

The effect of the Volkraw game method on the learning outcomes of volleyball underhand passing among twelfth-grade students

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ABSTRACT

This study examined the effect of the Volkraw game method on the learning outcomes of volleyball underhand passing among twelfth-grade students at SMA Negeri 1 Mranggen in the 2025/2026 academic year. It used a quantitative approach with a quasi-experimental method and a One-Group Pretest and Posttest Design, involving 33 students selected through random sampling. The independent variable was the Volkraw game method, while the dependent variable was students' underhand passing learning outcomes across the cognitive, affective, and psychomotor domains. The instruments consisted of a multiple-choice test for the cognitive domain, an observation checklist for the affective domain, and a 60-second practical test for the psychomotor domain. Data were analysed using descriptive statistics, the Shapiro-Wilk normality test, and the Paired Sample t-Test at a significance level of $\alpha = 0.05$. The results showed that the Volkraw game method had a highly significant effect on all three domains ($p < 0.001$). The psychomotor mean rose by 4.07 points ($t = -5.938$), the affective mean by 4.76 points ($t = -11.997$), and the cognitive mean by 15.15 points ($t = -9.265$). In conclusion, the Volkraw game method effectively improved students' volleyball underhand passing outcomes across the psychomotor, affective, and cognitive domains, making it a promising innovative instructional strategy for senior high school physical education.

Keywords: Volkraw method; learning outcomes; underhand pass; volleyball



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INTRODUCTION

In the context of sports education, the teaching and learning process serves as a vehicle for human development through physical activity. Indonesia's National Education System Law No. 20 of 2003, Article 1 Paragraph 1, defines education as a deliberate and organised effort to build a supportive learning atmosphere and process so that students can actively develop their potential and gain spiritual strength, self-discipline, character, intelligence, noble values, and the competencies they need. Within

this framework, physical education aims to provide learning experiences through movement so that students' motor skills develop in line with their growth and developmental stage, and to create opportunities for students to reach their full potential in ways that also support their cognitive and affective development (Fajri, 2019).

Physical Education, Sports, and Health is one of the most engaging and enjoyable subjects because it gives students the chance to learn, play, and work together with their classmates. Its learning process emphasises physical activity and healthy lifestyle practices that support students' physical, mental, and social development in a balanced and sustainable way (Fajar, 2020). Physical education classes cover many sports, including track and field, gymnastics, and games (Maulana, 2017), and volleyball is one of the materials commonly taught.

Volleyball is very popular in Indonesia because it is easy to play and does not require complicated facilities. It can be played in schools and communities using a simple court, a net, and a ball, which is why it is widely promoted through classroom instruction and extracurricular activities (Tapo et al., 2022). To play it effectively, however, students need to master the basic techniques of the game correctly and systematically (Mautama et al., 2022).

The underhand pass is a critical basic skill in volleyball. It is commonly used to receive serves, keep the ball under control, and start offensive plays. Sarwita (2017) notes that good underhand passing lets players direct the ball accurately to the setter so the team can attack effectively. Because it is also the most frequently used basic technique, mastering it plays an important role in determining the overall performance of the team (Subagio et al., 2022).

In practice, students' underhand passing skills remain relatively low, particularly at the senior high school level. Many students struggle to perform the pass correctly and show problems such as improper body positioning, poor ball control, and weak coordination between hand and foot movements. These issues produce inaccurate passes and make the game less effective. Saputra and Tofikin (2022) suggest that low passing skills may stem from monotonous teaching methods, a lack of variety in drills, and low student motivation. Sahabuddin et al. (2020) support this, finding that poor passing skills are linked to limited active participation and unengaging training methods that make the technique hard to master. Similar difficulties have been reported elsewhere, and play-based interventions have been shown to improve students' under-passing competence (Rajidin et al., 2022), while combined under-passing and game approaches have strengthened technical skill among volleyball players (Khoirudin et al., 2023).

Teaching the underhand pass in schools also still tends to rely on conventional methods built around repetitive drills, without engaging game-based approaches. As a result, students grow bored and lose enthusiasm for the lessons. Senior high school students generally prefer activities that are fun, competitive, and involve group interaction, so a monotonous approach makes the learning objectives harder to reach (Widat & Hasan, 2025).

The underhand pass is a fundamental skill that is fairly difficult for beginners to master because it calls for precise body positioning, arm strength, and good motor coordination. Handayani (2019) describes it as a technique of handling the ball with the lower arms to receive or pass it to a teammate, while Ginting et al. (2018) explain that the point of contact lies on the part of the arm between the wrist and the elbow. Students therefore need practice that is repetitive yet engaging so their passing skills can develop properly.

One alternative for improving underhand passing outcomes is the Volkraw game method. Volkraw is a modified form of volleyball designed with simpler rules and a focus on underhand passing. It makes learning easier by turning it into play, so the process becomes more engaging, lively, and less tedious. Showab and Djawa (2019) note that a game-based approach can raise student

engagement in physical education because students feel more motivated, take part more actively, and are better able to reach optimal learning outcomes.

Learning outcomes are important indicators in education because they reflect how successful students are after taking part in learning activities. Djara et al. (2023) describe learning outcomes as achievements that show how far students understand and master the material in terms of knowledge, attitudes, and skills. Their success depends not only on the teaching methods and media used by teachers but also on students' internal factors. Kesuma et al. (2021) note that internal factors such as motivation, intellectual ability, health, attention, attitudes, and mental readiness significantly shape the outcomes students achieve, and that favourable conditions make optimal results easier to reach.

Previous studies have shown that game-based methods can improve basic technical skills in volleyball. Hambali (2016) found that a game-based method for teaching underhand passing improved accuracy and ball control among junior high school students, and Hipolitus et al. (2022) reported that it also raised students' motivation and interest in volleyball lessons. Even so, research remains limited on how effective the Volkraw game method specifically is for underhand passing among high school students.

This study matters because of its potential to improve volleyball learning outcomes among senior high school students, particularly in mastering the underhand pass. By examining the effectiveness of the Volkraw game method, it is expected to contribute to more creative and effective teaching strategies while improving students' passing outcomes. The findings may also help physical education teachers design learning programmes that are more engaging and better matched to students' needs.

A preliminary observation at SMA Negeri 1 Mranggen indicated that underhand passing was still taught with conventional and less varied methods. Activities mainly consisted of repetitive passing drills performed in lines, with little use of game-based or enjoyable approaches, so many students became bored and lacked the motivation to improve. Several students also showed poor team communication during practice, difficulty controlling the direction of the ball, and incorrect body positioning when receiving it. The physical education teacher added that more innovative methods are needed to encourage students to become more active and engaged.

Based on these findings, the Volkraw game method is considered a relevant alternative for improving underhand passing at SMA Negeri 1 Mranggen in a more effective and enjoyable way. Building on this rationale, the present study empirically examines the effectiveness of the Volkraw game method across the cognitive, affective, and psychomotor domains of underhand passing, and is expected to guide teachers in choosing more appropriate and evidence-based volleyball instructional strategies.

METHOD

This study used a quantitative approach with a quasi-experimental method and a One-Group Pretest and Posttest Design. In this design, a single experimental group took a pretest (O_1) before the intervention, then received the Volkraw game method (X) as the treatment, and finally took a posttest (O_2) to measure changes in students' volleyball underhand passing outcomes. The design was chosen because it suits the study of an intervention's effect on the same group of participants. A similar design was used by Wicaksono and Guntur (2024) in their study on the effect of the wall-target method on the accuracy of volleyball underhand passing. It should be noted that a one-group pretest and posttest design has no control group, so the observed improvement cannot be fully separated from other possible influences such as maturation or repeated testing, and this limitation is revisited in the Discussion.

The study involved twelfth-grade students at SMA Negeri 1 Mranggen during the 2025/2026 academic year. A sample of 33 students was selected through random sampling so that the characteristics of the sample reflected those of the population. The independent variable was the Volkraw game method, a modified volleyball game with simplified rules that focus on underhand passing. The dependent variable was students' underhand passing learning outcomes, covering the cognitive, affective, and psychomotor domains. The cognitive domain was measured with a multiple-choice test, the affective domain with an observation checklist of student attitudes, and the psychomotor domain with a 60-second practical passing test. Data were collected through tests, observation, and documentation, using instruments that had been checked for validity and reliability.

Data analysis included descriptive statistics, the Shapiro-Wilk normality test, and hypothesis testing with the Paired Sample t-Test at a significance level of $\alpha = 0.05$. The Shapiro-Wilk test was used because the sample size was 50 or fewer. Descriptive statistics summarised the pretest and posttest scores for each domain, the normality test confirmed that the data met the assumption of a normal distribution, and the paired-sample t-test examined whether the mean differences between pretest and posttest were statistically significant.

RESULTS

The analysis began with descriptive statistics for the pretest and posttest scores in each domain, followed by normality testing and paired-sample t-tests. The results are presented in Tables 1 to 5. Based on the descriptive analysis of 33 samples, students' psychomotor skills improved, with the mean score rising from 30.45 (range 24 to 37) at pretest to 34.52 (range 31 to 37) at posttest. The drop in standard deviation from 3.666 to 1.564 shows that psychomotor ability became much more consistent and homogeneous after the intervention. The affective mean also rose from 32.03 to 36.79 and the cognitive mean from 60.61 to 75.76, so all three domains improved on average.

Table 1. Descriptive Statistics

Descriptive Statistics	N	Min	Max	Mean	Std. Deviation
Pre_Psychomotor	33	24	37	30.45	3.666
Post_Psychomotor	33	31	37	34.52	1.564
Pre_Affective	33	28	38	32.03	2.834
Post_Affective	33	33	39	36.79	1.495
Pre_Cognitive	33	40	90	60.61	12.232
Post_Cognitive	33	40	100	75.76	15.817
Valid N (listwise)	33				

Table 2. Psychomotor Normality Test

Tests of Normality	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Psychomotor	.135	33	.134	.954	33	.171
Post_Psychomotor	.144	33	.079	.939	33	.066

The normality test on the 33 samples shows that the pretest and posttest psychomotor data are normally distributed, supported by Shapiro-Wilk significance values of 0.171 and 0.066, both above 0.05.

Table 3. Affective Normality Test

Tests of Normality	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Affective	.141	33	.096	.947	33	.106
Post_Affective	.162	33	.027	.939	33	.064

The affective data are also normally distributed, with Shapiro-Wilk significance values of 0.106 for the pretest and 0.064 for the posttest, both above the 0.05 threshold.

Table 4. Cognitive Normality Test

Tests of Normality	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Cognitive	.186	33	.005	.936	33	.051
Post_Cognitive	.180	33	.008	.936	33	.053

The cognitive data likewise meet the normality assumption, with Shapiro-Wilk significance values of 0.051 for the pretest and 0.053 for the posttest, both just above 0.05. Because all three domains satisfy the normality assumption, parametric paired-sample t-tests were appropriate.

Table 5. Results of the Paired Samples t-Test for the Cognitive, Affective, and Psychomotor Domains

Domain	Mean Difference (Pre – Post)	t	df	p-value	Interpretation
Psychomotor	-4.061	-5.938	32	< 0.001	Significant
Affective	-4.758	-11.997	32	< 0.001	Significant
Cognitive	-15.152	-9.265	32	< 0.001	Significant

Based on the results of the paired samples *t*-test, all three learning domains showed statistically significant differences between the pre-test and post-test scores ($p < 0.001$). The negative mean differences indicate that the post-test scores were higher than the pre-test scores, demonstrating that the intervention had a positive effect on students' learning outcomes in the psychomotor, affective, and cognitive domains. Among the three domains, the cognitive domain showed the greatest improvement, with a mean difference of -15.152.

DISCUSSION

The analysis shows that the Volkraw game method had a highly significant effect on all three domains of underhand passing learning outcomes ($p < 0.001$). In the psychomotor domain, an average increase of 4.07 points together with a drop in standard deviation from 3.666 to 1.564 indicates that the intervention narrowed the achievement gap among students. In the affective domain, the highest *t*-value of -11.997 shows that changes in motivation and participation were the most consistent effect. In the cognitive domain, the largest average increase, a mean gain of 15.15 points, came with a rise in standard deviation, which points to a widening gap in understanding among students. These results agree with Effendy et al. (2020), who found that modifying volleyball games helps students improve their underhand passing because learning becomes more active and enjoyable and the basic

movements become easier to grasp. They also fit broader evidence that game-based physical learning models support motor skill acquisition (Purwanto et al., 2024) and that a game-based approach improves volleyball passing performance (Karisman & Supriadi, 2022).

A comparison can also be drawn with Ciptadi et al. (2025), whose study on the Teaching Games for Understanding and Direct Instruction models found no significant interaction between the two on volleyball passing skills, with a significance value of 0.553 ($p > 0.05$). This suggests that the widening cognitive gap among students may not come solely from the choice of a particular method but could also reflect internal factors such as prior ability, intrinsic motivation, and individual learning capacity. In other words, the two methods appeared roughly equally effective in general terms, and what may set students apart is their initial characteristics. This tentatively implies that consistently applying a play-based approach could matter as much as the specific method, though the present study did not test these student-level moderators directly, so the interpretation is better treated as a direction for future research than a firm conclusion.

Theoretically, the study reinforces earlier findings on how modified volleyball games improve students' affective outcomes. It echoes evidence that cooperative, game-based formats can build students' confidence and motivation during volleyball instruction (Kharisma et al., 2025) and that combining under-passing practice with game-based approaches improves technical skill (Khoirudin et al., 2023). Comparable gains from play-based methods have been reported for volleyball under-passing (Rajidin et al., 2022), within a Teaching Games for Understanding framework (Pambudi et al., 2024), for website-assisted passing instruction (Hambali et al., 2022), and across systematic reviews of play-based interventions for underhand passing (Iqbal et al., 2025) and of teaching methods for motor skill development in other sports (Zubaida et al., 2021). Together these findings align with wider evidence that game-based learning and gamification can strengthen motivation, engagement, and skill acquisition in physical education (Camacho-Sánchez et al., 2023).

From a practical standpoint, the study offers a three-level Volkraw model, covering beginner, intermediate, and advanced stages, that physical education teachers can readily adopt to reduce boredom with conventional methods. The rise in variation in cognitive outcomes also highlights the need for future work on a differentiated Volkraw approach that accommodates differences in learning ability. Several limitations should be acknowledged. First, the one-group pretest and posttest design has no control group, which makes it hard to isolate the effect of the Volkraw method from external factors. Second, the sample was limited to 33 students from a single school, so the findings should be generalised with caution. Third, the intervention ran for only four instructional sessions, which may not have been enough for students with very low initial skill. Fourth, even with a standardised observation rubric, the affective assessment may still have carried some observer bias. The method proved effective, but its use should include differentiated instruction and enough intervention time to accommodate students' varied abilities.

CONCLUSION

Based on the descriptive statistics, normality test, and paired-sample t-test conducted on 33 participants, the Volkraw game method had a highly significant effect on all three domains of volleyball underhand passing learning outcomes among twelfth-grade students at SMA Negeri 1 Mranggen (psychomotor $t = -5.938$; affective $t = -11.997$; cognitive $t = -9.265$; all $p < 0.001$). The greatest mean improvement appeared in the cognitive domain, while the most consistent effect, meaning the least score variation, appeared in the affective domain. Cognitive achievement showed greater variation, which suggests that the Volkraw method may need to be paired with differentiated strategies for students with lower initial cognitive ability. This game-based approach adds original

empirical evidence for the Volkraw method at the senior high school level and offers a practical three-level model, covering beginner, intermediate, and advanced stages, that teachers can readily adopt. The findings should be read with several limitations in mind, namely the absence of a control group, a single-school sample, a relatively short intervention, and the potential for subjectivity in assessing the affective domain despite a standardised rubric. Overall, the Volkraw game method marks a shift from repetitive drills toward meaningful, game-based learning, and the study is expected to provide a foundation for developing similar approaches in other sports, so that play is treated not as the opposite of learning but as a bridge to real skill mastery.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

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