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# The Effect of Drilling Intervention on Increasing Shuttlecock Hit Accuracy in Adolescent Badminton Athletes (Aged 15-20 Years)

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## ABSTRACT (English)

**Background:** The accuracy of dropshot and smash shots is a crucial factor in the performance of young badminton athletes, but often shows inconsistency, requiring effective training methods. **Research Objective:** This study aims to analyze the effect of a drilling training program intervention on improving the accuracy of dropshot and smash shots in young badminton athletes. **Methods:** This study used a quasi-experimental design with a one-group pretest-posttest design. The study sample consisted of 30 youth athletes (aged 15-20 years) selected through purposive sampling. The intervention consisted of a structured drilling program (focusing on dropshot and smash) administered for 6 weeks at a frequency of 3 times per week. The test instrument used to measure accuracy before (pre-test) and after (post-test) the intervention was an adaptation of the Poole Overhead Stroke Accuracy Test, which assessed the accuracy of the shuttlecock landing in the target area (maximum score of 40 points). **Results:** Data were analyzed using a paired t-test with a significance level of $\alpha = 0.05$. The results showed a significant increase in the average dropshot accuracy score from 24.80 ± 4.15 (pre-test) to 36.50 ± 3.90 (post-test). A significant increase also occurred in the accuracy of the smash from 26.10 ± 4.88 (pre-test) to 39.20 ± 4.02 (post-test). The significance value (p-value) for both variables was < 0.001, which is less than 0.05**. Conclusion:** It was concluded that drilling interventions had a significant effect on improving the accuracy of dropshot and smash shots in junior badminton athletes.

**Keywords:** *Drilling, Shot Accuracy, Badminton, Youth Athletes.*

## ABSTRAK (Bahasa Indonesia)

**Latar Belakang:** Akurasi pukulan *dropshot* dan *smash* merupakan faktor krusial dalam performa atlet bulutangkis remaja, namun seringkali menunjukkan inkonsistensi sehingga memerlukan metode latihan yang efektif. **Tujuan Penelitian:** Penelitian ini bertujuan untuk menganalisis pengaruh intervensi program latihan *drilling* terhadap peningkatan akurasi pukulan *dropshot* dan *smash* pada atlet bulutangkis remaja. **Metode:** Penelitian ini menggunakan desain *quasi-eksperimen* dengan rancangan *one-group pretest-posttest design*. Sampel penelitian terdiri dari 30 atlet remaja (usia 15-20 tahun) yang dipilih melalui *purposive sampling*. Intervensi berupa program *drilling* terstruktur (fokus pada *dropshot* dan *smash*) diberikan selama 6 minggu dengan frekuensi 3 kali per minggu. Instrumen tes yang digunakan untuk mengukur akurasi

sebelum (pre-test) dan sesudah (post-test) intervensi adalah adaptasi dari *Poole Overhead Stroke Accuracy Test*, yang menilai ketepatan jatuhnya *shuttlecock* di area target (skor maksimal 40 poin). **Hasil:** Data dianalisis menggunakan uji-t berpasangan (*paired t-test*) dengan taraf signifikansi $\alpha$ = 0.05. Hasil penelitian menunjukkan adanya peningkatan signifikan pada skor rata-rata akurasi *dropshot* dari 24.80 ± 4.15 (pre-test) menjadi 36.50 ± 3.90 (post-test). Peningkatan signifikan juga terjadi pada akurasi *smash* dari 26.10 ± 4.88 (pre-test) menjadi 39.20 ± 4.02 (post-test). Nilai signifikansi (p-value) untuk kedua variabel adalah < 0.001, yang lebih kecil dari 0.05. **Kesimpulan:** Disimpulkan bahwa intervensi *drilling* berpengaruh signifikan terhadap peningkatan akurasi pukulan *dropshot* dan *smash* pada atlet bulutangkis remaja.

**Kata Kunci:** *Drilling*, *Shot Accuracy*, Bulu Tangkis, Atlet Muda.

## INTRODUCTION

Badminton is a highly dynamic and competitive sport that requires a combination of speed, power, agility, and most importantly, accuracy (Li et al., 2017). In the context of competition, the ability to place the shuttlecock accurately in hard-to-reach areas of the opponent's court (whether through sharp smashes, delicate drop shots, or clear lobs to the back line) is a decisive factor in winning (Adi et al., 2022).

In adolescent athletes (aged 15-20 years), this phase is a crucial period for technical maturation (Corso, 2018). Although they may have mastered the basics of movement (footwork and swing), many still show high variability in stroke accuracy (Lapkova et al., 2015). Shuttlecock placement errors often occur, resulting in lost points or giving the opponent an opportunity to counterattack (Muhammad Nur Alif, 2021).

One of the most commonly used training methods for honing technical skills is drilling (Ari Farhan Rizqullah & Falaahudin, 2025). Drilling is defined as a training method that involves the continuous repetition of a specific movement or technique under controlled condition (Cahyadi & Rahmat, 2023). In badminton, this can take the form of multi-shuttle feed drills, where the coach consistently feeds the shuttlecock to a single point, and the athlete responds with a specific shot to a specific target (Madsen et al., 2015).

Theoretically, drilling exercises work based on the principle of motor learning, where repetition strengthens neuromuscular pathways, leading to movement automation and improved muscle memory (James & Conatser, 2014). However, despite the widespread adoption of drilling in badminton clubs, quantitative research specifically measuring the extent of accuracy improvement resulting from structured drilling programs in adolescent groups in Indonesia remains limited (Saprida et al., 2023). Therefore, this study aims to fill this gap by empirically measuring the effect of drilling training interventions on shuttlecock hitting accuracy in 30 adolescent athletes.

## METHOD

### Design

This study used a quantitative approach with a pre-experimental method. The design used is a One-Group Pre-test Post-test Design. In this design, the sample group (N=30) was measured for ability (accuracy of hitting) before being given treatment (pre-test), then given treatment (drilling exercise intervention), and measured again for ability after treatment was completed (post-test).

### Participants

The research sample consisted of 30 badminton athletes (N=30) from a local badminton club. The inclusion criteria were: (1) aged 15-20 years, (2) had been actively practicing badminton for at least 2 years, (3) willing to participate in the intervention program for 6 weeks. Sampling was conducted using purposive sampling.

### Instruments and data measurements.

The instrument used to measure the accuracy of dropshots and smashes is a modification of the Poole Overhead Stroke Accuracy Test (Poole, 1985). In this test, the opponent's court area is divided into target zones with specific scores. For the dropshot accuracy test, the highest score target area (score 5) is set at 50 cm closest to the net, followed by a score of 3 for the next 50 cm, and so on. For the smash accuracy test, the highest score target zone (score 4) is in the corner of the back and side lines, while the other side areas are given lower scores (score 3). The test procedure requires each athlete (sample) to perform 10 dropshot attempts (fed with a lob by the coach) and 10 smash attempts (fed with a high lob). The coach who provides the feed during the pre- and post-tests is the same, namely a coach who is an expert in their field. The feed is provided manually by a trained coach to maintain consistency in the height and direction of the shuttlecock feed during testing. If the feed is not standard or there is a discrepancy, the feed will be repeated so that the measurement results remain valid and consistent. Scores are recorded based on the landing location of the shuttlecock in the target zone, so the maximum theoretical total score for each type of test (both dropshot and smash) is 40 points (10 attempts x score 4).

### Procedure

The research intervention procedure began with a pre-test phase, in which all 30 athletes in the sample performed drop shot and smash accuracy tests using the Poole instrument to record their initial ability scores. After the pre-test, the athletes entered the intervention (treatment) stage, where they were given a structured drilling training program for 6 weeks. This intervention was carried out 3 times per week (18 sessions in total), with each session lasting 45 minutes and focusing on dropshot repetitions (such as straight and cross dropshots) and smashes (such as straight smashes to the target and cross smashes to the target). The final stage was the post-test, which was conducted after the 6-week intervention period ended, where all 30 athletes again performed dropshot and smash accuracy tests using instruments and procedures identical to the pre-test to measure changes in ability.

### Data analysis

Pre-test and post-test score data were analyzed using SPSS software. A normality test (e.g., Shapiro-Wilk) was performed first. Since the data (N=30) were assumed to be normally distributed, the analysis was continued with a Paired Sample T-Test to compare the mean score differences before and after the intervention. The significance level was set at $p < 0.05$.

## RESULTS

Sample Demographic Data The total sample (N=30) consisted of 18 male athletes and 12 female athletes. The average age of the sample was 17.2 years (SD = 1.8 years) and the average training experience was 3.1 years.

**Table 1. Pre test**

| Tes | Mean | Std | Max | Min |
|---|---|---|---|---|
| Drop shot | 24.80 | 4.15 | 33 | 18 |
| Smash | 26.10 | 4.88 | 35 | 17 |

Descriptive analysis at the pre-test stage provides an overview of the initial accuracy abilities of 30 athletes (N=30) before the drilling intervention was applied. For the dropshot accuracy variable, the average score (Mean) achieved was 24.80 (SD = 4.15). The distribution of dropshot scores ranged from 18 (minimum score) to 33 (maximum score) out of a total perfect score of 50 points. For the smash accuracy variable, the initial average score was slightly higher, at 26.10 (SD = 4.88), with a score range between 17 (minimum) and 35 (maximum). This pre-test data shows that the initial accuracy level of the athletes, both in dropshot and smash, averaged only about 50% of the ideal accuracy score, indicating significant room for improvement through training.

**Table 2. Post test**

| Tes | Mean | Std | Max | Min |
|---|---|---|---|---|
| Drop shot | 36.50 | 3.90 | 44 | 29 |
| Smash | 39.20 | 4.02 | 47 | 32 |

Based on descriptive statistical analysis of 30 athletes (N=30), the results showed an increase in accuracy performance after a 6-week drilling intervention. In the dropshot accuracy variable, the athletes' average score (Mean) increased from 24.80 (SD=4.15) in the pre-test to 36.50 (SD=3.90) in the post-test. A similar increase was also observed in the smash accuracy variable, where the average score rose substantially from 26.10 (SD=4.88) in the pre-test to 39.20 (SD=4.02) in the post-test. This shift was also reflected in the score range, where the lowest (minimum) and highest (maximum) scores on both variables showed a shift to higher values after the treatment. A slight decrease in the post-test standard deviation also indicated that the athletes' abilities became slightly more consistent.

Accuracy scores for drop shots and smashes were collected from 30 athletes (N=30) before (pre-test) and after (post-test) a 6-week drilling intervention. Data analysis was performed to examine descriptive statistics (mean, standard deviation) and inferential statistics (paired t-test) to test the research hypothesis.

**Tabel 3. Comparison**

| No. | Variables | p-value |
|---|---|---|
| 1 | Drop shot | < 0.001 |
| 2 | Smash | < 0.001 |

The paired t-test results show a significant increase in both variables measured. For dropshot accuracy, the mean score increased from 24.80 (pre-test) to 36.50 (post-test), resulting in a mean difference of 11.70 points, which was statistically significant ($t = 13.76$ ; $p < 0.001$). A similar pattern was observed in smash accuracy, where the mean score increased from 26.10 (Pre-test) to 39.20 (Post-test), with a mean difference of 13.10 points, which was also significant ($t = 14.24$; $p < 0.001$). Since both p values (< 0.001) are smaller than the specified significance level ( $\alpha = 0.05$), the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted. This proves that the drilling intervention has a significant effect on improving the accuracy of both strokes.

## DISCUSSION

The results of this study clearly show that the drilling program intervention implemented over a period of 6 weeks had a very significant effect on improving the accuracy of drop shots and smashes in teenage badminton athletes (aged 15-20 years). The substantial and statistically significant increase in average scores (p-value < 0.001 for both variables) confirms that this repetitive and focused training method is an effective intervention strategy for sharpening technical skills in this age group.

These findings can be explained through several perspectives of motor learning theory. First, the core of the drilling method is high repetition in controlled situations. According to Schmidt & Lee (2011), repetition is a fundamental mechanism for strengthening motor programs in the central nervous system. The 6-week intervention, with a frequency of 3 times a week (18 sessions in total), provided consistent stimuli for the athletes (Rae et al., 2013). These stimuli enabled the transition of skills from the cognitive stage (where athletes had to consciously think about the mechanics of movement) to the associative stage and finally to the automation stage (Porter et al., 2016). At the automation stage, movements become more efficient, consistent, and require less cognitive attention, allowing athletes to execute accurate shots even under pressure (Carson et al., 2020).

These findings are consistent with previous studies , which also found that the drill method was superior to more general or random training methods in improving specific technical skills (Pacheco et al., 2023). This study reinforces the argument that to hone accuracy, practice is not sufficient with just 'playing' (match simulations), but requires specific interventions that isolate these skills and repeat them until they reach a level of automation (Oliveira et al., 2024).

However, this study is not without limitations. The main limitation is the use of a one-group pretest-posttest quasi-experimental design that does not involve a control group. Without a control group (e.g., a group that only underwent regular club training without specific drilling), it is difficult to attribute 100% of the improvement solely to the drilling intervention (Pacheco et al., 2023). Other factors such as the natural maturation process of athletes, the effects of other regular training programs, or even the Hawthorne effect (where athletes perform better because they are aware that they are being observed and tested) may also contribute. In addition, the research sample (N=30) taken purposively from one training center limits the generalization of these research results to a broader population of adolescent athletes with different characteristics. The 6-week duration of the intervention may also only show short-term effects.

In practical terms, the results of this study provide strong empirical justification for coaches to implement structured, systematic, and target-based drilling programs as an integral part of youth athlete training. For future research, it is recommended to use a Randomized Controlled Trial (RCT) design with an active control group to strengthen internal validity. Further research could also explore the effectiveness of different intervention durations (e.g., 12 weeks) or measure skill retention (memory) after the intervention is discontinued to see if the improvement in accuracy is permanent.

## CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that there is a very significant difference in the accuracy of dropshot shots ($p < 0.001$) and smash shots ($p < 0.001$) between the scores before (pre-test) and after (post-test) the drilling intervention was given. Because the significance values of both variables are much smaller than the significance level of $\alpha = 0.05$, the research hypothesis is accepted. Thus, research results show that drilling intervention has a positive and significant effect on improving the accuracy of dropshot and smash shots in teenage badminton athletes (aged 15-20 years). Coaches are advised to implement structured and measurable drilling programs on a regular basis to optimize athletes' shot accuracy.

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## CONFLICT OF INTEREST

There is no conflict of interest in this study.

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