy among members of the UNIMUDA Sorong Badminton Club. Therefore, the research hypothesis stating that drill training improves smash accuracy was supported.

Discussion

The present study investigated the effect of a drill training method using cardboard targets on badminton smash accuracy among members of the Badminton Student Activity Unit (UKM) at Universitas Pendidikan Muhammadiyah (UNIMUDA) Sorong. The statistical analysis demonstrated a significant improvement in smash accuracy following the intervention ($p = 0.002$), indicating that repetitive target-oriented drill training effectively enhanced participants' ability to place the shuttlecock more accurately. These findings support the hypothesis that structured drill practice contributes positively to technical performance in badminton.

The improvement observed in this study can be explained through the principles of motor learning theory, which state that repeated practice facilitates movement automation, strengthens neuromuscular coordination, and reduces movement variability (Bastug, 2018; Hromčík et al., 2019; Kushwaha & Tyagi, 2023; Ruslan et al., 2021). Drill training allows athletes to perform identical movement patterns repeatedly while receiving continuous intrinsic feedback regarding the accuracy of each stroke (Hananto Puriana et al., 2023; Pradana et al., 2020; W. Kusnanik et al., 2019). As practice is repeated, athletes progressively refine movement execution, resulting in greater precision and consistency during smash performance. This finding is consistent with the work of Sánchez-Díaz et al., (2021), who emphasized that repetitive practice enhances motor control through continuous error correction and the development of stable movement patterns.

From a biomechanical perspective, smash accuracy depends not only on muscular power but also on the coordination of body segments during stroke execution. Effective smash performance requires synchronized lower-limb force generation, trunk rotation, shoulder acceleration, elbow extension, and wrist flexion to control both shuttlecock velocity and landing position (Ichsan et al., 2023; S. Ma et al., 2024; Pratama, 2020). Although the participants in this study demonstrated adequate physical capacity, preliminary observations suggested that inaccuracies primarily resulted from inconsistent shuttlecock placement rather than insufficient power. Therefore, the target-based drill intervention successfully directed athletes' attention toward controlling shuttlecock trajectory instead of merely increasing hitting force (Apriandi et al., 2023; Gunawan et al., 2023). This observation supports previous studies reporting that technical training emphasizing movement precision is more effective for improving stroke accuracy than physical conditioning alone.

The use of cardboard targets also represents an important practical contribution of this study. Unlike commercial badminton target systems, cardboard targets are inexpensive, portable, and easy to construct, making them suitable for schools, universities, and community badminton clubs with limited financial resources. The visual target provided immediate performance feedback, enabling athletes to recognize errors and adjust subsequent movements accordingly. Such external focus of attention has been shown to facilitate motor skill acquisition and improve movement efficiency in sports performance (Edmizal et al., 2024; Kusnadi et al., 2019; Rahmat, 2021; Soemardiawan et al., 2019; Zhou et al., 2022).

The findings of this study are consistent with previous investigations demonstrating that drill-based practice improves technical skills in badminton. Earlier studies have shown positive effects of repetitive drills on stroke consistency, service accuracy, and overall technical proficiency. However, most previous studies evaluated general technical performance or employed commercial training equipment (Kusnadi et al., 2019; Phomsoupha & Laffaye, 2020; Rahmat, 2021). The present study extends the existing literature by demonstrating that a simple cardboard-target drill can

significantly improve smash accuracy, thereby providing empirical evidence for an economical training alternative that is easily implemented in university badminton programs.

The novelty of this study lies in integrating repetitive drill training with a low-cost visual target to improve smash accuracy among university badminton players. While previous studies have primarily focused on physical conditioning, multishuttle drills, or technical repetition without specific visual targets, the present study demonstrates that incorporating simple target media enhances movement precision through repetitive motor learning. Consequently, this intervention offers a practical evidence-based coaching strategy that can be widely adopted in educational institutions and amateur badminton clubs.

Despite these promising findings, several limitations should be acknowledged. First, the study employed a one-group pretest–posttest design without a control group, limiting causal inference regarding the effectiveness of the intervention. Second, the relatively small sample size ($n = 13$) restricts the generalizability of the findings to broader badminton populations. Third, the study evaluated only smash accuracy without examining related performance variables such as shuttlecock speed, jump height, reaction time, or biomechanical characteristics. Future studies are therefore encouraged to employ randomized controlled designs with larger samples, longer intervention periods, and more comprehensive performance measurements to further validate the effectiveness of target-based drill training.

CONCLUSION

This study demonstrates that the drill training method using cardboard targets significantly improves badminton smash accuracy among members of the UNIMUDA Sorong Badminton Student Activity Unit. These findings indicate that repetitive target-oriented practice effectively enhances athletes' ability to control shuttlecock placement, supporting the principles of motor learning that emphasize repetition and continuous movement refinement in developing technical skills. The study contributes to badminton coaching by providing empirical evidence that simple and low-cost training media, such as cardboard targets, can serve as an effective alternative for improving smash accuracy. This approach offers practical advantages because it is inexpensive, easy to implement, and suitable for schools, universities, and community badminton clubs with limited training facilities. Consequently, coaches and physical education practitioners may integrate target-based drill training into regular practice programs to improve technical performance more efficiently. Despite these promising findings, the study has several limitations, including the relatively small sample size, the absence of a control group, and the focus solely on smash accuracy without considering other performance indicators such as shuttlecock velocity, jump height, movement biomechanics, or match performance. Therefore, future studies should employ randomized controlled designs with larger and more diverse samples, longer

intervention periods, and comprehensive performance assessments to further establish the effectiveness of target-based drill training and its application in competitive badminton settings.

Conflict of interest

The authors declare no conflict of interest.

Funding

No external funding information was provided for this revision.

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