

Soft touch, strong skills: utilizing rubber balls to enhance underhand passing in elementary volleyball education

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ABSTRACT

The ability to perform accurate underhand passing is a fundamental skill in volleyball, yet many elementary school students struggle to master this technique due to limited coordination and inappropriate learning media. The purpose of this study was to improve fifth-grade students' learning outcomes in performing underhand passing skills through the use of rubber ball media. Conducted as classroom action research at SD Negeri Bantulan, Yogyakarta, the study involved collaboration between researchers and physical education teachers. The research followed a cyclical model consisting of planning, action, observation, and reflection. Data were collected through initial assessments and two implementation cycles. The findings indicated a substantial improvement in student learning outcomes: from a baseline of 51.85% mastery in Cycle I to a full 100% achievement in Cycle II. These results suggest that the use of rubber ball media is an effective strategy to enhance underhand passing skills among fifth-grade students. The study contributes practical insights for educators seeking to adapt physical education practices to the developmental needs of young learners.

KEYWORDS

Underhand Passing; Rubber Ball Media; Learning Outcomes; Elementary Physical Education

1. INTRODUCTION

Physical education at the elementary level plays a vital role (Kuswoyo & Fandiasto, 2023; Pangrazi & Beighle, 2019) in shaping students' motor skills, physical confidence, and lifelong interest in sports (Goodway et al., 2014; Siedentop & Mars, 2022). Among various physical activities, volleyball is one of the most popular and frequently taught games in schools (Batez et al., 2021). A core technique in volleyball—underhand passing (Gunawan et al., 2024), is essential for basic gameplay and team coordination (Hakim et al., 2024). However, many primary school students face challenges in mastering this skill, often due to developmental limitations in motor control, fear of injury, and a lack of suitable instructional media. This issue is especially evident in public elementary schools with limited access to adaptive teaching tools.

Several studies have demonstrated that using modified equipment tailored to learners' developmental needs can significantly accelerate the learning process and enhance motor skill performance. Recent research further emphasizes the importance of developmentally appropriate teaching strategies in physical education, highlighting how adapted tools and methods can foster engagement, reduce learning anxiety, and support more effective skill acquisition among young learners. Brocken et al. (2021) found that the use of a reverse field hockey stick—which alters the dominance and coordination of the hands—led to greater improvements in skill acquisition compared to standard equipment. This study emphasizes that modifying equipment can promote positive transfer of learning by aligning with the dynamic capabilities of the learner. Similarly, Nor Azmi et al. (2020) reported that children aged 7–9 years who practiced badminton using modified rackets and court dimensions exhibited improved shot accuracy and higher engagement levels during training. Furthermore, Afrouzeh et al. (2020) showed that children, regardless of their working memory capacity, achieved better motor task performance when using modified basketball equipment. Collectively, these findings highlight that adapting sports equipment—such as using lighter balls, smaller courts, or ergonomically suitable tools—creates a more supportive and effective learning environment, particularly for elementary school students.

Ramadanisti et al. (2023) found that fifth-grade students showed better performance in volleyball underhand serves when taught using rubber ball media, with learning mastery rising from 73.33% to 90%. Another study by Tamami & Hamid (2017) showed that modified equipment like

rubber or balloon balls made volleyball lessons more effective and enjoyable, helping all students achieve the desired learning outcomes. Although these results are promising, there is still limited research focusing specifically on the use of rubber ball media for teaching volleyball underhand passing among elementary school students in the Indonesian context. Therefore, further research is needed to strengthen these findings and explore their practical use in different school settings.

In this study, the term rubber ball media refers to soft, lightweight rubber balls approximately 18–20 cm in diameter and weighing between 150–180 grams. These balls are significantly lighter and softer than standard volleyballs, making them safer and easier to handle for elementary school students. Although they do not exactly match the size and weight of official volleyballs, they provide a close enough resemblance in form and function to facilitate the development of fundamental volleyball techniques—particularly underhand passing—while minimizing fear of injury and improving motor control during learning.

In many Indonesian public elementary schools, students often struggle to master underhand passing in volleyball due to a combination of limited physical strength, fear of injury from standard volleyballs, and the absence of appropriate instructional media. Observations in several schools show that students tend to avoid the ball or perform the technique incorrectly, which inhibits their overall skill development. Teachers also face challenges in adapting volleyball instruction to suit the developmental readiness of young learners, particularly in resource-limited settings.

While previous studies (e.g., Ramadanisti et al., 2023; Tamami & Hamid, 2017) have demonstrated the benefits of modified equipment in general, few have specifically addressed the use of rubber balls to teach underhand passing in elementary volleyball contexts. Moreover, existing studies rarely connect the instructional challenges observed in real school settings with evidence-based interventions that are practical, safe, and developmentally appropriate.

Supporting previous findings, Irawan (2017) conducted classroom action research using modified rubber balls with fifth-grade elementary students in Melawi. The results showed an improvement in underhand passing skills, with average scores increasing from 69.77 in the first cycle to 82.14 in the second, reflecting a 58.62% improvement. Similarly, Ketaren et al. (2023) developed interactive multimedia tools to teach underhand passing and serving to fourth-grade students. Their study recorded average scores of 86.75 for passing (N-Gain = 0.7), 81.5 for serving (N-Gain = 0.6), and 89 for overall learning outcomes (N-Gain = 0.8), all categorized as high improvement. Furthermore, Zainudin et al. (2024) implemented mini-volleyball activities using plastic balls for

sixth-grade students in Indralaya. The study showed that the percentage of students achieving mastery increased from 58% to 86%, with average scores rising from 58.62 to 86.20.

In response to this gap, this study proposes that using rubber ball media can serve as an effective pedagogical intervention to improve underhand passing skills among fifth-grade students. Rubber balls are softer and more manageable for young learners, reducing the fear of contact and allowing students to focus on technique and accuracy. This aligns with the constructivist approach to learning, which advocates for active, learner-centered environments.

Accordingly, the purpose of this study is to evaluate the effectiveness of rubber ball media in improving underhand passing performance through a classroom action research (CAR) approach (Kunlasomboon et al., 2015), involving cycles of planning, action, observation, and reflection (Hermawan et al., 2023; Mertler, 2009). The findings are expected to provide practical implications for physical education teachers and support evidence-based innovation in instructional practices at the primary education level. The hypothesis of this research is that the integration of rubber ball media in volleyball instruction will lead to significant improvement in students' learning outcomes, particularly in their ability to perform underhand passing.

2. METHODS

2.1. Study Design and Participants

This study employed a Classroom Action Research (CAR) design, which is characterized by a cyclical process involving planning, action, observation, and reflection (Kemmis & McTaggart, 1988). The CAR model was chosen because it allows researchers to directly intervene in the teaching process, assess its impact in real-time, and make iterative improvements based on observations and reflections.

The study was conducted at SD Negeri Bantulan, Yogyakarta, during the first semester of the 2023/2024 academic year. A total of 31 fifth-grade students (17 boys and 14 girls), aged 10–11 years, participated in this classroom action research. The sampling technique used in this study was total sampling, as all students in the fifth-grade class who met the inclusion criteria were involved in the intervention. All participants were in good physical health and had no prior injuries that could hinder their participation in physical education activities. Prior to the study, informed consent was obtained from the school authorities and the students' guardians. The physical education teacher was actively involved as a collaborator throughout the research process.

2.2. Procedure

The research was conducted in two cycles, each comprising the following stages:

Each cycle followed four systematic stages: (1) planning, (2) action, (3) observation, and (4) reflection. In Cycle I, the research began with the preparation of a lesson plan and a diagnostic assessment to determine the students' initial ability in performing underhand passes. The intervention was implemented during regular physical education sessions using rubber balls, which were selected to support better grip, minimize fear of injury, and improve technical execution. Observations and performance assessments were conducted throughout the activities.

Based on the reflection of Cycle I results, Cycle II was planned with refinements to the teaching approach. The intervention continued using rubber ball media, with enhancements such as targeted feedback and structured pair drills to optimize skill acquisition. The entire study was conducted over a period of four weeks, with each cycle spanning two weeks and comprising two 60-minute physical education sessions per week, for a total of eight teaching sessions.

This iterative and reflective process aligns with the core principles of Classroom Action Research, where ongoing evaluation and responsive adjustments are essential to improving instructional effectiveness (Kemmis et al., 2014; Mertler, 2017).

2.3. Statistical Analyses

This study employed quantitative analysis to evaluate the improvement in students' learning outcomes in underhand passing using rubber ball media during volleyball lessons. The data were collected through direct observations by the collaborator, using a structured observation sheet developed based on specific performance indicators. These indicators covered three main aspects of the skill: initial position, execution of movement, and final position (follow-through), each consisting of several sub-indicators with a scoring scale ranging from 1 to 3. The maximum total score for each student was 36. The assessment was carried out twice: before and after each cycle of the intervention.

The students' scores were calculated using the following formula:

$$\text{Score} = \left(\frac{\text{Total Score Obtained}}{36} \right) \times 100$$

To determine the level of mastery, a Minimum Mastery Criterion (MMC) of 75 was applied. Students who achieved a score equal to or greater than 75 were considered to have achieved mastery learning. The percentage of mastery learning in each cycle was calculated using the formula:

$$\text{Mastery Learning Percentage} = \left(\frac{\text{Number of Students Meeting MMC}}{\text{Total Number of Students}} \right) \times 100$$

Data from observations, interviews, and documentation were triangulated to strengthen the validity of the findings. The reflection results from each cycle were used to modify and improve instructional strategies for the subsequent cycle.

3. RESULTS

3.1. Initial Condition

The research commenced on November 27, 2023, with an initial observation and a pre-test on underhand passing skills in volleyball involving fifth-grade students at SD Negeri Bantulan, Yogyakarta. This initial stage aimed to identify the students' prior competence in physical education, particularly in basic volleyball passing skills. The results of the pre-test are presented below:

Table 1. Distribution of pre-test scores in underhand passing skills

Score Interval	Frequency	Relative Percentage (%)	Midpoint
47 - 51	3	9.68%	49
52 - 56	5	16.13%	54
57 - 61	6	19.35%	59
62 - 66	8	25.81%	64
67 - 71	5	16.13%	69
72 - 76	4	12.90%	74
Total	31	100%	—

The data above indicates that only 4 students (12.90%) had achieved the minimum competency threshold (KKTP), while the majority had not met the expected performance standards. These findings informed the planning of instructional interventions using varied ball media to improve the students' underhand passing abilities.

Cycle I

The first cycle was carried out over two sessions, each aligning with the 2 × 35-minute physical education class schedule.

a) Planning

The researcher collaborated with the teacher to develop an instructional plan based on the weaknesses identified during the pre-test. The planned strategy involved the use of rubber balls to support learning and facilitate student understanding of the underhand passing technique.

b) Action and Observation

During implementation, students practiced underhand passing using rubber balls. Observations focused on student enthusiasm, attention to instructions, and execution of motor skills. The following key findings were noted:

- ✓ Some students continued to struggle with the technique due to varying levels of motor ability.
- ✓ The use of rubber balls increased student motivation, as the ball was easier to control.
- ✓ A few students lacked focus initially but responded well to redirection.

c) Reflection

A joint reflection with the teacher indicated improvements in student motivation and learning outcomes. However, it was noted that the 3-meter passing distance between students was too challenging for some. It was recommended to reduce the distance to 2 meters in the next cycle to optimize skill development.

d) Cycle I Assessment Results

Table 2 presents the distribution of student scores in Cycle I of the underhand passing volleyball lesson. Out of 31 students, the majority scored within the 70–74 range (32.26%), followed by the 65–69 range (22.58%). Only 6 students (19.35%) achieved or exceeded the Minimum Mastery Criteria (KKTP), specifically those scoring between 75 and 84. This marks an improvement from the previous percentage of 12.90%, indicating positive progress in students' underhand passing skills. Nevertheless, most students remain within the moderate score range and require further guidance to reach the expected competency level.

Table 2. Distribution of scores in Cycle I

Score Interval	Frequency	Relative Percentage (%)	Midpoint
55 – 59	3	9.68%	57
60 – 64	5	16.13%	62
65 – 69	7	22.58%	67
70 – 74	10	32.26%	72
75 – 79	4	12.90%	77
80 – 84	2	6.45%	82
Total	31	100%	–

Cycle II

The second cycle was conducted based on the evaluation and reflection of the first cycle, aiming to improve students' underhand passing skills in volleyball.

a) Planning

Building upon the findings from Cycle I, the instructional plan for Cycle II maintained the use of rubber balls but revised the passing distance to 2 meters. The objectives of Cycle II were:

- ✓ To further enhance students' technical mastery.
- ✓ To build confidence through manageable challenges.
- ✓ To create a more engaging and supportive learning environment.

b) Action

The changes implemented in Cycle II proved effective. Students demonstrated improved concentration and better technique execution. The adjusted passing distance allowed students to achieve more accurate passes and improved teamwork.

c) Observation Results in Cycle II

- ✓ Students clearly understood and performed the techniques appropriately.
- ✓ Skill execution was more disciplined and structured from start to finish.
- ✓ Students showed improved discipline and attentiveness to instructions.
- ✓ A positive learning atmosphere developed, encouraging greater participation.

d) Cycle II Assessment Results

Table 3 presents the distribution of student scores in the final assessment of underhand passing skills. Out of 31 students, the majority scored within the 86–90 range (35.48%), followed by the 81–85 range (25.81%) and 76–80 range (16.13%). A smaller portion of students achieved scores between 91–95 (9.68%), 71–75 (9.68%), and only one student (3.23%) reached the highest score range of 96–100. This distribution indicates a consistent upward trend in performance, with most students reaching high levels of competency, further confirming the effectiveness of the instructional strategy used throughout the learning cycles.

Table 3. Distribution of scores in Cycle II

Score Interval	Frequency	Relative Percentage (%)	Midpoint
71 – 75	3	9.68%	73
76 – 80	5	16.13%	78
81 – 85	8	25.81%	83
86 – 90	11	35.48%	88
91 – 95	3	9.68%	93
96 – 100	1	3.23%	98
Total	31	100%	–

4. DISCUSSION

This study was initiated with the main hypothesis that the use of varied ball media, particularly rubber balls, would significantly improve fifth-grade students' underhand passing skills in volleyball. The intervention was designed based on students' initial performance, which revealed low levels of competency, with only 12.90% of students meeting the minimum mastery criteria during the pre-test phase.

The study's results confirm this hypothesis. Following the instructional intervention in Cycle I, the proportion of students meeting the competency threshold increased to 19.35%. By Cycle II, a significant improvement was observed, with a large majority of students scoring within the higher performance ranges. Specifically, 35.48% of students scored between 86–90, and 25.81% scored between 81–85, with the total percentage of students achieving or exceeding the KKTP (*Kriteria Ketuntasan Tingkat Pencapaian*) or minimum mastery criteria rising substantially compared to the pre-test and Cycle I.

These improvements can be directly linked to the characteristics of the rubber ball media used. According to Irawan (2017) rubber balls with reduced weight and softer surfaces make volleyball learning more approachable for elementary students by minimizing the fear of injury and enabling better ball control. This is particularly important for underhand passing, which requires precise timing and proper posture. Similarly, Zainudin et al. (2024) found that the use of lightweight plastic balls in modified volleyball games led to significant gains in students' passing accuracy and confidence. While these tools differ from official volleyballs in terms of material and weight, they provide functional similarity in terms of size and basic movement dynamics, making them suitable alternatives for foundational skill development. Furthermore, studies by Ketaren et al. (2023)

emphasize that gradual introduction to official sports equipment through modified tools can foster positive skill transfer and smoother progression toward standard gameplay.

When compared with prior research in physical education and motor skill development, these findings show strong alignment. Riyanto & Syamsudin (2021) found that structured physical education programs can significantly improve the motor competence of elementary students. Their findings highlight the value of consistent and contextually appropriate instructional approaches—much like the use of modified balls and adjusted distances applied in this study.

Moreover, Santoso et al. (2023) demonstrated a positive relationship between motor ability and physical education achievement, supporting the idea that skill-focused interventions can enhance not only performance but also academic outcomes in PE. Similarly, Pratama et al. (2022) highlighted that interactive and engaging teaching approaches—such as media-assisted instruction—can significantly enhance fundamental motor skills in young learners. Although their study specifically employed Augmented Reality (AR), the underlying principle remains the same: innovative and supportive teaching strategies foster better learning outcomes by increasing student engagement.

From a practical standpoint, this study offers valuable implications for physical education teachers and curriculum developers. The use of rubber balls, which are softer and easier to control, allows students to focus on mastering technique without fear of injury or failure. Additionally, reducing the passing distance between students proved effective in building confidence and ensuring consistent performance. This adaptive approach is particularly useful in classrooms with diverse skill levels, enabling more inclusive and supportive learning environments.

The significance of these findings lies in the demonstrated effectiveness of simple, scalable instructional adjustments. In contexts where resources may be limited, introducing varied and appropriate media can make a measurable difference in student learning. Furthermore, the structured reflection and revision between cycles underscore the importance of iterative, data-driven teaching practices.

Looking ahead, future research could explore the long-term retention of skills acquired through media-assisted learning in physical education. Additionally, comparative studies involving different types of ball games or varied age groups could further validate and expand upon the current study's conclusions. The integration of digital tools or blended learning methods could also be investigated as part of broader innovation in physical education instruction.

In summary, the study provides strong evidence supporting the hypothesis that the use of varied ball media enhances students' underhand passing skills. The improvement in performance across learning cycles highlights the effectiveness of adaptive teaching strategies and reinforces the need for responsive, engaging instruction in physical education.

5. CONCLUSIONS

This study confirmed that the use of varied ball media, especially rubber balls, significantly enhances students' underhand passing skills in volleyball. The percentage of students achieving the minimum mastery criteria (KKTP) increased from 12.90% in the pre-test, to 19.35% in Cycle I, and then to 83.87% in Cycle II, indicating a substantial and consistent improvement throughout the intervention. Furthermore, by the end of Cycle II, 35.48% of students scored in the 86–90 range, and 25.81% in the 81–85 range, reflecting both quantitative and qualitative gains in performance.

Rubber balls, being soft and manageable, reduced student anxiety and encouraged accurate technique execution, while the shortened passing distance increased success and engagement. These simple yet effective adjustments enabled more inclusive participation and skill mastery across diverse student abilities.

Teachers are encouraged to incorporate such modifications, especially when addressing students with varying readiness levels. Regular reflection and data-driven adjustments to teaching strategies—as implemented across the two cycles—were key to achieving these outcomes.

Therefore, schools should provide training for PE teachers in designing innovative, inclusive, and resource-efficient learning environments. Policymakers are also urged to support such practices by integrating flexible methods into the curriculum. Future research should explore the long-term retention of these skills and the effectiveness of similar interventions across different sports and age levels.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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