

The effect of underhand passing training on basic volleyball technique skills of junior high school students in bojonegoro regency

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Info Artikel: Dikirim: 03-05-2026 Direvisi: 28-05-2026 Diterima: 03-06-2026	Abstrak: This study aims to determine the effect of underhand passing training on the basic volleyball technical skills of junior high school students in Bojonegoro Regency. A pre-experimental method with a one-group pretest-posttest design was employed. The sample consisted of 32 students from SMP Negeri 2 Bojonegoro selected through purposive sampling. Data were collected using an underhand passing ability test adapted from the Brady Wall Volley Test. A paired sample t-test was used for data analysis at a significance level of 0.05. The results revealed a significant improvement in underhand passing ability following the eight-week training program ($t = 8.743$; $df = 31$; $p < .001$). The mean pretest score was 14.25 ($SD = 3.12$) and the mean posttest score was 21.63 ($SD = 2.87$), reflecting an increase of 51.79%. Effect size analysis using Cohen's d (calculated as the mean difference divided by the pooled standard deviation) yielded a value of 2.46, indicating a very large practical significance. It is acknowledged that effect sizes of this magnitude in single-group pre-experimental designs may partly reflect the absence of a control group and are interpreted with appropriate caution. These findings confirm that systematic underhand passing training exerts a positive and significant effect on the volleyball basic technical skills of junior high school students in Bojonegoro Regency. It is recommended that physical education teachers implement structured passing training programs to enhance students' volleyball competencies. Keywords: underhand passing; volleyball; basic techniques; junior high school; Bojonegoro
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INTRODUCTION

Physical education plays a strategic role in shaping the physical quality and psychomotor development of students. Volleyball is one of the compulsory sports taught within the Physical Education, Sport, and Health (PESH) curriculum at the junior high school level. Beyond its physical benefits, volleyball fosters teamwork, discipline, and sportsmanship among young learners (Kusuma & Hartono, 2021). According to the Bojonegoro Regency Education Office (2023), there are 87 junior high schools across the district, with more than 25,000 students participating in physical education lessons annually.

The fundamental techniques of volleyball include serving, passing, spiking, and blocking. Among these, underhand passing constitutes the cornerstone of volleyball play, as it is employed in nearly every first ball reception (Supriyadi et al., 2022). Mastery of underhand passing enables teams to build effective offensive sequences and maintain ball control during rallies. However, a preliminary observation conducted in September 2024 at SMP Negeri 2 Bojonegoro revealed that a substantial number of students still experienced considerable difficulty performing underhand passing correctly, particularly with respect to body position, arm swing mechanics, and ball direction accuracy.

The problem of low underhand passing proficiency among junior high school students in Bojonegoro was further substantiated by a preliminary observation conducted by the researchers at SMP Negeri 2 Bojo-

negoro in September 2024, which indicated that 68.75% of students had not met the minimum competency standard (KKM) in volleyball practice assessments (unpublished field data, 2024). This finding is consistent with Pratama & Setiawan (2021), who reported that the majority of students in non-urban areas of East Java exhibit volleyball skill levels below the national benchmark. These circumstances necessitate the development and implementation of systematic, structured, and measurable training interventions to improve students' fundamental technical skills.

Systematic underhand passing training has been demonstrated to be effective in enhancing volleyball basic technical skills. Wahyudi & Rahmawati (2022) established that a structured eight-week passing training program produced significant improvements in students' underhand passing ability. Correspondingly, Wibowo et al. (2023) found that a repetition-based underhand passing training model yielded superior outcomes compared to conventional instructional methods. Internationally, Lidor & Mayan (2005) demonstrated the importance of structured practice routines in volleyball skill acquisition, and Magill & Anderson (2021) provided theoretical grounding for progressive skill training in motor learning contexts. Voigt & Klen-trou (2004) further affirm that passing is among the most technically demanding skills in volleyball, underscoring the need for structured training. These collective findings provide a compelling empirical basis for the development and testing of underhand passing training programs in schools across Bojonegoro Regency.

Theoretical frameworks suggest that volleyball fundamental technique proficiency is influenced by multiple factors, including training program quality, training frequency, student motivation, and the availability of sporting facilities (Nugroho & Adiputra, 2021). Training programs designed with adherence to scientific principles—such as overload, progression, and specificity—have been shown to produce more pronounced improvements in students' motor skills compared to unstructured approaches (Firmansyah & Kusuma, 2022). Accordingly, this study was designed to rigorously evaluate the effectiveness of a systematic underhand passing training program on the volleyball basic technical skills of junior high school students in Bojonegoro Regency.

The urgency of this research is particularly pronounced given the need to improve physical education quality in district-level areas such as Bojonegoro, where volleyball instruction requires further empirical attention and evidence-based development. This study therefore aims to determine the effect of underhand passing training on the basic volleyball technical skills of junior high school students in Bojonegoro Regency. The findings are expected to provide empirical contributions for the development of volleyball training methodologies at the junior high school level, particularly within the educational context of Bojonegoro Regency.

METHODS

Research Design

This study employed a pre-experimental method using a one-group pretest-posttest design. This design was selected because the primary research objective was to measure changes in underhand passing ability before and after the administration of a treatment within the same group (Sugiyono, 2021). The one-group pretest-posttest design is recognized as an appropriate approach for evaluating the effectiveness of a training program within a school-based physical education context (Creswell & Creswell, 2022). The treatment administered consisted of a structured volleyball underhand passing training program implemented over eight weeks, with sessions conducted three times per week.

Population and Sample

The study population comprised all Grade VIII students at SMP Negeri 2 Bojonegoro for the 2024/2025 academic year, totaling 256 students distributed across eight classes. Purposive sampling was employed based on predetermined inclusion and exclusion criteria. The school was selected because it was the site of the preliminary observation identifying the volleyball skill deficit, and the researchers had institutional access and cooperation from school administrators and PESH teachers, which facilitated rigorous intervention monitoring. Inclusion criteria included: (1) Grade VIII students actively enrolled in PESH lessons, (2) absence of injury limiting physical activity, (3) willingness to participate in all phases of the study, and (4) possession of parental or guardian written consent. Based on these criteria, a final sample of 32 students was obtained, comprising 18 male and 14 female students. A priori power analysis using G*Power 3.1 (Faul et al., 2009) for a paired samples t-test with a medium effect size ($d = 0.5$), $\alpha = 0.05$, and power = 0.80 indicated a minimum required sample of 27 participants, confirming that the obtained sample of 32 was adequate for the planned analyses.

Research Instrument

The instrument used in this study was an underhand passing ability test adapted from the Brady Wall Volley Test (Lestari & Haryanto, 2021). Although the Brady Wall Volley Test was originally developed for high school students, Lestari & Haryanto (2021) validated a modified version specifically for Indonesian junior high school students, confirming its suitability for this age group. The test procedure required students to stand behind a boundary line and perform underhand passes against a wall for 60 seconds. The score recorded was the total number of balls successfully returned using correct underhand passing technique. The psychometric properties of the adapted instrument were established by Setiawan & Nugroho (2022) through a pilot study with a comparable junior high school population in East Java, yielding a validity coefficient of $r = 0.87$ and a reliability coefficient of $\alpha = 0.91$, confirming its validity and reliability for use in this study.

Training Program

The underhand passing training program implemented in this study was designed in accordance with established scientific training principles, including overload, progression, specificity, reversibility, and individuality (Bompa & Buzzichelli, 2022). The program was conducted over eight weeks, with a frequency of three sessions per week (Monday, Wednesday, Friday), each session lasting 90 minutes. Each session comprised three phases: (1) a 15-minute warm-up phase, (2) a 60-minute underhand passing core training phase, and (3) a 15-minute cool-down phase.

The underhand passing training content was organized into five progressive stages: Stage 1 (weeks 1–2) focused on fundamental body positioning and arm movement mechanics; Stage 2 (weeks 3–4) developed coordination between foot and arm movements; Stage 3 (weeks 5–6) trained ball direction accuracy and speed control; Stage 4 (week 7) integrated underhand passing within game-like situations; and Stage 5 (week 8) involved technique evaluation and consolidation. Each stage was designed with progressively increasing intensity to ensure optimal neuromuscular adaptation (Junaedi & Suparman, 2023). Table 1 presents the training dose per stage, detailing the number of repetitions, sets, and work-to-rest ratios applied at each phase of the program. In Stages 1–2, students performed 3 sets of 20 passes per set with a 1:2 work-to-rest ratio (approximately 30 seconds work, 60 seconds rest). In Stages 3–4, volume was increased to 4 sets of 25 passes with a 1:1.5 ratio. In Stage 5, evaluation sessions comprised 2 sets of 30 passes at game pace.

Data Analysis

Data obtained from the pretest and posttest were analyzed using descriptive statistics to characterize the score distribution, and inferential statistics using the paired sample t-test to test the research hypothesis. Prior to hypothesis testing, the normality of data distribution was examined using the Shapiro-Wilk test (given $n < 50$), and variance comparability between pretest and posttest was examined through visual inspection and variance ratio analysis, as Levene's test is designed for independent rather than paired groups (Field, 2022). All statistical analyses were performed using IBM SPSS version 26.0 at a significance level of $\alpha = 0.05$ (Pallant, 2020). Additionally, effect size was calculated using Cohen's d (mean difference divided by pooled SD) to determine the magnitude of the training program's effect on students' underhand passing ability (Sullivan & Feinn, 2021).

RESULTS

Descriptive Statistics

The descriptive statistical analysis of pretest and posttest data for the underhand passing ability of students at SMP Negeri 2 Bojonegoro yielded the following results. The mean pretest score was 14.25 (SD = 3.12), with a minimum value of 8 and a maximum value of 20. The mean posttest score was 21.63 (SD = 2.87), with a minimum value of 15 and a maximum value of 28. The mean improvement in underhand passing ability from pretest to posttest was 7.38 points, equivalent to a 51.79% increase. These data indicate a substantial enhancement in students' underhand passing ability following the eight-week training program.

Table 1. Descriptive Statistics of Underhand Passing Ability (n = 32)

Variable	Mean	SD	Min	Max
Pretest	14.25	3.12	8	20
Posttest	21.63	2.87	15	28
Mean Difference	7.38	-	-	-
% Improvement	51.79%	-	-	-

Note. SD = Standard Deviation; Min = Minimum; Max = Maximum.

The pretest data distribution yielded a skewness value of 0.234, indicating an approximately normal distribution. The posttest data distribution yielded a skewness value of -0.187, also indicating an approximately normal distribution. The pretest variance (9.73) was slightly greater than the posttest variance (8.24), suggesting that students' abilities became more homogeneous following the training program. These distributional characteristics supported the suitability of parametric statistical procedures for hypothesis testing.

Normality and Homogeneity Tests

The Shapiro-Wilk normality test results demonstrated that the pretest data were normally distributed ($W = 0.967$; $p = 0.431 > 0.05$) and the posttest data were also normally distributed ($W = 0.972$; $p = 0.518 > 0.05$). The normality assumption was therefore satisfied, justifying the use of the parametric paired sample t-test. For paired data, variance equality between pre- and posttest was examined through visual inspection of box plots and by comparing the variance ratio (pretest variance = 9.73; posttest variance = 8.24; ratio = 1.18), which fell well within acceptable bounds. This approach is more appropriate for within-subject repeated-measures data than Levene's test, which is designed for independent groups (Field, 2022). The fulfillment of normality

assumptions and comparable variances validated the use of parametric statistical procedures for hypothesis testing in this study.

Table 2. Shapiro-Wilk Normality Test Results

Variable	W	p-value	Distribution
Pretest	0.967	0.431	Normal
Posttest	0.972	0.518	Normal

Note. W = Shapiro-Wilk statistic; significance level $\alpha = 0.05$.

Hypothesis Testing

The paired sample t-test results demonstrated a statistically significant difference between the pretest and posttest underhand passing ability scores of students. The calculated t-value was 8.743 with degrees of freedom (df) = 31 and a significance value of $p < .001$. Since $p < .001 < \alpha = 0.05$ and the calculated t-value (8.743) exceeded the critical t-value (2.040), the null hypothesis (H_0) was rejected and the alternative hypothesis (H_a) was accepted. These results confirm that there was a significant effect of underhand passing training on the volleyball basic technical skills of students at SMP Negeri 2 Bojonegoro.

Table 3. Paired Sample t-Test Results

Comparison	Mean Diff.	t	df	p	Cohen's d
Pretest → Posttest	7.38	8.743	31	< .001*	2.46

Note. * $p < .001$; Cohen's d: small = 0.2, medium = 0.5, large = 0.8 (Cohen, 1988). Mean Diff. = posttest – pretest.

Effect size analysis using Cohen's d — calculated as the mean difference divided by the pooled standard deviation ($SD_{pooled} = [(SD^2_{pre} + SD^2_{post})/2]^{0.5} = 3.00$) — yielded a value of $d = 2.46$, which falls within the very large effect size category ($d > 0.8$). It is acknowledged that this exceptionally large effect size likely reflects, at least in part, the sensitivity of the pre-post design to maturation and testing effects in the absence of a control group, and should therefore be interpreted as an upper-bound estimate rather than a definitive measure of intervention efficacy. The percentage improvement (gain score) of 51.79% further corroborated the effectiveness of the training program, though this metric is interpreted in the context of the baseline scores and design limitations (Hattie, 2023).

DISCUSSION

The results of this study support the hypothesis that systematic and programmatic underhand passing training is associated with improved volleyball basic technical skills among junior high school students in Bojonegoro Regency. The 51.79% mean improvement in underhand passing ability was observed in the context of a one-group pre-experimental design; without a control group, causal attribution of this improvement exclusively to the training program cannot be made with full confidence, as maturation, history, and testing effects cannot be ruled out. Nevertheless, the magnitude of improvement is broadly consistent with prior studies employing similar eight-week protocols, and the effect size confidence interval (estimated 95% CI for d: 1.68 to 3.24, based on noncentral t-distribution) indicates a robustly large effect even at its lower bound. This finding aligns with Wahyudi & Rahmawati (2022), who reported a 43.6% improvement in underhand passing ability following an eight-week training program among junior high school students in Surabaya.

The significant improvement in underhand passing ability observed in this study can be explained through several physiological and psychomotor mechanisms. First, repeated training conducted with progressively increasing intensity facilitates neuromuscular adaptations that render movement coordination more efficient (Bompa & Buzzichelli, 2022). These adaptations encompass enhanced synchronization of motor units, reduced co-contraction of antagonist muscles, and increased nerve conduction velocity, all of which collectively contribute to improved motor skill performance (Fadilah & Setiawan, 2022).

Second, the progressively structured training program in this study provided students with opportunities to form accurate motor patterns through an optimal motor learning process. Motor learning theory posits that consistent repetition of correct movements reinforces the neural pathways associated with the specific skill, rendering movement increasingly automatic and precise (Schmidt & Lee, 2020). The implementation of a training program that accounts for the developmental characteristics of junior high school students has been shown to be more effective than programs that neglect learner characteristics (Nurhasanah & Supriatna, 2021).

Third, student motivation and active engagement in the training process contributed substantially to the program's success. Observational data collected throughout the research period indicated that students demonstrated high enthusiasm in each training session, as evidenced by an attendance rate of 96.3%. This high attendance rate supported training consistency, which in turn facilitated improvements in underhand passing ability (Rahmawati & Kusuma, 2023). This finding aligns with Self-Determination Theory (SDT), which posits that students' intrinsic motivation plays a pivotal role in the success of school-based sport training programs (Deci & Ryan, 2021).

Comparative analysis with previous studies reveals favorable consistency. Hartanto & Nugraha (2023) reported a 48.2% improvement in underhand passing ability among SMP Negeri students in Malang following an eight-week training program, a figure closely aligned with the present study's finding of 51.79%. Similarly, Firmansyah et al. (2022) reported a 45.7% improvement in Kediri Regency using a comparable training protocol. The consistency of these findings across multiple East Java settings reinforces the argument that systematic underhand passing training represents an effective intervention for improving volleyball basic technical skills among junior high school students.

This study carries several limitations that warrant acknowledgment. First, the one-group pretest-posttest design without a control group limits the researchers' ability to eliminate the influence of extraneous variables that may have contributed to the improvement in underhand passing ability, such as students' independent practice outside research hours or prior volleyball experience. Second, the unusually large Cohen's d of 2.46 — which is atypical for educational intervention research — may partly reflect a design artifact inherent to the single-group repeated-measures structure, including possible testing effects from the repeated use of the same instrument. Third, no follow-up retention test was administered after the conclusion of the training program; consequently, it cannot be claimed that the observed improvements represent durable learning rather than transient performance gains. Fourth, the sample restricted to one school in Bojonegoro Regency constrains the generalizability of findings to broader populations. Future research employing more rigorous experimental designs with control groups, larger representative samples drawn from across Bojonegoro Regency, longer intervention periods, and post-training retention assessments is strongly encouraged to further consolidate and extend the validity of the present findings (Sugiyono, 2021).

The practical implications of this study's findings are highly relevant for PESH teachers and sports coaches in schools across Bojonegoro Regency. The underhand passing training program developed in this study can be adapted and incorporated into the PESH curriculum as a strategic approach to enhancing stu-

dents' volleyball skills. Given the constraints of sports facilities and equipment commonly faced by district-level schools, this training program was intentionally designed to be implementable with minimal equipment while maintaining its effectiveness (Suherman & Wahyuni, 2022). These findings provide robust empirical evidence supporting the importance of structured training programs in volleyball instruction at the junior high school level.

CONCLUSION

Based on the results and discussion presented, it can be concluded that underhand passing training exerts a positive and significant effect on the volleyball basic technical skills of junior high school students in Bojonegoro Regency. This is evidenced by a calculated t-value of 8.743 ($df = 31$; $p < .001$), a mean improvement in underhand passing ability of 51.79%, and a very large effect size (Cohen's $d = 2.46$, calculated using pooled SD). These results are interpreted with the caveat that the pre-experimental design limits causal attribution. A systematically designed, progressive, and structured training program implemented over eight weeks at a frequency of three sessions per week proved effective in enhancing students' volleyball basic technical skills.

Based on these findings, several recommendations are offered. First, PESH teachers at junior high schools in Bojonegoro Regency are advised to implement systematic underhand passing training programs as an integral component of the PESH curriculum to improve students' volleyball basic technical skills. Second, school administrators should ensure adequate facilities and dedicated time allocations for the implementation of structured volleyball training programs. Third, future research employing more rigorous experimental designs with control groups, larger representative samples drawn from across Bojonegoro Regency, and longer intervention periods is strongly encouraged to further consolidate and extend the validity of the present findings.

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