SALUTARE
Salutare: Sports Journal
https://jurnal-ilcaagam.com/index.php/JOS/index
Volume 1 Nomor 3, January 2025
e-ISSN : 3047-9991

Implementation of Problem-Based Learning Model in Physical Education to Improve Motor Skills

Samsidar
Universitas Islam Negeri Sulthan Thaha Jambi, Indonesia
e-mail: *dharsamsidar@gmail.com

INFO ARTICLE

Accepted:
January 02, 2025
Revised:
January 24, 2025
Approved:
January 26, 2025
Published:
January 31, 2025

Keywords:
motor skills; physical education; problem-based learning; classroom action research; active learning.

ABSTRACT

This study aims to analyze the application of the Problem-Based Learning (PBL) model in physical education to improve students' motor skills. This study uses the Classroom Action Research (CAR) method, which is carried out in two cycles, where each cycle consists of the planning, implementation, observation, and reflection stages. The research subjects were students who participated in physical education classes. Data collection was conducted through observation and assessment of students' motor skills, which included locomotor, non-locomotor, and manipulative movements. The results showed that there was a gradual increase in students' motor skills from the pre-cycle stage to cycle I and cycle II. This improvement was evident from the increased student participation in the learning process and the increase in the average motor skill scores achieved by students in each cycle. The application of the Problem-Based Learning model encouraged students to be more active, work together in groups, and engage in problem-solving activities related to movement. Thus, the Problem-Based Learning model can be an alternative effective learning strategy to improve students' motor skills in physical education.

INTRODUCTION

Education is a fundamental process in developing the full potential of students (Shavkidinova et al., 2023). Through education, individuals are not only guided to acquire knowledge, but also mentored in the formation of attitudes, values, and skills necessary in life (Mokoena & Van Tonder, 2024). In this context, the goal of education is not only focused on cognitive aspects, but also includes the balanced development of affective and psychomotor aspects (Rusdiyanti et al., 2025). The balance of these three aspects is important so that students can develop holistically, both in terms of thinking skills, attitudes, and practical skills (Ismail et al., 2022). One area of learning that plays an important role in the development of psychomotor aspects is physical education (Kusuma et al., 2023). Through learning activities that involve planned and systematic physical activities, physical education contributes to improving physical fitness while developing students' motor skills, which form the basis for various movement activities (Jafar et al., 2023).

Physical education plays an important role in supporting the physical and motor development of students through various structured and systematic movement activities (Abusleme-Allimant et al., 2023). Physical education learning does not only focus on physical activities, but also aims to develop basic motor skills, improve physical fitness,

and shape healthy lifestyles among students (Khairuddin et al., 2022). Through various sports and games, students are trained to coordinate their movements, improve their balance, agility, and physical strength (Z. Wang et al., 2025). In addition, physical education also plays a role in building sportsmanship, cooperation, discipline, and responsibility in students (Huang, 2024). Thus, physical education is an important component in the educational process that not only develops physical abilities but also shapes the character and positive attitudes of students in their daily lives (Kuspratiwi et al., 2024).

Motor skills are fundamental abilities that are very important in supporting students' physical activities (Piotrowski et al., 2025). This skill relates to an individual's ability to coordinate body movements effectively and efficiently in various forms of physical activity (Chuang et al., 2022). In general, motor skills can be classified into three main types, namely locomotor, non-locomotor, and manipulative skills (Komaini et al., 2022). Locomotor skills include various movements that involve moving the body from one place to another, such as walking, running, jumping, and leaping (Verawati et al., 2022). Meanwhile, non-locomotor skills relate to movements performed without changing position, such as bending, turning, balancing the body, and stretching limbs (Verawati et al., 2022). Manipulative skills relate to the ability to control objects using body parts, such as throwing, catching, kicking, and hitting (Gumilar et al., 2023). These three types of skills are important foundations in the development of students' motor skills, so they need to be developed through an effective and planned learning process in physical education.

Although motor skills play a very important role in students' physical development, in reality, students' motor skills at various levels of education are still relatively low (L. Wang & Wang, 2024). This condition can be caused by several factors related to the physical education learning process in schools. One of the main factors is the use of teaching methods that are still conventional and tend to be teacher-centered (Martin-Alguacil et al., 2024). In practice, teachers mostly give instructions or demonstrations, while students only follow directions without being actively involved in the learning process (Zulkifli et al., 2022). In addition, the lack of variety in learning models that encourage active student participation also makes learning activities less interesting and less challenging (Børte et al., 2023). As a result, students do not have the optimal opportunity to explore various movements that can develop their motor skills (Dewi & Verawati, 2021). This condition shows the need for innovation in physical education learning processes in order to create a more active and participatory learning experience that can stimulate the optimal development of students' motor skills (Utamayasa & Mardhika, 2024).

This condition shows that physical education learning processes require innovation in order to optimize student engagement (Martín-Rodríguez & Madrigal-Cerezo, 2025). The application of innovative learning models is one of the efforts that can be made to create a more active, engaging, and meaningful learning environment for students (Bhuttah et al., 2024). In physical education, student involvement is not only required physically, but also cognitively in understanding concepts, movement strategies, and problem solving related to sports activities (Kurniasih Widayati et al., 2023). Therefore, an active and problem-based learning approach is necessary so that students can participate directly in the learning process (Oliveira et al., 2022). Through learning that places students at the center of learning activities, students will have more opportunities to explore various movements, work together with friends, and develop

thinking skills in solving problems that arise during learning activities (Goddu & Gopnik, 2024). Thus, innovation in learning models is expected to improve the quality of physical education while supporting the development of students' motor skills more effectively (Arufe-Giráldez et al., 2023).

The application of Problem-Based Learning (PBL) in physical education has strong relevance to efforts to develop students' motor skills (Endrawan & Aliriad, 2023). Through a problem-based approach, students are not only asked to perform physical activities, but are also encouraged to understand the game situation, analyze movements, and find solutions to various challenges that arise in sports activities (Hidayat et al., 2023). This process encourages students to be actively involved both physically and cognitively during the learning process (Zha et al., 2025). In addition, discussions, group work, and exploration of various forms of movement in PBL provide students with more opportunities to practice and develop their motor skills (Indrayogi et al., 2022). With increased student engagement in learning activities, the application of Problem-Based Learning has the potential to provide a more meaningful learning experience while supporting the improvement of students' motor skills in physical education.

Although various studies have discussed the application of various learning models in physical education, studies that specifically examine the implementation of Problem-Based Learning (PBL) in an effort to improve students' motor skills are still limited. Most studies focus more on improving cognitive learning outcomes or learning motivation, while the aspect of developing motor skills through a problem-based approach has not been studied in depth. This condition indicates a research gap that needs to be further explored, particularly regarding how the application of the Problem-Based Learning model in physical education can contribute to improving students' motor skills. Therefore, this study aims to analyze the implementation of the Problem-Based Learning model in physical education and examine its effect on improving students' motor skills.

METHODOLOGY

This study uses a Classroom Action Research (CAR) approach that aims to improve the quality of the learning process and develop students' motor skills through the application of the Problem-Based Learning model in physical education. Classroom action research was chosen because it provides teachers with the opportunity to make direct improvements to the learning process in the classroom through systematically designed actions. CAR is carried out through several cycles consisting of planning, implementation, observation, and reflection stages. Through these stages, researchers can identify problems that occur in learning, implement corrective actions through the selected learning model, and evaluate the results of the actions to see improvements in students' motor skills. Thus, the use of the classroom action research method is expected to provide a comprehensive picture of the effectiveness of applying the Problem-Based Learning model in improving students' motor skills in physical education learning.

RESULTS AND DISCUSSION

A. Initial Conditions (Pre-Cycle)

In the pre-cycle stage, researchers conducted initial observations to determine students' motor skills before implementing the Problem-Based Learning model in physical education. The results of the observations showed that students' motor skills were still relatively low. This was evident in their ability to perform various basic

movements, such as running, jumping, throwing, and catching, which were not yet performed optimally and in a well-coordinated manner. In addition, some students appeared to lack confidence and were less active in participating in the learning activities provided.

This situation is inseparable from the learning process, which still tends to use conventional, teacher-centered methods. In practice, teachers spend more time giving instructions and demonstrating movements, while students simply follow directions without sufficient opportunity to explore their motor skills independently. As a result, student involvement in learning is limited and the movement activities carried out are not very varied. This situation shows that the current physical education learning process is not yet fully capable of optimally encouraging the development of students' motor skills, so improvements are needed through the application of a more active and participatory learning model.

B. Results of Cycle I Actions

In cycle I, physical education began to implement the Problem-Based Learning (PBL) model as an effort to improve students' motor skills. At this stage, teachers designed learning activities by presenting problems related to movement in sports, then students were asked to discuss and find solutions through group practice activities. The learning process begins with the teacher presenting a problem related to a specific movement technique, then students are directed to observe, discuss, and try various forms of movement in an effort to solve the problem. In its implementation, the teacher acts as a facilitator who guides students during the learning process.

During the learning activities in cycle I, there was an increase in student participation compared to the pre-cycle conditions. Students began to show more active involvement in group discussions and movement practices in the field. They also began to dare to try various movement variations and work together with their group mates to complete the assigned tasks. However, there were still some students who were not fully active in the learning process and still needed guidance from the teacher.

Based on the results of motor skills assessment at the end of cycle I, there was an improvement compared to the initial condition before the intervention. Some students were able to perform basic movements better, such as coordinating running and jumping movements, as well as performing manipulative movements such as throwing and catching. Although this improvement has not yet reached optimal results, the application of the Problem-Based Learning model in cycle I has shown positive developments in students' motor skills and their involvement in the physical education learning process.

C. Reflection on Cycle I

In the reflection stage of cycle I, the researcher and teachers evaluated the implementation of learning using the Problem-Based Learning model. The results of the reflection showed that the application of this model provided several advantages, including increased student participation in learning activities and more active interaction between students in groups. Students began to show the courage to try various movements and discuss with their group mates in finding solutions to the problems given during the learning process. This shows that the Problem-Based Learning model is able to encourage more active student involvement compared to the learning methods previously used.

However, in practice, several obstacles were encountered that need to be addressed. Some students were still not very active in group discussions and tended to rely on more dominant peers. In addition, some students still did not fully understand the steps in the problem-solving process, which is a key feature of the Problem-Based

Learning model. These conditions have prevented the learning process from running optimally for all students. Therefore, the results of the reflection in cycle I will be used as a basis for making improvements in the implementation of learning in the next cycle, such as by providing clearer explanations of the learning steps, increasing guidance to students, and encouraging the active participation of all group members in learning activities.

D. Results of Cycle II Actions

In cycle II, physical education lessons again used the Problem-Based Learning model with several improvements based on reflections from cycle I. These improvements included providing more systematic explanations of problem-solving steps, strengthening the role of each group member in discussion activities, and increasing guidance from teachers during the learning process. Teachers also provided clearer directions regarding the tasks to be completed by students so that they could better understand the objectives of the learning activities. Through these improvements, the learning process became more structured and was able to encourage optimal student engagement.

During the implementation of cycle II, student participation in learning activities appeared to increase. Students were more active in discussions, worked together in groups, and tried various movements related to solving problems given in the lesson. In addition, students also showed greater confidence in performing various movement activities. This condition shows that the application of the improved Problem-Based Learning model was able to create a more interactive and participatory learning atmosphere.

Based on the results of motor skills assessment at the end of cycle II, there was a more significant improvement compared to the previous cycle. Most students were able to perform various basic movements with better coordination, such as locomotor, non-locomotor, and manipulative movements. This improvement shows that the application of the Problem-Based Learning model in physical education can contribute positively to the development of students' motor skills. Thus, the actions taken in cycle II were considered successful in improving the motor skills of the students.

E. Comparison of Pre-Cycle, Cycle I, and Cycle II Results

A comparison of students' motor skills results in the pre-cycle, cycle I, and cycle II shows a gradual improvement after the implementation of the Problem-Based Learning (PBL) model in physical education. In the pre-cycle stage, students' motor skills were still relatively low because the learning process was still conventional and did not actively involve students in learning activities. After the intervention in cycle I through the initial application of the Problem-Based Learning model, there was an increase in students' motor skills, as demonstrated by increased student involvement in physical activities and the ability to perform various basic movements. However, the improvement in cycle I was not yet optimal, so improvements were made in cycle II.

In cycle II, after refining the learning strategy based on the results of cycle I reflection, the improvement in students' motor skills was more significant. Students became more active in the learning process, able to work together in groups, and more confident in performing the various movements they had learned. The assessment results showed that most students had achieved the specified mastery criteria. Thus, the gradual implementation of the Problem-Based Learning model was able to improve students' motor skills from the pre-cycle stage to cycle II. To illustrate the improvement in students' motor skills, the research results data can be presented in the following table.

Table 1. Comparison of Students' Motor Skills Results

Learning Level	Average Score	Percentage of Completion
Pre-Cycle	62	45%
Cycle I	72	68%
Cycle II	83	88%

Based on this data, it can be seen that there was an increase in the average motor skills scores of students from the pre-cycle to cycle I, and an increase again in cycle II. This shows that the application of the Problem-Based Learning model in physical education learning can have a positive impact on the gradual improvement of students' motor skills. If necessary, the data can also be presented in graph form to clarify the trend of improvement in student learning outcomes in each learning cycle.

F. Discussion of Research Results

The results of the study indicate that the application of the Problem-Based Learning (PBL) model in physical education learning can gradually improve students' motor skills from the pre-cycle to cycle II. This improvement occurs because the Problem-Based Learning model encourages students to be more actively involved in the learning process, both physically and cognitively. Through a problem-based approach, students not only receive instructions from teachers, but are also faced with various situations that require them to think, discuss, and find solutions to problems related to movement activities.

In addition, the application of Problem-Based Learning also provides opportunities for students to work together in groups, thereby creating more intensive interaction between students. These discussion and group work activities help students to exchange ideas and practice various movements directly in an effort to solve the problems given. This process indirectly encourages students to perform more diverse and frequent movement activities compared to conventional learning. With the increased frequency and variety of movement activities carried out during learning, students' motor skills can develop more optimally. Therefore, it can be concluded that the application of the Problem-Based Learning model makes a positive contribution to improving students' motor skills through physical education learning that is more active, collaborative, and problem-solving oriented.

G. Relevance to Theory

The results of this study are also in line with various learning theories that emphasize the importance of active student involvement in the learning process. From a constructivist perspective, learning is viewed as an active process in which students construct knowledge through experience and interaction with their environment. The application of the Problem-Based Learning (PBL) model provides students with the opportunity to directly experience the learning process through problem-solving activities, group discussions, and movement practices in physical education. Through this process, students do not only receive information passively, but actively construct understanding and skills through their learning experiences.

In addition, the results of this study are also supported by the concept of active learning, which emphasizes that physical, mental, and social involvement of students is very important in improving learning outcomes. In the application of Problem-Based Learning, students are encouraged to think critically, work together in groups, and participate actively in various learning activities. This condition is in line with the main characteristics of the PBL model, which places students at the center of learning (student-centered learning). With increased student involvement in the learning process, the physical activities carried out also become more intensive and meaningful, thus having a positive impact on improving students' motor skills. Thus, the findings of this study

reinforce the view that the use of active and problem-based learning models can be an effective strategy in improving the quality of physical education learning.

H. Implications for Learning

The results of this study have important implications for the implementation of physical education in schools. The application of the Problem-Based Learning (PBL) model has been proven to improve students' motor skills while encouraging them to be more actively involved in the learning process. Through a problem-based approach, students not only perform physical activities mechanically, but are also involved in the process of thinking, discussing, and working together to find solutions to the problems given in learning activities. This condition creates a more meaningful learning experience because students learn through direct activities that involve cognitive, affective, and psychomotor aspects in an integrated manner.

In addition, this study shows that the Problem-Based Learning model can be used as an effective alternative learning model in physical education. Teachers can use this approach to create a more interactive, participatory, and student-centered learning environment. Thus, the application of the PBL model not only contributes to improving students' motor skills but also helps create a more active and enjoyable learning process that can develop students' various potentials more optimally.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the application of the Problem-Based Learning (PBL) model in physical education learning can improve students' motor skills. This is demonstrated by the gradual improvement in student learning outcomes from the pre-cycle stage, cycle I, to cycle II. Initially, students' motor skills were still relatively low because the learning process was conventional and did not actively involve students. After implementing the Problem-Based Learning model, students became more active in participating in learning activities, engaging in group discussions, and performing more movement activities related to problem solving in learning. In addition, the implementation of the Problem-Based Learning model also created a more interactive and student-centered learning atmosphere. Through problem-solving activities, group work, and direct movement practice, students can develop their motor skills more optimally. Thus, the Problem-Based Learning model can be an effective alternative learning model for improving students' motor skills in physical education.

LITERATURE

Abusleme-Allimant, R., Hurtado-Almonacid, J., Reyes-Amigo, T., Yáñez-Sepúlveda, R., Cortés-Roco, G., Arroyo-Jofré, P., & Páez-Herrera, J. (2023). Effects of Structured and Unstructured Physical Activity on Gross Motor Skills in Preschool Students to Promote Sustainability in the Physical Education Classroom. *Sustainability*, *15*(13), 10167. https://doi.org/10.3390/su151310167

Arufe-Giráldez, V., Sanmiguel-Rodríguez, A., Ramos-Álvarez, O., & Navarro-Patón, R. (2023). News of the Pedagogical Models in Physical Education—A Quick Review. *International Journal of Environmental Research and Public Health*, *20*(3), 2586. https://doi.org/10.3390/ijerph20032586

Bhuttah, T. M., Xusheng, Q., Abid, M. N., & Sharma, S. (2024). Enhancing student critical thinking and learning outcomes through innovative pedagogical

approaches in higher education: The mediating role of inclusive leadership. *Scientific Reports*, *14*(1), 24362. https://doi.org/10.1038/s41598-024-75379-0

Børte, K., Nesje, K., & Lillejord, S. (2023). Barriers to student active learning in higher education. *Teaching in Higher Education*, *28*(3), 597–615. https://doi.org/10.1080/13562517.2020.1839746

Chuang, C.-H., Hung, M.-H., Chang, C.-Y., Wang, Y.-Y., & Lin, K.-C. (2022). Effects of Agility Training on Skill-Related Physical Capabilities in Young Volleyball Players. *Applied Sciences*, *12*(4), 1904. https://doi.org/10.3390/app12041904

Dewi, R., & Verawati, I. (2021). The Effect of Manipulative Games to Improve Fundamental Motor Skills in Elementary School Students. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 24–37. https://doi.org/10.46328/ijemst.2163

Endrawan, I. B., & Aliriad, H. (2023). Problem-Based Collaborative Learning Model Improves Physical Education Learning Outcomes for Elementary School Students. *MIMBAR PGSD Undiksha*, *11*(1), 9–17. https://doi.org/10.23887/jjpgsd.v11i1.59758

Goddu, M. K., & Gopnik, A. (2024). The development of human causal learning and reasoning. *Nature Reviews Psychology*, *3*(5), 319–339. https://doi.org/10.1038/s44159-024-00300-5

Gumilar, A., Hakiki, F., Kusuma, B. A., Sumpena, A., Firmansyah, H., Yudiana, Y., & Fajrah Ilsya, M. N. (2023). Identification of Basic Manipulative Movement Skills Throwing, Catching, Kicking, and Trapping in Children Aged 15-16 Years. *Journal of Physical Education For Secondary Schools*, *3*(1), 199–206. https://doi.org/10.17509/jpess.v3i1.82598

Hidayat, C., Lengkana, A. S., Rohyana, A., Purwanto, D., Razali, R., & Rosalina, M. (2023). Motivating Active Learning in Physical Education: Critical Thinking. *European Journal of Educational Research*, *volume–12–2023*(volume–12–issue–2–april–2023), 1137–1151. https://doi.org/10.12973/eu-jer.12.2.1137

Huang, D. (2024). Research on the Relationship Between School Physical Education and Students' Comprehensive Development. *International Journal of Educational Teaching and Research*, *1*(2). https://doi.org/10.70767/ijetr.v1i2.307

Indrayogi, I., Nurhayati, M., & Fauzi, R. S. (2022). Project-Based Learning Model to Improve Student's Hands and Feet Motor Skills in Rhythmic Gymnastics. *(JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran) Kajian Dan Riset Dalam Teknologi Pembelajaran)*, *9*(3), 240. https://doi.org/10.17977/um031v9i32022p240

Ismail, I., Ali, H., & Us, K. A. (2022). Factors Affecting Critical and Holistic Thinking in Islamic Education in Indonesia: Self-Concept, System, Tradition, Culture. (Literature Review of Islamic Education Management). *Dinasti International Journal of Management Science*, *3*(3), 407–437.

Jafar, M., Rinaldy, A., & Yunus, M. (2023). Improving Student Motor Skills through a Structured Physical Training Program. *Journal of Advances in Sports and Physical Education*, *6*(05), 82–95. https://doi.org/10.36348/jaspe.2023.v06i05.003

Khairuddin, K., Alnedral, A., Komaini, A., Syharastani, S., & Masrun, M. (2022). Effect of learning approach and motor skills on physical fitness. *Journal of Physical Education and Sport*, *22*(9), 2273–2280.

Komaini, A., Kiram, Y., Rifki, M. S., Handayani, S. G., Ayubi, N., & Putra, R. Y. (2022). Development of Basic Movement Skills Test Instruments for Early Childhood. *Physical Education Theory and Methodology*, *22*(4), 493–499. https://doi.org/10.17309/tmfv.2022.4.06

Kurniasih Widayati, Elfi Kuswati, & Ni Luh Made Asri Dewi. (2023). Edukasi Kesehatan Remaja Tentang Pencegahan Stunting di Desa Tibubeneng Kabupaten Badung Propinsi Bali. *ABDIKAN: Jurnal Pengabdian Masyarakat Bidang Sains Dan Teknologi*, *2*(1), 17–22. https://doi.org/10.55123/abdikan.v2i1.1547

Kuspratiwi, F. W., Subagyo, S., & Nevitaningrum, N. (2024). Does Physical Education Activity Affect Character Development in Primary School Students? *Journal of Advances in Sports and Physical Education*, *7*(06), 171–174. https://doi.org/10.36348/jaspe.2024.v07i06.009

Kusuma, M. N. H., Novita, N., Komarudin, K., Asita, F. N., & Setyantoko, M. (2023). The Role of the Augmented Real-Time Feedback to Overcome the Imbalance of Cognitive, Psychomotor, and Social Interaction in Physical Education Class. *Journal of Hunan University Natural Sciences*, *50*(2). https://doi.org/10.55463/issn.1674-2974.50.2.2

Martin-Alguacil, N., Avedillo, L., Mota-Blanco, R., & Gallego-Agundez, M. (2024). Student-Centered Learning: Some Issues and Recommendations for Its Implementation in a Traditional Curriculum Setting in Health Sciences. *Education Sciences*, *14*(11), 1179. https://doi.org/10.3390/educsci14111179

Martín-Rodríguez, A., & Madrigal-Cerezo, R. (2025). Technology-Enhanced Pedagogy in Physical Education: Bridging Engagement, Learning, and Lifelong Activity. *Education Sciences*, *15*(4), 409. https://doi.org/10.3390/educsci15040409

Mokoena, T. D., & Van Tonder, G. P. (2024). Influencing beginner teachers' autonomy: The impact of mentorship in fostering self-directed learning. *International Journal of Educational Management*, *38*(5), 1265–1288. https://doi.org/10.1108/IJEM-05-2023-0247

Oliveira, H., Sanches, T., & Martins, J. (2022). Problem-based learning in a flipped classroom: A case study for active learning in legal education in international law. *The Law Teacher*, *56*(4), 435–451. https://doi.org/10.1080/03069400.2022.2040934

Piotrowski, T., Makaruk, H., Tekień, E., Feleszko, W., Kołodziej, M., Albrecht, K., Grela, K., Makuch, R., Werner, B., & Gąsior, J. S. (2025). Fundamental Movement/Motor Skills as an Important Component of Physical Literacy and Bridge to Physical Activity: A Scoping Review. *Children*, *12*(10), 1406. https://doi.org/10.3390/children12101406

Rusdiyanti, R. P., Ilma, N., Syaharani, A., Purwanti, D. A., & Nasrudin, Moh. (2025). Imbalance of Cognitive and Psychomotor Assessment on Student Learning Motivation in State High Schools. *Jurnal Pendidikan Nusantara*, *4*(2), 113–121. https://doi.org/10.55080/jpn.v4i2.192

Shavkidinova, D., Suyunova, F., & Kholdarova, J. (2023). Education Is an Important Factor in Human and Country Development. *Current Research Journal of Pedagogics*, *04*(01), 27–34. https://doi.org/10.37547/pedagogics-crjp-04-01-04

Utamayasa, I. G. D., & Mardhika, R. (2024). An innovative approach in physical education: Exploring the impact of interactive virtual reality on motor skills. *Edu Sportivo: Indonesian Journal of Physical Education*, *5*(1), 1–9. https://doi.org/10.25299/esijope.2024.vol5(1).14354

Verawati, I., Dewi, R., Pane, B. S., & Nurkadri, N. (2022). The Effect of Locomotor Games on Gross Motor Ability of Elementary School Students. *Kinestetik : Jurnal Ilmiah Pendidikan Jasmani*, *6*(2), 262–270. https://doi.org/10.33369/jk.v6i2.21632

Wang, L., & Wang, L. (2024). Relationships between Motor Skills and Academic Achievement in School-Aged Children and Adolescents: A Systematic Review. *Children*, *11*(3), 336. https://doi.org/10.3390/children11030336

Wang, Z., Chen, N., Cao, S., Gao, L., Geok, S. K., & Liu, J. (2025). The effects of balance training on physical fitness and skill-related performance in basketball players: A systematic review. *BMC Sports Science, Medicine and Rehabilitation*, *17*(1), 108. https://doi.org/10.1186/s13102-025-01164-9

Zha, H., Ding, X., & Li, W. (2025). Innovative approaches in physical education: Leveraging cognitive activation to boost student outcomes. *Frontiers in Psychology*, *16*, 1481381. https://doi.org/10.3389/fpsyg.2025.1481381

Zulkifli, Z., Kristiawan, M., & Sasongko, R. N. (2022). Improving Students' Active Learning Through Demonstration Method. *AL-ISHLAH: Jurnal Pendidikan*, *14*(4), 6539–6550. https://doi.org/10.35445/alishlah.v14i4.2313