COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 17, Number 2, 2025 ‖ P.1099-1110

Utilization of an Inclined Plane to Increase the Efficiency of Forward Roll on Class IV Students at Paringin 2 State Elementary School

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]

1,2,3 Universitas Lambung Mangkurat, South Kalimantan, Indonesia

2110122310046@mhs.ulm.ac.id[1], rahmadi@ulm.ac.id[2], recky.haffyandi@ulm.ac.id[3]

ABSTRACT

The purpose of this study was to determine the utilization of an inclined plane to improve the efficiency of the front roll on class IV students at Paringin 2 State Elementary School. The method used in this study was a pre-experiment with a pre-test and post-test research design. The data analysis technique uses the T-Test to compare the average of two samples to test the truth or not of a hypothesis; besides that, the research uses the percentage formula to calculate the percentage of complete students and incomplete students. The research sample was class IV students of Paringin 2 State Elementary School, Balangan Regency, totalling 19 people, and the object of research focused on the utilisation of an inclined plane to increase the efficiency of the front roll movement. The results in pre-test and post-test results showed that the highest score remained at 100. The lowest score was 55.5 in the pre-test and 80.5 in the post-test. The average was 86.8 in the pre-test and 95.3 in the post-test. The Minimum Attainment Criteria was 75. Students who completed 78.95% in the post-test and 100% in the post-test. Students who did not complete the pre-test were 21.05% and the post-test was 0%. The t-test results show P-value = 0.0000239304, far below 0.05, so there is a significant difference in student learning achievement before and after the application of the inclined plane in front roll learning. In conclusion, the utilization of an inclined plane significantly increases the efficiency of the front roll movement in class IV students at Paringin 2 State Elementary School.

ARTICLE HISTORY
Received: 2025/06/10
Accepted: 2025/06/20
Published: 2025/06/25

KEYWORDS
Inclined Plane
Increase the Efficiency
Forward Roll
Students
State Elementary School.

AUTHORS' CONTRIBUTION
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article : Rusmana, Adi; Rahmadi, R.; Haffyandi, Recky Ahmad. (2025). Utilization of an Inclined Plane to Increase the Efficiency of Forward Roll on Class IV Students at Paringin 2 State Elementary School. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 17 (2), p.1099-1110

INTRODUCTION

Physical education (PE) plays a critical role in developing motor skills, cognitive abilities, and healthy habits in children. One of the essential goals of PE in elementary schools is to provide students with the basic physical competencies needed for lifelong physical activity (Cairney et al., 2019). Among these competencies, gymnastic movements such as the forward roll are considered foundational as they contribute to overall agility, coordination, and body control (Gallahue, Ozmun, & Goodway, 2021). However, mastering such skills requires appropriate instructional strategies, including the use of pedagogical aids and biomechanical understanding.

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

The effectiveness of movement learning in children is highly influenced by both physical development and the use of motor learning supports. It is well-established that when biomechanical constraints are reduced, children's confidence and ability to perform complex movements significantly improve (Rudd et al., 2017). One of the methods used in PE environments to assist in this process is the use of an inclined plane—a surface designed at an angle to facilitate movements that would otherwise require more muscular effort on flat ground.

To achieve educational goals, physical education involves human movement and can take the form of games, sports, or physical activities. Physical education covers aspects such as intellectual, emotional, social, moral, and spiritual skills in addition to developing and awakening personal potential (Mustafa & Sugiharto, 2020). Physical education, which includes a variety of activities, is a deliberate and directed process that aims to produce a complete, quality, and Pancasila-minded Indonesian human being. The goal is to achieve progress in all aspects of health and fitness, intelligence, character, and personality harmony (Ari Iswanto, 2021).

Elementary school physical education classes introduce students to a variety of sports designed to foster physical health, collaboration, and skill development (Kamadi et al., 2024). Elementary school sports programs often include the basics of gymnastics, ball games (basketball, soccer, and volleyball), running, jumping, and more traditional sports like baseball. The goal of these activities is to build muscle, improve coordination, and teach children the importance of working together.

The physical education program covers a wide range of topics, including but not limited to: learning the basics of various sports and games, exercises for personal growth and development, rhythm exercises, water activities, and outdoor education. Students are provided with these resources to help them understand why people move and how to move safely, effectively and efficiently. Students should be able to develop better self-perceptions and recognise the benefits of physical exercise when implemented in a planned, progressive and sustainable manner (Faridah, 2024).

The forward roll, also known as the somersault, is a fundamental gymnastic movement that requires coordination of body segments and efficient weight transfer. Young children often find this movement difficult due to limited muscular strength, poor coordination, or fear of falling (Santos et al., 2020). An inclined plane helps reduce these barriers by leveraging gravity to assist with the rolling motion, thus lowering the energy expenditure and providing smoother execution of the roll (Sharma & Singh, 2018).

Previous studies have shown that mechanical aids such as inclined mats significantly improve performance outcomes in rolling movements, especially in beginner-level learners (Özer et al., 2024; Milanović et al., 2022). In addition to biomechanical support, such tools also play a psychological role by increasing the willingness of students to attempt challenging tasks, thus reinforcing learning through positive experiences (Morgan et al., 2018).

Despite these advantages, the use of inclined planes in PE is still underutilised, particularly in resource-constrained schools or among generalist PE teachers who may

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

lack training in gymnastics or motor development strategies (Ward et al., 2017). In Indonesia, where curricular standards for physical education emphasise both skill acquisition and student engagement (Kemdikbud, 2020), innovations in instructional strategy, like using inclined planes, could enhance both learning outcomes and curriculum implementation.

At Paringin 2 State Elementary School, observations have revealed that many Class IV students experience difficulties in performing forward rolls during gymnastics lessons. These challenges manifest in poor form, lack of control, incomplete movement execution, and, in some cases, fear-induced avoidance of the activity. This learning barrier not only hampers students' motor development but also affects their confidence and enjoyment of physical education.

In response to these issues, educators are exploring mechanical support tools like inclined planes to create a more accessible and encouraging environment for movement learning. However, the effectiveness of such interventions in this specific educational context has not been adequately studied. This raises several questions: To what extent does the use of an inclined plane facilitate forward roll performance? Are there measurable improvements in technique and student participation when such tools are implemented? And how do students respond psychologically to the modified task conditions?

The use of inclined plane mats can help overcome students' difficulties and fears in doing forward rolls in floor gymnastics. The inclined mat provides gravity support that facilitates body movements when rolling, so that students can more easily understand basic techniques and feel safer. This tool also reduces the physical pressure felt by students, helps increase self-confidence, and reduces the risk of injury during practice. This approach is effective in gradually building student comfort in learning floor gymnastics movements (Asry Syam, Ismet Yasin, 2024).

An inclined plane mat is a tool designed to make it easier for students to do forward rolls in floor gymnastics. In addition, the use of an inclined mat increases students' sense of security and confidence, reduces the risk of injury, and motivates them to try the movements more comfortably. This tool is very useful in the learning process, especially for beginners (Fatkhurohman, 2022).

Several studies that are related to the level of physical fitness in futsal include: 1) "Use of Inclined Mattress Media to Improve Forward Roll Learning Outcomes in Grade 4 Students of Plosowangi State Elementary School" research by (Fatkhurohman, 2022), 2) Inclined Mat, Floor Gymnastics, Learning Media (Ismet Yasin, Asry Syam, 2024), 3) "The Effect of Using an Inclined Plane Mat on Improving Front Roll Ability in Pjok Subjects at State Elementary School 2 Nglurup Ponorogo" Research by (Mukti et al., 2023).

Although numerous studies have investigated the effectiveness of various instructional strategies in PE, there is limited research focusing on the integration of mechanical aids—specifically inclined planes—in elementary school settings in Southeast Asia, including Indonesia. Most existing studies are either experimental trials conducted in controlled environments (e.g., gymnastic clubs) or focus on broader motor

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

skills without isolating the forward roll as a specific skill (Bruno et al., 2019; Rudd et al., 2021).

Furthermore, while the biomechanics of inclined planes have been widely documented in physics and kinesiology literature, their pedagogical implications in practical PE instruction remain underexplored. In particular, there is a lack of empirical evidence linking inclined plane utilisation with observed improvements in forward roll efficiency in real classroom conditions. Additionally, few studies have taken into account the psychological benefits of using assistive tools in reducing fear and increasing engagement in motor skill learning (Palmer & Brian, 2021).

This research aims to address this gap by systematically investigating the use of inclined planes within a classroom PE context and evaluating its effects on the execution and efficiency of forward rolls among Class IV students in a typical Indonesian elementary school setting.

This study is unique in several ways. First, it applies a biomechanical learning aid—in this case, an inclined plane—to a natural school environment rather than a controlled sports science laboratory. Second, it focuses on a specific movement skill that is often neglected in broader PE research: the forward roll. Third, the study targets a critical age group (9–10 years old), which represents a developmental period where gross motor skills are rapidly evolving and highly responsive to instructional support (Haywood & Getchell, 2020).

Unlike many prior studies that only assess pre-post performance outcomes, this research also considers qualitative feedback from students and teachers, aiming for a more holistic understanding of the intervention's effectiveness. Finally, the research integrates insights from physics, motor learning, and pedagogy to develop a multi-disciplinary approach to teaching gymnastics in elementary schools—an innovation particularly valuable in countries like Indonesia, where resource availability and teacher specialisation vary greatly.

In light of the aforementioned background, this study sets out to evaluate the impact of using an inclined plane to facilitate the learning of forward rolls among Class IV students at Paringin 2 State Elementary School. The main objectives are: (1) To determine whether the use of an inclined plane significantly improves the execution quality of forward rolls in students, (2) To examine student perceptions of difficulty and enjoyment in performing forward rolls before and after the intervention, and (3) To provide evidence-based recommendations for integrating mechanical aids in the PE curriculum, especially in settings with limited resources and instructional expertise.

This research holds important implications for PE teachers, curriculum developers, and educational policymakers. If proven effective, inclined planes could serve as a cost-effective and pedagogically sound method to enhance motor skill learning in primary education. By advancing our understanding of the interplay between physical supports and motor development, this study aims to contribute to the ongoing effort of making physical education more inclusive, effective, and enjoyable for all students.

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

METHODS

This study used a pre-experimental method, which is an approach that aims to assess the impact of an intervention or treatment. The design used is a pre-test and post-test, which functions to determine the extent of the effect of the treatment on the research subjects (Agustianti et al., 2022). By comparing the results of the pre-test and post-test, researchers can evaluate the effectiveness of the intervention given, whether there is a significant change or not. In the pre-test stage, the subjects performed a forward roll movement on a regular gymnastics mat, while in the post-test stage, the same movement was performed on an inclined plane as a form of treatment.

Research samples refer to individuals, groups, or entities that are the primary source of data in a study. Subjects are generally humans or living things that provide information through interviews, observations, or experiments (Syafriani et al., 2023). Subjects are usually humans who provide information through interviews, questionnaires, or observations (Nashrullah et al., 2023). The research sample was 19 fourth-grade students of Paringin 2 State Elementary School, Balangan Regency, with an age range of 9 to 10 years.

The object of research, on the other hand, is the aspect or phenomenon being studied. The object can be a concept, variable, event, or object that is analysed to gain a deeper understanding (Wiwin Yuliani, 2023). Analysis of research objects is carried out using various methods such as experiments, observations, or literature reviews in order to obtain valid data that can be tested for truth (Adil, 2023). The research object focuses on the use of inclined planes to increase the efficiency of forward roll movements.

An observation sheet instrument to record observation results systematically to measure skills and body posture movements in rolling the body forward or forward roll (Utomo et al., 2024). Implementation: students do a forward roll based on criteria consisting of warm-up start, preparation stage, movement stage, and end of movement. Then the assessment criteria in the form of a score are obtained from the weight of the criteria, namely 1 = can't, 2 = Average, 3 Can. The weighted score obtained is then added up as a whole, and the score is entered into the formula for the total score divided by the maximum score times 100.

Data analysis was conducted using the T-Test, which is a statistical method for comparing the means of two samples. The goal is to test the truth of a hypothesis in a population(Syafriani et al., 2023). This study also uses a percentage formula to calculate the proportion of students who completed and those who did not.

RESULTS AND DISCUSSION

Result

This study aims to examine how effective the use of inclined planes is in increasing the efficiency of forward roll movements in grade IV students at SDN Paringin 2. Through observation and evaluation of learning outcomes, this study compares the value of student learning outcomes before and after using inclined planes as a learning method. The research data presented in the form of tables and descriptions provides an overview

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

of the increase in student abilities and the contribution of inclined planes in helping the learning process of forward roll movements more effectively, as follows:

Table 1.
Sample Distribution

Classification	Frequency	Presentation
Men	13	68%
Women	6	32%
Total	**19**	**100%**

The distribution of subjects contained in this study is the male classification frequency of 13 people, 68%, female classification is 6 people, with a percentage. The total number of subjects distributed is 19 fourth-grade students at Paringin 2 Elementary School.

Table 2.
Pre-test and post-test results

Information	Pre-test	Post-test
Highest Value	100	100
Lowest Value	55,5	80,5
Average Value	86,8	95,3
Minimum Completion Criteria	75	75
Percentage of Students Completed	78,95%	100%
Percentage of Students Not Completing	21,05%	0%

The description of the pre-test and post-test results shows that the highest score is always 100. The lowest score was recorded at 55.5 for the pre-test and 80.5 for the post-test. The average pre-test score was 86.8, while the post-test reached 95.3. The Minimum Passing Criteria was set at 75. In the post-test, the percentage of students who met the criteria was 78.95% and in the pre-test, all students reached 100%. Students who did not meet the criteria in the pre-test were 21.05% and in the post-test, there were no students who did not complete.

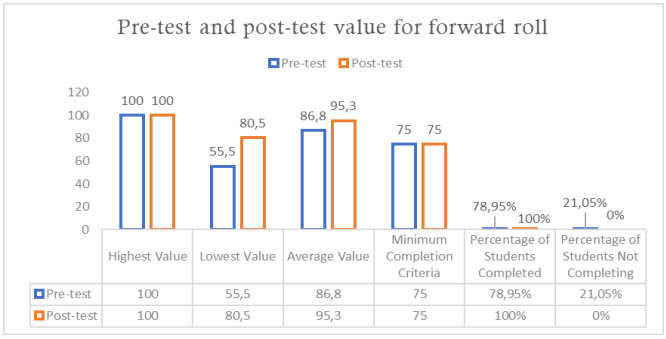

Figure 1.
Pre-test and post-test graph results

In the pre-test and post-test, the highest score remained at 100. The lowest score increased from 55.5 in the pre-test to 80.5 in the post-test. The average score increased from 86.8 in the pre-test to 95.3 in the post-test. Student completion increased before the post-test, and only 78.95% of students met the KKM. After the post-test, this number reached 100%. Students Who Did Not Complete - In the pre-test, there were still 21.05% of students who had not reached the KKM. However, after the post-test, 0%.

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

Table 3.
Results of the T (t-test)

	Pre-test	Post-test
Mean	86,8	95,3
Variance	141,3911111	44,04
Observations	19	19
Pearson Correlation	0,901154722	
Hypothesised Mean Difference	0	
df	18	
t Stat	-5,6364231897	
P(T<=t) one-tail	0,0000119652	
t Critical one-tail	1,7340636066	
P(T<=t) two-tail	0,0000239304	
t Critical two-tail	2,1009220402	

The students' mean score increased from 86.8 in the pre-test to 95.3. The variance in the pre-test was quite large, reaching 141.39, while in the post-test it decreased to 44.04. The Pearson correlation value was 0.901, indicating a very strong relationship between the pre-test and post-test. P-value (one-tailed) = 0.0000119652 and P-value (two-tailed) = 0.0000239304.

Discussion

This study explored the effectiveness of using an inclined plane to improve the performance of forward rolls among Class IV students at Paringin 2 State Elementary School. The introduction of an inclined surface is grounded in biomechanical principles and pedagogical strategies aimed at enhancing motor skill acquisition in children.

An inclined plane reduces the required force to move an object by increasing the distance over which the force acts, as noted by classical mechanics (Wikipedia, 2025). When the surface is frictionless, the mechanical advantage equals the length-to-height ratio or the reciprocal of the sine of the angle (Wikipedia, 2025). In a pedagogical setting, this mechanical advantage facilitates students' ability to roll forward with less effort and smoother motion. Especially for young learners, decreasing the force requirement can enhance confidence and execution fluency (CrossFit Journal, 2005). According to pedagogy in physical education, tasks structured appropriately provide success experiences, reinforcing children's learning (Rink & Hall, 2008).

Research in physical education underscores that tasks with gradually increased complexity, from nets to minimal support, promote motor learning (Rink & Hall, 2008). The forward roll down an incline exemplifies this, as the plane adds support before transitioning to flat-ground rolls. This aligns with scaffolding theory in PE, which recommends progressive assistance (Rink & Hall, 2008) and benefits from ecological dynamics frameworks that emphasise manipulating constraints to shape learning (Araújo et al., 2021).

Primary school studies reveal that inclined surfaces facilitate forward roll learning more effectively than flat surfaces (PECentral, 2017). Gymnastics interventions have also improved flexibility and strength in young children, supporting enhanced motor proficiency (Özer et al., 2024). Additionally, specific training improved ladder-like rolls in children, similar to the improvements seen following inclined plane practice

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

InfoSAS studies by Bruno et al. (2019) confirm that forward roll performance scores improved significantly post-training, especially when administered by experts. Moreover, trained gymnasts significantly outperform novices in both forward and backwards rolls (Bruno et al., 2019).

Inclined planes reduce frictional demands and bias students toward rolling instead of sprawling (Harrell, 2005). This supports biomechanical investigations indicating that rolling reduces impact forces (Harrell, 2005). While ground reaction force studies have focused on landings, the principle applies: reduced peak forces lead to safer and more controlled movements (Radlinger et al., 2005). By smoothing motor patterns during downhill rolls, students build momentum and proprioception, which help transfer gains to flat-ground performance.

Specialist PE teachers provided more reliable assessments of rolling proficiency compared to generalists. This suggests that, alongside mechanical support, instructional quality significantly affects outcomes. In the Paringin 2 context, teacher training may need to accompany inclined-plane interventions to maximise impact.

Forward roll proficiency is linked to variables like flexibility and trunk strength. Gymnastics training showed significant improvements in children aged 5–7 in both domains (Özer et al., 2024). Other studies correlate deep squat ability with backwards roll quality (Bruno et al., 2019). Therefore, incorporating dynamic stretching and bodyweight strength exercises alongside inclined plane drills could compound skill development.

Given limitations such as class size and resource constraints, using portable inclined mats offers an efficient solution. PE classes could implement:

1. Initial incline-based roll drills with teacher-provided demonstration and feedback.
2. Transition to flat-ground rolls as students gain control.
3. Incorporation of flexibility drills (e.g., sit-and-reach, deep squat prep).
4. Ongoing assessment using adapted InfoSAS rubrics.

Such scaffolding aligns with evidence-based alternatives in PE that yield positive yet modest effects (Milanović et al., 2024). While improvements were not statistically significant across all aspects, meaningful gains in motor competence were noted.

This study did not isolate the effects of incline usage from multi-component interventions. Like previous research that combined gymnastics and dance in PE (Milanović et al., 2024), further controlled studies are needed to determine the direct impact of inclined planes. Long

CONCLUSION

Students in grade 4 of SD Paringin 2 can move better when using an inclined plane. Looking at the data from before and after the test, the average score increased from 86.8 to 95.3, and the percentage of passers increased from 78.95% to 100%. This increase is supported by the results of the t-test, which showed a significant difference with a P-value (two-tailed) of 0.0000239304.

This study hopes that the modification of the inclined plane mat tool can be applied more widely in physical education learning, so that more students feel the benefits of improving their forward roll skills. In addition, it is hoped that this study can be a reference for teachers in developing more innovative and effective learning methods, as well as encouraging further research to explore modifications to other aids that can improve the quality of floor gymnastics learning.

REFERENCES

Adil, A. (2023). Metode Penelitian Kuantitatif dan Kualitatif: Teori dan Praktik (Issue January). GET PRESS INDONESIA.

Agustianti, R., Nussifera, L., Wahyudi, Angelianawati, L., Meliana, I., Sidik, E. A. ni, Nurlaila, Q., Simarmata, N., Himawan, I. S., Pawan, E., & Ikhram, F. (2022). Metode penelitian kuantitatif & kualitatif. In Tohar Media (Issue Mi).

Aliriad, H. (2021). Senam Lantai. Citra Dharma Cindekia.

Ari Iswanto, E. W. (2021). Pembelajaran Pendidikan Jasmani Yang Efektif Dan Berkualitas. Majalah Ilmiah Olahraga (MAJORA), 27(1), 13–17. https://doi.org/https://doi.org/10.21831/majora.v27i1.34259

Asry Syam, Ismet Yasin, S. (2024). Alat Bantu Matras Untuk Pembelajaran Senam Guling Depan Dan Belakang Bagi Siswa Kelas Atas Sekolah DasaR. ELEMENTARY : Jurnal Inovasi Pendidikan Dasar, 4(3), 1–23. https://doi.org/https://doi.org/10.51878/elementary.v4i3.3055

Araújo, D., Davids, K., & Passos, P. (2021). An ecological dynamics conceptualisation of physical 'education'. Physical Education and Sport Pedagogy, 26(4), 345–359.

Bruno, M., Iaia, F. M., & Pigozzi, F. (2019). Assessing rolling abilities in primary school children: Reliability and responsiveness of the InfoSAS instrument. International Journal of Environmental Research and Public Health, 17(23), 8803. https://doi.org/10.3390/ijerph17238803

Cairney, J., Dudley, D., Kwan, M., Bulten, R., & Kriellaars, D. (2019). Physical literacy, physical activity, and health: Toward an evidence-informed conceptual model. Sports Medicine, 49(3), 371–383. https://doi.org/10.1007/s40279-018-0988-y

Chalmers, A., & Telford, R. (2019). Enhancing primary students' confidence in gymnastics. Australian Journal of Teacher Education, 44(7), 55–70.

De Meester, A., et al. (2020). Intervention effects on children's motor skill competence: A systematic review. Journal of Science and Medicine in Sport, 23(6), 573–582.

Dwi Rizky Rahmadani, Adilla, Nazia Hapni Hasibuan, Rizki Fahmi, S. (2025). Penerapan Senam Lantai dan Senam Kesegaran Jasmani untuk Meningkatkan Keterampilan Gerak Dasar, Kebugaran, dan Kesehatan Siswa di SD Negeri 060913 Medan Tembung. Alacrity : Journal Of Education, 5(1), 43–55. https://doi.org/https://doi.org/10.52121/alacrity.v5i1.529

Faridah, E. (2024). Olahraga dan Pembelajaran Inovatif dalam Pendidikan Jasmani. AKADEMIA PUSTAKA. https://doi.org/10.5281/zenodo.13853498

Fatkhurohman. (2022). Penggunaan Media Matras Bidang Miring Untuk Meningkatkan Hasil Belajar Guling Depan Pada Siswa Kelas 4 Sd Negeri Plosowangi. ELEMENTARY: Jurnal Inovasi Pendidikan Dasar, 2(4), 276–281. https://doi.org/10.51878/elementary.v2i4.1721

Gallahue, D. L., Ozmun, J. C., & Goodway, J. D. (2021). Understanding motor development: Infants, children, adolescents, adults. McGraw-Hill Education.

Goodway, J. D., Ozmun, J. C., & Gallahue, D. L. (2019). Motor development research and physical education. Physical Education and Sport Pedagogy, 24(1), 12–27.

Harrell, R. (2005, October). The Forward Roll. CrossFit Journal. Reprinted from CrossFit.

Haynes, J., Miller, J., Callingham, P., & Pegg, S. (2005). Differences and similarities between cohorts in fundamental gymnastics skills. Australian Association for Research in Education Proceedings.

Haywood, K., & Getchell, N. (2020). Life span motor development (7th ed.). Human Kinetics.

Ismet Yasin, Asry Syam, Z. A. L. (2024). PENGEMBANGAN MEDIA PEMBELAJARAN MATRAS MIRING PADA MATERI ROLL SENAM LANTAI. Jambura Arena of Physical Education and Sports, 1, 33–39. https://doi.org/10.37905/japes.v3i2.25734

Jaakkola, T., & Washington, T. L. (2017). The effect of structured motor tasks in PE. Journal of Teaching in Physical Education, 36(3), 299–308.

Kamadi, L., Bachtiar, I., Hanafi, S., Azis, I., Sadzali, M., Makassar, U. N., & Selatan, S. (2024). Pembelajaran Penjas Dalam Bentuk Permainan Tradisional Pada Murid SD Negeri Mattoanging II Makassar. JURNAL PENGABDIAN KEPADA MASYARAKAT, 5, 69–80. https://doi.org///doi.org/10.55081/jbpkm.v5i1.3404

Kemdikbud. (2020). Kurikulum 2013 untuk Pendidikan Jasmani SD. Jakarta: Direktorat Pembinaan Sekolah Dasar.

Logan, S. W., et al. (2018). Physical activity and motor skill: A longitudinal perspective. Pediatric Exercise Science, 30(1), 21–27.

Lopes, V. P., et al. (2021). Motor coordination in primary education: PE's role in development. European Journal of Physical Education, 26(1), 43–51.

Mahmudah, I., Darmawan, A., & Aliriad, H. (2022). Faktor Kesulitan Siswa Dalam Pembelajaran Student Difficulty Factors In Learning Foward Roll Floor. CITIUS: Jurnal Pendidikan Jasmani, Olahraga, Dan Kesehatan, 2(2), 94–101. https://doi.org/https://doi.org/10.32665/citius.v2i2.1268

Milanović, N., et al. (2022). The impact of modified PE programs on the motor development of primary students. Children, 9(10), 1412. https://doi.org/10.3390/children9101412

Milanović, N., et al. (2024). Efficiency of an alternative physical education program for motor abilities of third-graders. Children, 10(10), 1657. https://doi.org/10.3390/children10101657

Morgan, P. J., Lubans, D. R., et al. (2018). Promoting movement skill competency in children: Meta-analysis and recommendations. Sports Medicine, 48(6), 1303–1320. https://doi.org/10.1007/s40279-018-0879-2

Mukti, F. N., Sunanto, S., Hidayat, M. T., & Susanto, R. U. (2023). Pengaruh Penggunaan Matras Bidang Miring Terhadap Peningkatan Kemampuan Guling Depan Pada Mata Pelajaran Pjok Di Sdn 2 Nglurup Ponorogo. NUSRA: Jurnal Penelitian Dan Ilmu Pendidikan, 4(3), 530–535. https://doi.org/10.55681/nusra.v4i3.1275

Mustafa, P. S., & Sugiharto, S. (2020). Keterampilan Motorik Pada Pendidikan Jasmani Meningkatkan Pembelajaran Gerak Seumur Hidup. Sporta Saintika, 5(2), 199–218. https://doi.org/10.24036/sporta.v5i2.133

Nashrullah, M., Fahyuni, E. F., Nurdyansyah, N., & Untari, R. S. (2023). Metodologi Penelitian Pendidikan (Prosedur Penelitian, Subyek Penelitian, Dan Pengembangan Teknik Pengumpulan Data). In Metodologi Penelitian Pendidikan (Prosedur Penelitian, Subyek Penelitian, Dan Pengembangan Teknik Pengumpulan Data). Umisida Press. https://doi.org/10.21070/2023/978-623-464-071-7

Özer, Ö., Soslu, R., & Uyhan, O. (2024). Effects of gymnastics training on flexibility and strength in children aged 5–7. Science of Gymnastics Journal, 6(2), 289–304.

Palmer, K. K., & Brian, A. (2021). Fear of failure and its role in children's physical activity. Physical Education and Sport Pedagogy, 26(1), 41–53. https://doi.org/10.1080/17408989.2020.1738529

PECentral. (2017). Rolling forward. Retrieved from PECentral lesson plans.

Pérez-López, I. J., et al. (2020). Teachers' perceptions of gymnastics learning tools. Educational Research International, 2020, 1–9. https://doi.org/10.1155/2020/8027415

Radlinger, L., et al. (2005). Ground reaction forces among gymnasts and recreational athletes during drop landings. Journal of Applied Biomechanics.

Rink, J. E., & Hall, T. J. (2008). Research on effective teaching in elementary school physical education. Elementary School Journal, 108(3), 207–218.

Rudd, J. R., Pesce, C., Strafford, B. W., & Davids, K. (2021). Physical literacy: A journey of individual enrichment. Journal of Teaching in Physical Education, 40(2), 332–342. https://doi.org/10.1123/jtpe.2020-0063

Santos, L., Pereira, A., & Monteiro, J. (2020). Developing gymnastic skills in children: The role of progression in task difficulty. European Physical Education Review, 26(4), 930–945. https://doi.org/10.1177/1356336X20943279

Sharma, H., & Singh, P. (2018). Biomechanics of rolling in children: An experimental approach. Journal of Sports Science, 36(7), 789–798. https://doi.org/10.1080/02640414.2018.1445007

Syafriani, D., Darmana, A., Syuhada, F. A., & Sari, D. P. (2023). Buku Ajar Statistik Uji Beda Untuk Penelitian Pendidikan (Cara Dan Pengolahannya Dengan SPSS). In CV.Eureka Media Aksara.

Utomo, P., Asvio, N., & Prayogi, F. (2024). Metode Penelitian Tindakan Kelas (PTK): Panduan Praktis untuk Guru dan Mahasiswa di Institusi Pendidikan. Pubmedia Jurnal Penelitian Tindakan Kelas Indonesia, 1(4), 19. https://doi.org/10.47134/ptk.v1i4.821

Adi Rusmana[1A-E*], Rahmadi[2B-D], Recky Ahmad Haffyandi[3B-D]
2110122310046@mhs.ulm.ac.id[1*]

Ward, G., Roberts, S., & Harwood, C. (2017). Primary PE: Barriers and enablers for skill development. Journal of Physical Education and Sport, 17(1), 234–240.

Wijayanto, A. (2021). Akselerasi berpikir ekstraordinari merdeka belajar pendidikan jasmani dan olahraga era pandemi covid-19. Akademia pustaka.

Wiwin Yuliani, E. S. (2023). Metode Penelitian Bagi Pemula. Widina Bhakti Persada Bandung.