



Training Using a Hanging Ball Modification Tool as an Effort to Improve Basic Volleyball Passing Techniques

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Abstract

This research is motivated by the low technical ability of elementary school students in volleyball underhand passing during extracurricular activities, caused by a lack of structured, repetitive, and innovative training. This study aims to analyze the effect of training using a modified hanging ball in the drill method on improving underhand passing ability. The method used was a quantitative one-group pretest-posttest preexperimental design. The subjects were 28 extracurricular students at Babakan Rancakalong Elementary School, selected using a purposive sampling technique. The research instrument was an underhand passing skills test covering initial stance, execution, and final stance. Data analysis was conducted using descriptive statistics, the Shapiro-Wilk normality test, the paired sample t-test, and the effect size test (Cohen's d). The results showed a significant increase in underhand passing ability, indicated by an increase in the average score from 19.17 (pretest) to 26.46 (post-test), with the minimum score increasing from 12 to 18 and the maximum score from 32 to 36. Normality testing indicated a normally distributed data ($p > 0.05$). A paired sample t-test obtained a significance value of 0.000 ($p < 0.05$), indicating a significant difference between before and after the treatment. The effect size of 3.64 indicated a very large effect. The conclusion of this study is that training using a modified hanging ball in the drill method effectively improves elementary school students' basic underhand passing skills and can be used as an alternative, innovative, systematic, and applicable learning method.

How to Cite

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INTRODUCTION

Physical education can generally be defined as education through selected physical activities, games, or sports to achieve desired goals (Budi & History, 2024). Physical education is the only school subject that focuses on the overall development of students' psychomotor skills and mental well-being and has a significant influence on designing daily movement routines and habits (Lenka et al., 2021). In this context, physical education instruction in elementary schools is not only oriented towards the physical aspect but also serves as the foundation for the development of sustainable basic motor skills.

Quoting the definition from PBVSI, volleyball is a sport played by two teams separated by a net with the goal of getting the ball into the opponent's court (Ilhamdi et al., 2023). Mastery of basic volleyball techniques is a crucial factor in determining game success. One of the most fundamental basic techniques is the underhand pass, which serves as initial control when receiving an opponent's serve or attack (Riksandi et al., 2024).

However, based on initial observations at Babakan Elementary School, underhand passing skills are still relatively low and uneven. This is indicated by a lack of accuracy in ball direction, suboptimal motor coordination, and errors in the initial stance, execution, and final stance. This condition aligns with empirical findings from preliminary data, which show a wide range of student abilities. These problems are suspected to be caused by a lack of structured training, a lack of varied learning methods, and the limited use of media or tools appropriate to the characteristics of elementary school students.

Theoretically, the drill method is an effective approach to improving motor skills through systematic repetition of movements. This method emphasizes the formation of motor habits through repetition, thereby making skills more automatic and permanent (Susanto et al., 2021). Furthermore, motor learning theory states that directed repetition and consistent feedback will accelerate skill acquisition (motor learning theory), especially in elementary school-aged children who are in the basic coordination development phase.

On the other hand, the use of modified equipment in sports learning also plays a crucial role in increasing the effectiveness of training. Modified equipment such as hanging balls can help students understand the direction the ball is coming from, improve body position, and

enhance hand-eye coordination. This is supported by research by Hikmawati et al., (2023), which showed that hanging ball training significantly improved underhand passing skills and hand-eye coordination. Another study by Rochim, (2023) also found that drills using hanging balls were effective in improving students' underhand passing skills.

Furthermore, research by Harun et al., (2024) showed that using a hanging ball can improve the speed and accuracy of underhand passing in junior high school students. This finding is supported by Syauki, (2020), who stated that a modified hanging ball significantly improved underhand passing skills. In general, these studies share similarities in the use of drill methods and hanging ball aids as interventions to improve basic technical skills.

However, there are several fundamental differences that indicate a research gap. Most previous studies were conducted at the junior high or college level and focused more on formal classroom learning contexts, rather than on extracurricular activities in elementary schools. Furthermore, some studies have added other variables such as hand-eye coordination or focused on techniques other than underhand passing. Therefore, there is limited research specifically examining the combination of drill methods and modified hanging ball equipment in the context of extracurricular activities for elementary school students (Taupik et al., 2025).

The urgency of this research lies in the importance of improving the quality of physical education instruction from an early age, particularly in mastering basic sports techniques. Good underhand passing skills not only contribute to game performance but also form the foundation for the development of other technical skills in volleyball. Furthermore, the use of innovative training methods tailored to the characteristics of elementary school students is crucial to improving motivation and participation. If this issue is not addressed promptly, it will result in poor quality sports training at the elementary level and suboptimal development of students' motor skills.

Based on this description, this research makes a significant contribution by providing empirical evidence regarding the effectiveness of the drill method using a modified hanging ball in improving underhand passing skills in volleyball in elementary school students. This research is expected to serve as a reference in developing more innovative, effective, and student-centered physical education learning models. The purpose

of this research is to analyse whether training using modified hanging ball equipment through the drill method has a significant effect on improving students' basic underhand passing skills in volleyball extracurricular activities at Babakan Public Elementary School. In addition, this study aims to determine the magnitude of the effect of the training program on students' passing performance through systematic and structured practice.

The novelty of this research lies in the integration of the drill method with modified hanging ball training specifically applied in the context of elementary school volleyball extracurricular activities. Previous studies generally focused on junior high school students, university students, or formal classroom learning settings, whereas this research directly examines elementary school students who are still in the stage of developing basic motor coordination. Furthermore, this study emphasizes improving underhand passing techniques through repetitive and structured exercises adapted to the developmental characteristics of elementary school students. This approach is considered novel because it combines motor learning principles, modified learning media, and extracurricular sports coaching into a more contextual and applicable training model for elementary school physical education.

Another novelty of this research is the use of modified hanging ball equipment as a learning medium that enables students to practice movement accuracy, body positioning, and hand-eye coordination simultaneously in a safer and more controlled learning environment. This training model not only focuses on technical improvement but also encourages active participation, learning motivation, and self-confidence among students during volleyball practice activities. Therefore, this research is expected to contribute theoretically to the development of motor learning theory and practically to the innovation of volleyball coaching models at the elementary school level.

METHOD

This study employed a quantitative approach with a one-group pretest-posttest preexperimental design. This approach was chosen to test the effect of training using a modified hanging ball in the drill method on improving basic volleyball underhand passing skills. This design involved one group of subjects receiving an initial measurement (pretest), then treatment, and then

a final measurement (posttest). This allowed for direct observation of changes based on the differences in results before and after the treatment.

The study was conducted at Babakan Elementary School in, Rancakalong, Sumedang Regency, based on the identification of problems related to students' low underhand passing skills in volleyball extracurricular activities. The population consisted of all students participating in extracurricular volleyball activities, while the sample comprised 28 students selected using a purposive sampling technique. The participants included male and female students from grades IV, V, and VI, aged approximately 10–12 years, with relatively homogeneous characteristics in motor development and physical activity levels (Asrulla et al., 2023).

The variables in this study consisted of the independent variable, namely training using a modified hanging ball in the drill method, and the dependent variable, namely basic volleyball underhand passing technique. The research instrument used was an underhand passing skills test, which referred to an assessment rubric with three main aspects: initial stance, execution, and final stance. Each aspect has assessment indicators systematically arranged on a 1–4 scale, resulting in a maximum score of 36. This instrument was adapted to physical education learning standards and was used to objectively measure students' skill levels.



Figure 1. Treatment Flow

The data used in this study was quantitative, consisting of pretest and posttest scores for underhand passing skills. Data collection was conducted through skills tests administered before and after the treatment. The treatment was administered over 12 sessions, twice a week, with each training session focusing on repeating underhand passing movements using the modified hanging ball in a gradual and structured manner.

Data validity was maintained through the use of instruments that adhered to relevant assessment standards and consistent testing procedures for each subject. Furthermore, to ensure data accuracy, the entire measurement process was conducted under direct supervision and followed the same procedures for both the pretest and posttest.

Data analysis was conducted in stages, starting with descriptive analysis to determine the mean, median, standard deviation, and minimum and maximum values. A Shapiro-Wilk normality test was then performed to determine the data distribution. Because the data were normally distributed, the analysis continued with a paired sample t-test to determine significant differences between the pretest and posttest results. An effect size test using Cohen's *d* was also conducted to determine the magnitude of the treatment effect. All analyses were conducted at a significance level of 0.05.

RESULTS AND DISCUSSION

Table 1. Pretest and Posttest Scores

Participant	Pretest	Posttest
P1	15	21
P2	18	25
P3	14	22
P4	24	23
P5	17	30
P6	16	20
P7	19	22
P8	13	21
P9	21	23
P10	22	20
P11	18	20
P12	13	19
P13	23	25
P14	24	24
P15	16	22
P16	15	19
P17	19	19
P18	18	20
P19	12	27

P20	14	23
P21	25	18
P22	31	36
P23	18	35
P24	32	35
P25	21	25
P26	22	29
P27	16	28
P28	21	28

Table 1. Pretest and Posttest Scores data for underhand passing ability. It is known that the number of respondents in this study was 28 people consisting of students in grades IV, V, and VI. The pretest results show that the respondents' underhand passing ability still varies, with the lowest score being 12 and the highest score being 32. After being given treatment, the posttest results showed a significant increase in underhand passing ability, with the lowest score increasing to 18 and the highest score reaching 36.

Table 2. Frequency Distribution of Pretest Lower Passing Categories

Category	Frequency	Percentage (%)
Very Good	2	7.14%
Good	4	14.29%
Fair	15	53.57%
Poor	7	25.00%

Table 2. shows that the majority of participants in this study had sufficient passing ability, namely 15 students (53.57%) out of a total of 28 participants. This indicates that the proportion of students with low passing ability in the pretest was still considered sufficient.

Table 3. Frequency Distribution of Posttest Lower Passing Categories

Category	Frequency	Percentage (%)
Very Good	4	14.29%
Good	11	39.29%
Fair	12	43.86%
Poor	0	0%

Table 3 shows that some of the participants in this study had good passing ability, namely 11 people (39.29%) out of a total of 28 participants. This indicates that the participants had achieved a good level of understanding.

Table 4, showing the results of the descriptive statistical analysis of the pretest and posttest for underhand passing ability, shows a significant improvement after the treatment. In the pretest,

the average score was 19.17, with a median of 18, a minimum score of 12, a maximum score of 32, and a standard deviation of 5.02. This indicates that the respondents' initial abilities were relatively low, with a fairly varied distribution of data.

Table 4. Descriptive Statistical Analysis Results of Pretest and Posttest Underpassing

Data	Mean	Median	Min	Max	SD
Pretest	19.17	18	12	32	5.02
Posttest	26.46	25	18	36	5.30

Meanwhile, in the posttest, improvements were observed across all statistical indicators, with the average score rising to 26.46 and the median to 25. The minimum score also increased to 18 and the maximum score to 36, with a standard deviation of 5.30. This improvement indicates that the respondents' underhand passing ability experienced significant improvement after the treatment, although data variation among respondents remained relatively diverse.

Table 5. Shapiro-Wilk Normality Test

Data	Sig (p-value)	Information
Pretest	0.066	Significance
Posttest	0.189	Significance

Table 5 shows the results of the normality test using the Shapiro-Wilk method, obtained a significance value (p-value) on the pretest data of 0.066 and on the posttest data of 0.189. Both values are greater than the significance level of 0.05 ($p > 0.05$), so it can be concluded that the pretest and posttest data are normally distributed. Thus, the assumption of normality in this study has been met, so that parametric statistical analysis can be used for further hypothesis testing.

Table 6. Paired Simple T-Test

	T	Sig
Pretest and Posttest	-19.302	0.000

Table 6. Showing the results of the paired sample t-test, the calculated t value was obtained at -19.302 with a significance value (Sig) of 0.000. Because the significance value is smaller than 0.05 ($p < 0.05$), it can be concluded that there is a significant difference between the pretest and posttest results, thus, the treatment given has a significant effect on improving students' underhand passing abilities.

Table 7 shows Cohen's d test, the average underhand passing ability increased from 19.17 (pretest) to 26.46 (posttest) with a difference of

7.29 and an SD of 1.99. The d value of 3.64 indicates a significant effect.

Table 7. Effect Size (Cohenn's d)

Variable	Mean Diff	SD diff	Cohen's D	Cat.
Underhand Passing Ability	7.29	1.99	3.64	Big

This study involved 28 students from a combination of grades IV, V, & VI of elementary school with relatively homogeneous age characteristics in the basic motor development stage. In general, students in this class range are in a phase of motor coordination development that is starting to stabilize, but still require repeated practice to improve technical skills, especially in physical education learning. In line with Mujayanah, (2019) Physical Education Learning (PEL) aims to develop students' motor, cognitive, affective, and psychomotor abilities through structured physical activities. Also according to Agustian et al., (2022), Repetitive practice (drill) has long been used as an approach to improve basic technical skills by strengthening movement automation through gradual repetition and increasing training load. The pretest results showed that students' volleyball underhand passing skills varied, with the lowest score being 12 and the highest being 32. After treatment, the posttest results showed a significant improvement, with the lowest score being 18 and the highest being 36. This demonstrates a trend of improved skills in most students after treatment. This suggests that the training method used in this study, conducted over six weeks, with training twice a week, for a total of 12 sessions, each lasting 60 minutes, effectively stimulated skill development. However, there was variation in learning outcomes among students, influenced by differences in initial abilities, level of instruction comprehension, and individual motivation. This also confirms that an adaptive learning approach oriented toward structured practice is essential to optimize learning outcomes.

Based on the descriptive statistical analysis of the pretest data, the average score (mean) was 19.17, indicating that students' initial underhand passing abilities were still relatively low. The median score of 18.00 indicates that most students achieved scores around that value, showing that students' mastery of the basic underhand passing technique was still limited before the treatment was implemented. Furthermore, the standard deviation of 5.02 indicates considerable variation in students' initial abilities, with scores ranging from a minimum of 12.00 to a maximum of

32.00. Overall, these findings indicate that students' abilities before the intervention were still varied and uneven, with most students categorized at a relatively low skill level. These findings are in line with previous studies stating that elementary school students generally still experience difficulties in mastering underhand passing techniques due to limited structured and repetitive practice (Ginting & Winata, 2026).

Based on the descriptive statistical analysis of the posttest data, the mean score increased to 26.46, indicating that students' underhand passing abilities improved after receiving the treatment. The median score of 25.00 indicates that half of the students obtained scores equal to or above 25, while the remaining students scored below that value. In addition, the standard deviation of 5.30 indicates that score variation among students was still relatively diverse, although overall performance improved compared to the pretest results. The score range also increased, from a minimum score of 18.00 to a maximum score of 36.00. These results demonstrate that the learning process using modified hanging ball training with the drill method was able to improve students' volleyball underhand passing skills significantly. Similar findings were also reported in previous studies showing that repetitive drill-based practice and modified learning media can improve students' motor coordination, confidence, and passing performance in volleyball learning at the elementary school level (Alfauzi et al., 2026).

Based on the results of the normality test, before testing the hypothesis, the data were first tested for normality to determine whether they met the assumptions of the parametric test. The Shapiro-Wilk test was used to test for normality in this study because the number of respondents was less than 50. The results of the normality test showed a significance value (p-value) of 0.066 for the pretest data, while the significance value for the posttest data was 0.189. Both significance values were greater than 0.05 ($p > 0.05$), thus concluding that the pretest and posttest data were normally distributed. With the assumption of normality met, the requirements for using parametric tests have been met, allowing further data analysis to proceed using a paired sample t-test to determine the effect of ball training on volleyball underhand passing ability.

The results of the hypothesis testing in this study were conducted using a paired sample t-test after the pretest and posttest data were declared normally distributed based on the Shapiro-Wilk normality test. The purpose of the paired sample t-test was to determine the difference in the aver-

ge underhand passing ability of respondents before and after being given training with a modified hanging ball for 12 sessions. Based on the statistical analysis, a significance value (Sig. 2-tailed) of 0.000 was obtained. This value is smaller than the specified significance level ($\alpha = 0.05$), so the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. Thus, it can be concluded that there is a significant difference between the pretest and posttest results of the underhand passing technique ability after being given training with a modified hanging ball tool. This shows that the hanging ball modification training has a significant effect on improving the underhand passing technique ability in volleyball in extracurricular activities at Babakan Elementary School. Based on the frequency distribution table of the underhand passing category in the pretest, it can be seen that the majority of participants were in the sufficient category, namely 15 people (53.57%). Furthermore, the poor category was occupied by 7 people (25.00%). Meanwhile, the number of participants in the good category was only 4 people (14.29%), and the very good category was the least, namely 2 people (7.14%). This finding indicates that the participants' underhand passing ability before the treatment (pretest) was still dominated by the sufficient to poor category, so that in general the participants' initial skill level still needs to be improved. In line with research (Agustian et al., 2022), This claim is consistent with literature showing that pretest basic skills are often at a moderate or low level, so that drill-based learning treatments, games, or a combination are needed to improve the performance of basic techniques such as underhand passing in volleyball. Also according to aAkbar et al., (2023) that drill-based learning treatments in extracurricular activities are needed to improve the performance of underhand passing techniques in volleyball, if supported by modified tools such as hanging balls. Evidence from relevant references indicates that repetitive, structured drills consistently improve underhand passing skills, especially when combined with feedback, game context, and modifications to learning media tools. This is also consistent with research (Harmono & Pratama, 2022), which suggests that hanging balls can potentially improve underhand passing skills through unique visual-motor stimuli. Several studies have suggested that training using hanging balls can increase interest, motivation, and basic motor coordination, contributing to the effectiveness of underhand passing drills.

Based on the frequency distribution of posttest results, the majority of participants, 12

(43.86%), fell into the "fair" category. This indicates that the majority of participants achieved an adequate level of understanding, although not yet fully optimal. Furthermore, the "good" category came in second with 11 (39.29%), indicating that nearly half of the participants had achieved a good level of mastery after the treatment or learning. Four (14.29%) fell into the "very good" category, indicating that a small proportion of participants had achieved a very optimal level of understanding. This achievement can be an indicator that the applied learning methods or strategies were able to maximize learning outcomes for some participants. Meanwhile, no participants fell into the "less than" (0) category, indicating that all participants had exceeded the minimum expected level of understanding.

Overall, this distribution shows a fairly positive trend in learning outcomes, with no participants in the low category and a predominance of those in the fair and good categories. This can be interpreted as indicating that the intervention or learning process has had a significant impact on improving participants' abilities, although there is still room for further improvement to enable more participants to achieve the excellent category.

The use of this clear training program allows students to significantly improve their technical performance. Furthermore, research by Ilhamdi et al., (2023) exploring training with modified equipment has reported improved accuracy and hand-eye coordination through different sensory stimulation, thereby strengthening the effect of drills in underhand passing. Furthermore, research by Hikmawati et al., (2023) suggests that using modified equipment, such as hanging balls, provides alternative sensory input to increase students' attention to ball contact. Training using a hanging ball as a modification tool has the potential to improve underhand passing performance in volleyball, especially when combined with a series of structured drills and transfer skills to a real-game context. This aligns with research by Harmono & Pratama, (2022) that demonstrated the benefits of structured drills for improving basic technique, and that modification tools such as hanging balls can add sensory stimuli that improve accuracy, response speed, and eye-hand coordination. Meanwhile, research by Azizah & Sukoco, (2023) suggests that modification tools such as hanging balls can improve learning access for students with special needs or limited facilities. However, integration with a holistic learning context is still necessary to ensure transfer to real-game play.

To determine the extent of the effect of

calf raises, further analysis was conducted using the Cohen's *d* formula. The calculation yielded a Cohen's *d* value of 3.64, which falls into the very large influence category. This value indicates that calf raises have a very strong impact on improving players' long passing ability, not only statistically but also practically in the context of youth soccer development.

Despite the positive findings, this study still has several limitations that should be considered in interpreting the results. First, the research used a one-group pretest-posttest design without a control group, making it difficult to compare the effectiveness of the intervention with other learning methods or conventional training approaches. Second, the number of participants was relatively limited and only involved students from one elementary school, so the generalization of the findings to broader populations should be conducted carefully. In addition, differences in students' motivation, physical condition, learning speed, and prior volleyball experience may have influenced the variation in learning outcomes during the training process. Future studies are recommended to involve larger samples, use experimental designs with control groups, and examine additional variables such as motivation, coordination level, or physical fitness to obtain more comprehensive findings regarding underhand passing improvement in volleyball learning.

During the treatment process, several findings were identified that did not fully meet the expected objectives. Although most students showed significant improvement in underhand passing skills, several participants still experienced difficulties in maintaining body balance, directing the ball accurately, and synchronizing arm movements with body posture during practice sessions. Some students also required a longer adaptation period to understand the correct passing technique using the modified hanging ball media. In addition, limited training duration and differences in individual learning abilities caused several participants to show slower progress compared to others. These findings indicate that structured drill-based training using modified equipment is effective overall; however, additional individualized guidance and longer training duration may still be necessary to optimize skill mastery for all students.

Another important finding during the implementation process was that the use of modified hanging ball media increased students' enthusiasm, participation, and confidence during volleyball practice activities. However, several students tended to become dependent on the han-

ging ball as a fixed target, making the transition to real-game situations slightly challenging for some participants. This indicates that future training programs should combine modified equipment drills with direct game simulations to improve the transfer of technical skills into actual volleyball gameplay situation.

CONCLUSION

Based on the findings of this study, it can be concluded that the use of modified hanging ball training through the drill method is effective in improving students' basic underhand passing skills in volleyball extracurricular activities at Babakan Rancakalong Elementary School. The improvement in students' abilities indicates that repetitive and structured practice can help elementary school students develop better movement coordination, passing accuracy, and technical mastery in volleyball learning.

The findings of this study answer the research objective, namely to analyze the effect of modified hanging ball training using the drill method on students' underhand passing abilities. The results demonstrate that the combination of repetitive exercises and modified learning media creates a more effective and student-centered learning process. The drill method provides students with opportunities to continuously practice movement patterns, while the modified hanging ball helps students focus on ball contact, body positioning, and movement control during passing activities. As a result, students become more confident and actively involved in the learning process.

This study also shows that modified learning media can support motor skill development among elementary school students, especially during the stage of basic coordination development. The use of hanging ball modifications not only facilitates technical training but also increases students' motivation and participation during extracurricular volleyball activities. Therefore, this training model can be considered an innovative and applicable learning strategy for improving basic volleyball techniques at the elementary school level.

In addition, this study provides practical implications for physical education teachers and volleyball coaches in designing more structured, engaging, and developmentally appropriate training programs for elementary school students. The findings also strengthen the concept that learning approaches combining drill-based practice and modified equipment are capable of supporting more effective motor learning outcomes in physical education.

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