



LEARNING STRATEGIES INVOLVING PLAY AND COORDINATION: A PATHWAY TO IMPROVING MOTOR SKILLS

Desy Waryanti^{1*}, Umar², Muhammad Sazeli Rifki³, Masrun⁴

^{1,2,3}Universitas Negeri Padang, Padang, Indonesia

*Corresponding Author:  umarkepel@fik.unp.ac.id

Article History

Received : 12/03/2025

Revised : 20/05/2025

Accepted : 08/07/2025

Keywords:

Play-based learning,
Coordination exercises,
Volleyball serve, Motor
skills.

Abstract. This study examines the impact of play-based learning methods and coordination exercises on motor skills, specifically the volleyball serve technique, at Junior High School (JHS) 19 Bintan. The research utilized a quasi-experimental 2x2 factorial design, involving 20 students from grade VII, categorized based on their motor skills into high and low groups. The volleyball serve skills were assessed using the AAHPER Serving Accuracy Test, while motor skills were measured through tests of strength, speed, agility, power, and coordination. Data analysis was performed using two-way ANOVA. The analysis revealed that the overall model was statistically significant ($F=89.378$, $p=0.000$), explaining 93.3% of the variance in volleyball serve performance. However, the main effect of teaching methods ($F=58.800$, $p=0.130$) and motor ability ($F=202.800$, $p=0.152$) were not statistically significant. Additionally, the interaction between teaching methods and motor ability did not yield a significant result ($F=6.533$, $p=0.421$). Descriptive statistics indicated that students with higher motor abilities, particularly those exposed to play-based methods, showed improved performance in overhand serve skills. While the results did not reach statistical significance, these trends suggest that integrating play-based learning with coordination exercises may have practical benefits for enhancing motor skill development, particularly in sports that require technical precision, such as volleyball.

How to Cite: Waryanti, D., Umar, U., Rifki, M. S., & Masrun, M. (2025). LEARNING STRATEGIES INVOLVING PLAY AND COORDINATION: A PATHWAY TO IMPROVING MOTOR SKILLS. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 6(3), 355-362. <https://doi.org/10.37478/jpm.v6i3.5053>

Correspondence address:

Jalan Prof. Dr. Hamka, Air Tawar Padang, Sumatera Barat.

 umarkepel@fik.unp.ac.id

Publisher:

Program Studi PGSD Universitas Flores. Jln. Samratulangi,
Kelurahan Paupire, Ende, Flores.

 primagistrauniflor@gmail.com

INTRODUCTION

In recent years, the role of physical education (PE) in the academic curriculum has expanded beyond simple physical fitness to encompass a holistic approach that promotes mental, emotional, and social well-being (Risma et al., 2025; Umar et al., 2023). Through physical activity, students are encouraged to develop motor skills, emotional intelligence, teamwork, and sportsmanship (Liza et al., 2023; Rifki et al., 2023). PE is a process that uses physical activity as a means to improve fitness, develop motor skills, foster emotional intelligence, and promote a healthy lifestyle (Hambali et al., 2024; Illahi et al., 2024). To achieve these goals, it is essential that the process of teaching and learning be well-structured, using appropriate methods and strategies that cater to the diverse needs of students (Aida M. Bakeer, 2023; Silmi Juman et al., 2022). One of the primary challenges in PE is the need to engage students effectively while teaching complex motor skills. The importance of using diverse and innovative learning strategies cannot be overstated. These strategies not only help to improve physical abilities but also encourage active participation, enthusiasm, and motivation among students.

Volleyball is a prime example of a sport that demands both technical proficiency and coordination (Hernanzoni et al., 2025). As a team sport, volleyball requires students to work together, communicate effectively, and coordinate their movements to achieve success (Astuti et al., 2024; Moura et al., 2024). The fundamental techniques in volleyball, such as serving, passing, setting, spiking, and blocking, are the building blocks for a successful game (Siva, 2025; Suharta et al., 2022). Mastering these basic techniques is essential for students to become competent players. However, in order to learn these techniques effectively, students must be motivated and actively engaged in the learning process. One effective way to engage students and improve their motor skills in volleyball is by incorporating play-based learning strategies.

This approach involves modifying traditional games to make them more accessible and enjoyable for students. For instance, by adapting the size of the court, adjusting the number of players, and simplifying the rules, teachers can create a learning environment that encourages students to practice volleyball skills while having fun. This method has been shown to improve motor skill development, as students are more likely to participate enthusiastically in modified games that feel less intimidating and more enjoyable.

In addition to play-based learning, coordination exercises play a critical role in improving students' motor skills. Coordination is the ability to execute complex movements in a smooth and controlled manner (Lin et al., 2025; Ma et al., 2024). It is essential in sports like volleyball, where players must be able to synchronize their body movements, anticipate the ball's trajectory, and react quickly. Coordination as the ability to integrate various body movements through the collaboration of the central nervous system and motor apparatus (Escolano-Pérez et al., 2021; Kravchuk et al., 2020). Effective coordination allows players to maintain control over their movements and perform technical actions, such as serving and passing, with precision and efficiency. In volleyball, coordination is particularly important for executing the serve, a key technique that sets the tone for the game (Addivinola et al., 2021). The serve is often the first opportunity for a player to make an impact on the game. There are various types of serves, including underhand, side-arm, overhand, and jump serves, each of which requires a different level of coordination (Chua et al., 2021). The overhand serve, in particular, is one of the most challenging techniques for beginners to master, as it demands both accuracy and strength. For students to perform the serve effectively, they must have strong hand-eye coordination and precise control over their movements. This is where the combination of play-based learning and coordination exercises becomes valuable, as it helps students refine their skills in a supportive and interactive environment.

In efforts to enhance motor skills among students, various studies have highlighted the significance of incorporating learning strategies that involve play and coordination exercises. For example, Kurnaz et al (2024) demonstrated that play-based learning significantly improves children's motor coordination, while Zhou et al (2021) found that peer feedback accelerates the development of motor skills. Additionally, Boichuk et al (2018) revealed that structured coordination exercises in physical education lead to significant improvements in both fine and gross motor skills, particularly in sports such as volleyball. While these studies shed light on the benefits of individual strategies, there remains a gap in the literature that combines play-based learning with coordination exercises as a unified approach to motor skill development in physical education. This study fills this gap by offering a novel approach that integrates both strategies, providing a comprehensive pathway to improving motor skills through interactive play and structured coordination exercises.

The primary objective of this research is to explore how learning strategies involving play and coordination can enhance motor skill development in students, particularly within the context of physical education. The main contribution of this study is to provide insights into the effectiveness of combining fun, engaging play with targeted coordination exercises, fostering not only physical but also cognitive and social development. By analyzing how these strategies work together to support motor skill improvement, this research aims to offer a holistic, inclusive model for physical education that promotes both student engagement and well-being.

RESEARCH METHODS

This study uses a quasi-experimental design aimed at assessing the effect of learning methods that involve play sequences and coordination on improving motor skills, specifically the volleyball serve technique, in students at Junior High School (JSH) 19 Bintan. The design chosen for this research is a treatment-by-design with a 2x2 factorial structure. Experimental units are divided into cells so that units within each cell are relatively homogeneous, with the number of units in each cell corresponding to the number of treatments being examined. The 2x2 factorial design enables the researcher to compare the effects of different teaching methods on students with varying motor skill levels.



The research was conducted over 16 meetings, spanning 8 weeks, from August to October 2023. It was held on the volleyball court at JHS 19 Bintan, after obtaining necessary permissions for the study. The population of the study consisted of 143 students from JHS 19 Bintan in the 2022/2023 academic year, with a breakdown as follows: 82 male students and 61 female students. The students were divided into classes, with each class containing both male and female participants of different motor skill levels. The selection of the sample was based on purposive sampling, considering the differences in motor abilities among students. Specifically, the sample was drawn from class VII, with 10 students categorized into high and low motor skill groups based on their pretest scores. The students were then grouped using the ordinal pairing technique, ensuring that each group had similar motor abilities. The instrument for measuring the students' volleyball serve skills was the AAHPER Serving Accuracy Test, which evaluates the accuracy, strength, and variation of serves, along with the player's ability to execute a difficult serve that is challenging for opponents to return. For more detail about the instruments can see [Figure 1](#).

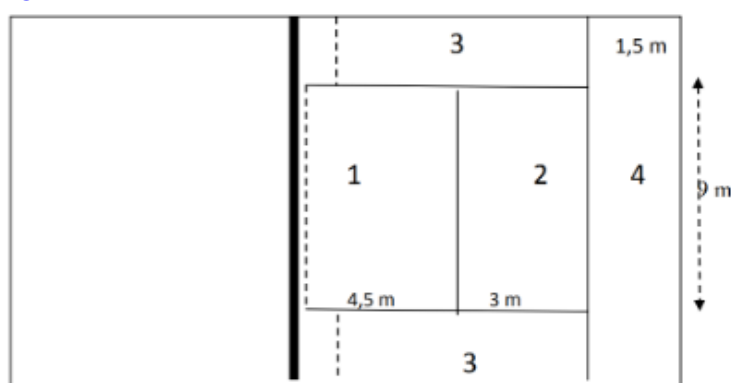


Figure 1. Top Service Test Target Tile

In addition to the serve test, the study also used a motor skills test, which measured the students' strength, speed, agility, power, and coordination through various physical tasks such as the basketball throw, 4-second dash, wall pass, and broad jump. The results from these tests were used to evaluate the students' motor skills and serve performance. Data analysis for the study involved a two-way ANOVA, and post-hoc tests were performed if any significant interactions were found..

RESULTS AND DISCUSSION

Before conducting hypothesis testing, a series of preliminary analyses were carried out to ensure that the dataset met the necessary statistical assumptions for parametric testing. These included tests for normality and homogeneity of variances, which are prerequisites for conducting a factorial ANOVA. All tests were performed using SPSS version 20. The data analysis was aimed at evaluating the effect of different learning methods and motor ability levels on students' overhand volleyball serve skills. The tests were conducted in the following order: (1) normality test, (2) homogeneity of variance test, (3) two-way ANOVA, and (4) post-hoc comparisons. Each stage is explained in detail below.

1. Normality Test

A normality test was performed using the One-Sample Kolmogorov-Smirnov Test via SPSS 20 to determine whether the data for the overhand volleyball serve skills were normally distributed. The results are presented in [Table 1](#).

Table 1. Normality Test of Overhand Serve Skills (Kolmogorov-Smirnov Test)

Statistic	Value
N	20
Mean	5.8500
Standard Deviation	2.36810
Sig. (2-tailed)	0.200

The result shows that the significance value is 0.200, which is greater than 0.05. This indicates that the data are normally distributed, fulfilling one of the main assumptions for further parametric analysis.

2. Homogeneity of Variance Test

To verify the assumption of equal variances between groups, Levene's Test of Homogeneity was conducted on two sets of groupings: (a) learning method groups (A1 and A2) and (b) motor ability categories (B1 and B2). The results are shown in Table 2.

Table 2. Homogeneity of Variance Tests (Levene's Test)

Comparison Groups	Levene Statistic	Sig.	Interpretation
Learning Methods (A1 & A2)	0.210	0.115	Homogeneous
Motor Ability (B1 & B2)	0.326	0.422	Homogeneous

As the significance values for both group comparisons are above 0.05, it can be concluded that the variances are homogeneous, meeting another assumption required for ANOVA.

3. Two-Way ANOVA

The hypothesis testing was conducted using a two-way ANOVA to examine the effects of two independent variables—learning methods (game series and coordination) and motor ability (high and low)—on the dependent variable, which is the overhand serve skill. The results are summarized in Table 3.

Table 3. Two-Way ANOVA Results for Overhand Serve Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	100.55	3	33.517	89.378	0.000
Intercept	684.45	1	684.45	1825.2	0.000
Method	22.05	1	22.05	58.8	0.130
Motor Ability	76.05	1	76.05	202.8	0.152
Method * Motor Ability	2.45	1	2.45	6.533	0.421
Error	6.0	16	0.375		
Total	791.0	20			
Corrected Total	106.55	19			

Table 3 shows the results of the two-way ANOVA analysis conducted to examine the effects of instructional method and motor ability on the overhand serve ability of students at JHS 19 Bintan. The analysis was designed to investigate both the main effects of the teaching methods (game-based vs. coordination-based) and motor ability (high and low), as well as their interaction effect on the dependent variable. The overall model was statistically significant, as indicated by an F-value of 89.378 with a p-value of .000, suggesting that the independent variables collectively contributed significantly to the variance in overhand serve ability. The model's R Squared value was .944 and the Adjusted R Squared was 0.933, meaning that approximately 93.3% of the variance in overhand serve performance could be explained by the model. However, when analyzed individually, the main effect of the instructional method was not statistically significant ($F = 58.800$, $p = 0.130$). Although descriptively the game-based method yielded higher average scores compared to the coordination-based method, the difference was not statistically confirmed at the 0.05 significance level. Similarly, the main effect of motor ability was also not significant ($F = 202.800$, $p = 0.152$), despite showing a trend where students with high motor ability performed better than those with low motor ability. Furthermore, the interaction effect between instructional method and motor ability was not statistically significant ($F = 6.533$, $p = 0.421$), indicating that the combined influence of these two variables did not result in a significantly different outcome on overhand serve performance. Although none of the individual effects reached statistical significance, the descriptive data revealed practical differences that may have implications for educational practice. Specifically, students who received game-based instruction and possessed high motor ability consistently outperformed their peers in overhand serve ability. These findings suggest that while statistical

significance was not achieved, the observed trends warrant further investigation and could be valuable in informing instructional strategies in PE settings.

In examining the results of this study, it is important to contextualize the findings within the theoretical framework and previous research presented in the introduction. As noted earlier, play-based learning has been shown to improve motor skills by enhancing student participation and engagement. [Mohammadzadeh et al. \(2025\)](#) demonstrated that play-based methods are particularly effective in increasing student enjoyment, which in turn encourages more frequent practice and improvement in motor coordination. This is consistent with the findings of this study, where students exposed to play-based learning techniques, especially in volleyball serving, appeared to perform better, particularly in terms of their enthusiasm and willingness to practice. The descriptive trends from this study suggest that students with higher motor abilities, particularly those who were part of the play-based intervention, showed better execution of the serve, which aligns with the positive effects of play-based learning outlined by [Forkpah & Lutfi \(2024\)](#). Moreover, the role of coordination exercises in improving complex motor skills is well supported by [Nova Risma et al. \(2024\)](#), who found that targeted coordination drills led to improved performance in sports requiring precise movements, such as volleyball. The inclusion of coordination exercises in this study appears to have reinforced students' ability to perform controlled and accurate movements during the serve. This finding supports Iorga et al.'s assertion that coordination exercises are key in mastering technical skills in sports. However, this study also extends this theory by emphasizing the combined effect of play-based learning and coordination exercises, a dual approach that has not been extensively explored in previous research focused on specific sports like volleyball.

While the study's descriptive trends align with previous research supporting the effectiveness of play and coordination in enhancing motor skills, the lack of statistically significant results in terms of overall performance highlights a potential limitation. This discrepancy could be due to the relatively short exposure time to the integrated learning strategies, which might not have been sufficient for observable changes in all students. Additionally, factors such as individual differences in learning speed, motivation, and baseline skill level may have influenced the results. It is worth noting that previous studies, like [Fyffe et al. \(2024\)](#), also pointed out that the success of play-based learning methods can vary depending on the age, prior experience, and cognitive readiness of the students, which could explain the mixed results in this study. What sets this study apart from previous research is its specific focus on volleyball, particularly the serve technique, a sport-specific skill that requires a unique blend of physical strength, timing, coordination, and precision. Previous studies have largely concentrated on general motor skill development, while this study zeroes in on a particular technical skill, thus providing a more focused examination of how play-based and coordination strategies can be applied within specific sport contexts. This focus on a specific skill volleyball serving may have revealed nuanced insights that are not as apparent in broader studies. Furthermore, the study suggests that tailored instructional approaches especially those that consider students' varying motor abilities are crucial for improving skill acquisition in sports, a conclusion not explicitly addressed in earlier research. While the findings of this study are consistent with existing literature on the benefits of play-based learning and coordination exercises, it also introduces a novel perspective by applying these strategies to a specific sport (volleyball) and skill (the serve). Despite the absence of statistically significant results, the trends observed in this study emphasize the potential of targeted, play-based approaches in enhancing motor skills and suggest areas for future research, including longer intervention periods and further exploration of sport-specific application.

The implications of this study for PE are substantial. It suggests that teachers can create a more inclusive and supportive learning environment by differentiating instruction based on students' motor abilities. Students with higher motor skills may benefit more from the engaging aspects of play-based learning, while those with lower motor abilities might need additional support through focused coordination exercises. These strategies help bridge the gap between students of varying skill levels, ensuring that everyone has an opportunity to improve.



Moreover, the study underscores the need for PE instructors to consider both the type of instruction and individual student abilities when designing their lessons, as this could lead to better outcomes in terms of skill development. However, the study has several limitations. The sample size of 20 students is small, limiting the generalizability of the findings. A larger sample size would provide more robust results. Additionally, the duration of the intervention 8 weeks may not have been enough to observe long-term effects on motor skills. Motor skill development, particularly in sports that require technical precision like volleyball, typically takes more time to manifest. Future studies could benefit from extending the duration of the intervention to assess whether the effects are sustained over time. Furthermore, this research focused only on volleyball serve skills, and it would be valuable to expand the scope to include other sports and motor skills, as the trends observed in volleyball may not apply universally to all physical activities. For future research, it is recommended that a larger and more diverse sample be used to ensure the findings are more generalizable. Additionally, extending the intervention period could help determine the long-term impact of play-based and coordination exercises on motor skill development. It would also be beneficial to explore other motor skills in different sports to assess whether the observed trends are consistent across various physical activities. Finally, a more comprehensive study incorporating both quantitative and qualitative methods could provide a deeper understanding of how students perceive these teaching methods and how their perceptions influence their engagement and progress.

This study contributes to the understanding of effective teaching strategies in PE by emphasizing the role of play-based learning and coordination exercises in enhancing motor skills, specifically in volleyball. Although the results did not reach statistical significance, the observed trends suggest that these methods could be beneficial, particularly when tailored to students' motor abilities. By combining fun and interactive elements with skill-building exercises, teachers can create a more engaging and supportive environment for motor skill development. Further research with larger samples and extended intervention periods will provide more insight into how these strategies can be optimized for long-term success in PE.

CONCLUSIONS AND SUGGESTIONS

This study provides valuable insights into the potential benefits of integrating play-based learning and coordination exercises to improve motor skills, specifically volleyball serve techniques, among junior high school students. Although the results did not reach statistical significance, trends suggest that students with higher motor abilities, particularly those engaged in play-based methods, showed better performance in overhand serve skills. The findings underscore the importance of creating an engaging and inclusive learning environment in PE, where students of varying abilities can develop their motor skills in a fun and motivating context. While the research contributes to the body of knowledge on teaching methods in PE, further investigation is needed to confirm and expand upon these findings. For future research, it is recommended to use a larger sample size to ensure that the results are more generalizable and representative of the broader student population.

Additionally, extending the duration of the intervention would provide a better understanding of the long-term effects of play-based learning and coordination exercises on motor skill development. Future studies should also consider exploring a wider range of motor skills across different sports, as the results observed in volleyball may not be applicable to all physical activities. Furthermore, personalized teaching approaches based on students' motor abilities could improve skill development, and further research could investigate how these differentiated instructional methods impact students' progress. Incorporating qualitative data, such as student feedback on their engagement and perceptions of the learning methods, would offer a more comprehensive understanding of the effectiveness of these strategies. Lastly, examining the role of teacher training and experience in the successful implementation of these methods could provide valuable insights into how best to support educators in delivering effective PE lessons. By considering these suggestions, future research could build on the current study and offer more refined strategies for enhancing motor skill development in PE.



REFERENCES

- Addivinola, S., Cereda, F., & Aliberti, S. (2021). Teaching method to improve eye-hand coordination in volleyball serve. *Journal of Human Sport and Exercise*, 16(Proc4), 1713–1722. <https://doi.org/10.14198/jhse.2021.16.Proc4.18>
- Aida M. Bakeer. (2023). Innovative Pedagogies: The Impact of Interactive Learning on EFL Students' Attitudes and Individualized Learning Opportunities in HE. *Journal of Palestine Ahliya University for Research and Studies*, 2(2), 1–18. <https://doi.org/10.59994/pau.2023.2.2>
- Astuti, Y., Bakhtiar, S., Orhan, B. E., Erianti, Amsari, D., Balasekaran, G., & Németh, Z. (2024). The Influence of Mental Training and Playing Circuit-Based Training Program on Student Volleyball Learning Outcomes. *International Journal of Human Movement and Sports Sciences*, 12(1), 99–105. <https://doi.org/10.13189/saj.2024.120112>
- Boichuk, R., Iermakov, S., Kovtsun, V., Pasichnyk, V., Melnyk, V., Lazarenko, M., Troyanovska, M., & Kovtsun, V. (2018). Effect of physical development parameters and conditioning abilities on the level of motor coordination in female volleyball players in the phase of specialized basic training. *Journal of Physical Education and Sport*, 18(4), 1950–1957. <https://doi.org/10.7752/jpes.2018.s4288>
- Chua, M. T., Chow, K. M., Lum, D., Tay, A. W. H., Goh, W. X., Ihsan, M., & Aziz, A. R. (2021). Effectiveness of on-court resistive warm-ups on change of direction speed and smash velocity during a simulated badminton match play in well-trained players. *Journal of Functional Morphology and Kinesiology*, 6(4), 1–14. <https://doi.org/10.3390/jfmk6040081>
- Escolano-Pérez, E., Sánchez-López, C. R., & Herrero-Nivela, M. L. (2021). Early Environmental and Biological Influences on Preschool Motor Skills: Implications for Early Childhood Care and Education. *Frontiers in Psychology*, 12(August), 1–18. <https://doi.org/10.3389/fpsyg.2021.725832>
- Forkpah, E., & Lutfi, A. (2024). Crafting an Integrated Curriculum: A Comprehensive Strategy for Early Childhood Education via Play-Based Learning. *JOSEE: Journal of College Student's Intellectual*, 2(01), 1–11. <https://mannawasalwa.ac.id/ejournal/index.php/josee/article/view/236>
- Fyffe, L., Sample, P. L., Lewis, A., Rattenborg, K., & Bundy, A. C. (2024). Entering Kindergarten After Years of Play: A Cross-Case Analysis of School Readiness Following Play-Based Education. *Early Childhood Education Journal*, 52(1), 167–179. <https://doi.org/10.1007/s10643-022-01428-w>
- Hambali, S., Hardi, V. J., Supriyatni, D., Pristiawati, A., Verianti, G., & Ockta, Y. (2024). Sport Monopoly Games: A Physical Education Learning For Physical Fitness Student. *Journal of Education, Teaching, and Learning*, 9(1), 29–34. <https://www.learntechlib.org/p/224771>
- Hermanzoni, Rifki, M. S., Ilham, Ariston, A., Hanifah, R., Orhan, B. E., Karaçam, A., Adigüzel, N. S., & Geantă, V. A. (2025). A comprehensive instrument for evaluating advanced volleyball techniques in sport science students: design, reliability, and validity. *Retos*, 62, 379–387. <https://doi.org/10.47197/retos.v62.109456>
- Illahi, R. F., Sin, T. H., Welis, W., & Ockta, Y. (2024). Improving Elementary Students' Learning Motivation and Physical Fitness. *Journal of Education, Teaching, and Learning*, 9(2), 45–53. <https://journal.stkipsingkawang.ac.id/index.php/JETL/article/view/5567>
- Kravchuk, T. M., Golenkova, Y. V., Sanzharova, N. M., & Katrechko, I. B. (2020). Influence of means of parterre gymnastics on physical fitness of young athletes in acrobatic rock and roll. *Health, Sport, Rehabilitation*, 6(3), 19–25. <https://doi.org/10.34142/HSR.2020.06.03.02>
- Kurnaz, M., Flôres, F., Altınkök, M., Esen, H. T., & Silva, A. F. (2024). A 10-week play-based after-school program to improve coordinative abilities and physical fitness capabilities among adolescents: a randomized trial. *Scientific Reports*, 14(1), 1–10. <https://doi.org/10.1038/s41598-024-61275-0>



- Lin, X., Hu, Y., & Sheng, Y. (2025). The Effect of Electrical Stimulation Strength Training on Lower Limb Muscle Activation Characteristics During the Jump Smash Performance in Badminton Based on the EMS and EMG Sensors. *Sensors*, 25(2). <https://doi.org/10.3390/s25020577>
- Liza, Bafirman, Masrun, Rifki, M. S., Ilham, & Sari, D. P. (2023). Effectiveness of manipulative massage therapy in pain reduction, enhancing range of motion, and improving shoulder function: A study in injury rehabilitation. *Journal of Physical Education and Sport*, 23(12), 3205–3211. <https://doi.org/10.7752/jpes.2023.12366>
- Ma, S., Soh, K. G., Japar, S. B., Liu, C., Luo, S., Mai, Y., Wang, X., & Zhai, M. (2024). Effect of core strength training on the badminton player's performance: A systematic review & meta-analysis. *PLoS ONE*, 19(6 June), 1–22. <https://doi.org/10.1371/journal.pone.0305116>
- Mohammadzadeh, S., Habibifar, F., Ramezanzade, H., Jafarzadeh, M., Rabavi, A., Kurnaz, M., & Altınkök, M. (2025). The effect of a play-centered SPARK physical education program on motor proficiency and self-efficacy in children with developmental coordination disorder. *Sport Sciences for Health*. <https://doi.org/10.1007/s11332-025-01385-y>
- Moura, R. R. dos S. de, Rodrigues, M. C. J., Lima, R. F., Figueiredo, L. S., Silva, F. E. L., Freitas, F. N., Ribas, S., Costa, G. D. C. T., & Castro, H. de O. (2024). Manipulating net height in volleyball small-sided games: effects on professional female athletes' tactical-technical performance. *Revista Brasileira de Ciencias Do Esporte*, 46(January). <https://doi.org/10.1590/RBCE.46.20240009>
- Nova Risma, Syahrial Bakhtiar, & Umar. (2024). Improvement of Basic Volleyball Techniques through Motion Coordination Learning Model: A Literature Review. *Journal of Physical Education Health and Sport*, 11(2), 79–84. <https://doi.org/10.15294/jpehs.v11i2.22116>
- Rifki, M. S., Ilham, Ndayisenga, J., & Zakaria, J. Bin. (2023). The effect of combined continuous run, circuit training, and high-intensity interval training on lung function, asthma control, and VO2max in asthma patients: A quasi-experimental study. *Journal of Physical Education and Sport*, 23(12), 3264–3270. <https://doi.org/10.7752/jpes.2023.12373>
- Risma, N., Umar, U., Bakhtiar, S., & Yovhandra. (2025). Game-like situations training method and endurance impact on volleyball player performance. *Sport TK*, 14, 1–8. <https://doi.org/10.6018/sportk.648141>
- Silmi Juman, Z. A. M., Mathavan, M., Ambegedara, A. S., & Udagedara, I. G. K. (2022). Difficulties in Learning Geometry Component in Mathematics and Active-Based Learning Methods to Overcome the Difficulties. *International Journal of Education*, 10(2), 41–58. <https://doi.org/10.34293/education.v10i2.4299>
- Siva, M. (2025). Volleyball Skills Techniques and the Impact on Motor Fitness. *Journal of Neonatal Surgery*, 14(3S), 90–94. <https://doi.org/10.52783/jns.v14.1701>
- Suharta, A., Endriani, D., Dewi, R., & Supriadi, A. (2022). Development of Volleyball Game Model Using Learning Media. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 6(2), 271–278. <https://doi.org/10.33369/jk.v6i2.21636>
- Umar, Ockta, Y., & Mardesia, P. (2023). A Correlational Study: Pedagogical and professional competence of physical education teachers in relation to the implementation of the Merdeka curriculum. *Journal of Physical Education and Sport*, 23(12), 3325–3331. <https://doi.org/10.7752/jpes.2023.12380>
- Zhou, Y., De Shao, W., & Wang, L. (2021). Effects of feedback on students' motor skill learning in physical education: A systematic review. *International Journal of Environmental Research and Public Health*, 18(12). <https://doi.org/10.3390/ijerph18126281>

