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The Effect of Jumping Step Up Training on Improving the Rhythm of Long Jump Takeoff of Elementary School Students

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Abstract

This study aims to determine the effect of jumping step-up training on increasing the takeoff rhythm in the long jump of elementary school students. Takeoff rhythm is a very important technical component because it determines the effectiveness of energy transfer from the run-up phase to the takeoff and jump phases. This study used an experimental method with a one-group pretest–posttest design with 19 elementary school students participating in physical education. The research instrument was a long jump skills test that assessed the accuracy of the takeoff rhythm, while treatment was given through jumping step-up training for eight meetings with structured intensity. Data were analyzed using a paired t-test to determine differences in results before and after treatmentThe results of the study showed a significant increase in the ability of the push-off rhythm after being given jumping step-up training. This increase is related to the increase in strength and explosive power of the leg muscles, motor coordination, rhythmic control of steps, and students' confidence when doing push-offs. Jumping step-up training is also suitable for the characteristics of elementary school students because the movements are simple, repetitive, and safe to do. Thus, jumping step-up can be recommended as an effective alternative plyometric exercise in physical education learning to improve the push-off rhythm and long jump performance of elementary school students.

How to Cite

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INTRODUCTION

The long jump is a branch of athletics that requires a combination of speed, strength, coordination, and mastery of technique to achieve maximum jump performance. One of the technical factors that significantly determines success in the long jump is the takeoff rhythm, which is the alignment of the rhythm of the steps before reaching the takeoff board, which directly influences the effectiveness of the propulsion force during the jump. From a biomechanical perspective, the accuracy of the distance and rhythm of the final step before takeoff plays a crucial role in creating the optimal angle and impulse, thus influencing the distance achieved by the jump(Ardiansyah et al., 2024). However, in elementary school students, rhythmic coordination skills in the starting step are still limited due to limited motor control and movement experience, resulting in ineffective takeoff and less than optimal jump distance. This indicates the need for training methods that emphasize the development of coordination, leg strength, and movement rhythm gradually and in accordance with the students' age developmental stage.

Jump-based and explosive strength exercises, such as knee tuck jumps and stair climbing, can improve takeoff and long jump skills by enhancing neuromuscular coordination and leg muscle strength(Arwih, 2022);(Awapape et al., 2024) . Exercises that combine speed and agility have also been shown to be effective in improving the quality of the run-up and control of stride rhythm, which are essential foundations for developing the long jump takeoff rhythm(Fauzi, M., Wiriawan, oce., Khamidi, 2020). Therefore, implementing training methods that emphasize stride rhythm and leg strength is crucial for improving takeoff rhythm in the long jump in elementary school students.

Several previous studies have examined efforts to improve long jump performance through various types of physical training and learning approaches, such as plyometric training, sprinting, leg muscle strength, and the development of game-based learning models. These research results generally indicate significant improvements in students' leg muscle explosive power and jump distance (Haryanto, I, A., Liputo, N., Fataha, 2021)(Hadjarati, H., Podungge,R., Haryanto, 2022). Furthermore, the integration of innovative learning models has also been shown to increase student engagement and understanding of basic long jump techniques(Lusiantri., Warni, H., 2023). However, most previous research has focused on physical strength, speed, and the final jump result, while the rhythmic ability of the steps towards the take-off board, as a determinant of the effectiveness of the take-off phase, has not been a primary focus.

Understanding and mastery of techniques, including the rhythm of the starting and takeoff steps, are greatly influenced by students' level of knowledge and motor awareness of the long jump learning process itself (Hafidz, A, I., Syafei, M, M., Afrinaldi, 2021).Lack of attention to developing the rhythmic pattern of the step can potentially lead to a suboptimal takeoff, even if the student possesses adequate strength and speed. Therefore, more specific learning and training interventions are needed to develop the rhythmic pattern of the step and motor coordination, thus improving not only physical ability but also the quality of the takeoff technique, a key factor in the success of the takeoff phase in the long jump.

Literature in the field of movement biomechanics states that the stride rhythm from the start to the moment of push-off must be stable and coordinated to effectively transfer horizontal to vertical velocity during the push-off phase. Inconsistent rhythm can potentially lead to inattentive body positioning and reduce the quality of the push-off. The running rhythm approach theory states that consistent stride rhythm helps athletes achieve optimal body position, maintain balance, and improve neuromuscular system readiness during the push-off step. Therefore, mastering stride rhythm is not only technical but also closely related to the athlete's physical and psychological readiness. Psychological factors such as self-confidence and self-control have been shown to influence the maintenance of consistent movement and focus during the long jump push-off (Maharani, M, P., Komarudin., Saputra, y, 2024). To develop these rhythmic abilities, training that emphasizes coordination, balance, and repeated control of stride patterns is necessary.

One relevant form of training is the jumping step-up, a coordination exercise involving gradual jumps. This exercise requires consistent rhythm, body balance, leg muscle control, and adaptation to varying stepping heights. Coordination exercises such as obstacle drills and varying stepping patterns have been shown to be effective in improving leg muscle agility and strength, which are essential for developing stride rhythm and takeoff quality (Mudariani, N, M., Artanayasa, I, W., Sudiana, I, 2021).Furthermore, the use of modified training methods and learning media has been shown to improve the quality of long jump technique learning and the

efficiency of physical education (PE) learning (Muntasir., Sumarjo., 2025).Supporting the development of measurable physical components is also crucial for improving overall long jump performance (Nurafiati et al., 2025).Therefore, jumping step-up training is believed to effectively improve takeoff rhythm in the long jump because it integrates various aspects, such as coordination, physical fitness, and psychology, required in the run-up and takeoff phases.

This study is novel because it specifically examines the impact of jumping step-up training on takeoff rhythm, not just leg muscle strength or jump distance, as has been generally studied in previous studies. Previous research has shown that leg muscle power and running speed play a significant role in long jump ability, but takeoff rhythm is often considered an implicit variable that has not been specifically measured (Persada, S., Haetami, M., Bafadal, F, 2021). Furthermore, bench or step-up training is typically aimed at improving jump performance, without in-depth exploration of its impact on step rhythm quality and takeoff rhythm (Rahanra, A, 2022).

The main differences of this study are the training method used, the measured variable, namely the push-off rhythm, and the measurement tool designed to capture aspects of coordination and rhythm in movement. The subjects of this study were elementary school students, who have different motor development characteristics and coordination needs compared to adolescent or adult athletes. At this age, a learning approach that emphasizes coordination, rhythm, and the joy of movement is more effective than an approach that only emphasizes the end result (Sobarna et al., 2020).This study also has high urgency because the push-off rhythm is an important part of learning athletic techniques in elementary schools, but is often overlooked in the practice of learning PJOK which is more focused on the end result. By increasing student learning motivation through a varied training approach that is in accordance with developmental characteristics, it is hoped that the quality of PJOK learning will be more optimal (Rozi, M, F., Putra, J., Suwirman., 2023).Thus, the results of this study are expected to serve as an empirical reference for PJOK teachers in developing training models that focus on coordination and rhythm to improve the quality of elementary school students' long jump technique.

Based on the literature review and previous research findings, there is a gap in research, namely the lack of studies specifically addressing the improvement of takeoff rhythm in the long jump through training focused on rhythmic coordination, particularly with the jumping step-up approach in elementary school students. The majority of previous studies have focused more on improving long jump results through increasing leg muscle explosiveness and the effectiveness of conventional training methods. Studies such as hurdles, deer running, and various forms of jumping and hop training have shown a significant impact on increasing leg muscle power and jump distance, but have not yet clearly examined the aspects of step rhythm and takeoff quality(Suhaimi, 2024);(Syahriannor et al., 2024) .

Comparisons between circuit training and conventional training methods focus more on achieving final results in the long jump, ignoring the initial technique and takeoff rhythm as crucial factors in takeoff success(Suhdy et al., 2019). This situation indicates that the rhythmic coordination aspect of the long jump remains an area that has not been thoroughly studied in research. Therefore, this study provides a new contribution by developing an innovative training model that emphasizes the systematic and measurable integration of the initial rhythm and takeoff technique. This approach not only has the potential to improve long jump performance but also provides a relevant scientific solution for improving basic long jump technique in elementary school students, who are in a crucial phase of coordination and motor control development.

This study aims to understand the effect of jumping step-up training on improving takeoff rhythm in the long jump in elementary school students. The research objective is based on the finding that explosive training, such as plyometrics, effectively improves long jump ability by increasing leg muscle strength and explosive power (Wibowo, R, A, T., Iskandar, M, I., Yulianto, P, 2021).However, this study has not specifically explored the aspects of step rhythm and takeoff quality. Therefore, jumping step-up training is considered more appropriate for elementary school students because it emphasizes rhythmic coordination, movement control, and gradual step adjustments. Therefore, this training is expected to improve the quality of takeoff technique and support long jump learning that aligns with students' motor developmental characteristics.

METHODS

This study uses a quantitative method with an experimental approach, aiming to determine the effect of jumping step-up training on the ac-

curacy of elementary school students' long jump push-offs. The quantitative approach was chosen because it emphasizes measuring data in the form of numbers, so that the effect of the treatment can be seen objectively and structured (Syahrizal & Jailani, 2023). The research design used is a One Group Pretest–Posttest Design, namely an experimental design that only involves one group of subjects without groups. In this design, subjects are first given an initial test (pretest) to determine their abilities before treatment, then given jumping step-up training as a treatment, and ended with a final test (posttest) to determine changes in abilities after undergoing treatment. According to (Syahroni, 2022), this design is effective for measuring changes in subject abilities by comparing conditions before and after treatment. Thus, this research design is considered appropriate to examine the causal relationship between jumping step-up training and increased accuracy of elementary school students' long jump push-offs..

The subjects of this study were 19 fourth-grade students at Public Alementary School Papringan 1. All students who attended physical education lessons were used as the population and sample of the study using a total sampling technique (100%). This technique was chosen because the number of subjects analyzed was relatively small, thus facilitating the complete research (Sumargo, 2020).

The instrument used in this study was the long jump skills test (Sunarto, 2015).The success of the study was measured through the level of accuracy of the push-off in the long jump and the improvement of students' long jump abilities, which were assessed based on push-off technique indicators in accordance with the assessment criteria that had been set out in the assessment instrument.

The research data analysis was conducted using a paired sample t-test to understand the differences in the results of the initial test (pretest) and the final test (posttest) in the experimental group. All data were analyzed using SPSS software with a significance level of 0.05. This test aims to evaluate the impact of jumping step-up training on the accuracy of the push-off in the long jump of students. The paired sample t-test was chosen because the measurements were carried out on the same subjects at two different times. Before the hypothesis testing process began, the data were first checked for normality as a requirement for parametric analysis, to ensure that the data had a normal distribution, so that the results of the statistical analysis obtained could be trusted (Isnaini et al., 2025).

The research procedure was carried out in several stages. The first stage was a pretest, which measured students' initial long jump abilities before receiving treatment. The second stage was the provision of treatment in the form of jumping step-up exercises, which were carried out over 8 meetings. In the first meeting, the exercise began with a single-footed jump onto a step or block approximately 15–25 cm high. Once one foot was on the step or block, students jumped back up and lowered their feet to the starting position. In subsequent meetings, the exercise was carried out by alternating feet, as well as increasing repetitions and the number of sets using the same movements. The final stage was a posttest, which aimed to measure changes in the accuracy of the students' long jump takeoff after participating in the jumping step-up training program.

RESULTS AND DISCUSSION

Table 1. Pretest and Posttest Results

Name	Pretest		Posttest	
	Mark	Information	Mark	Information
AAAZ	50	Not enough	87,5	Very good
ASAWM	37,5	Not enough	62,5	Enough
AGP	43,75	Not enough	81,25	Good
ABS	37,5	Not enough	56,25	Enough
ANJP	43,75	Not enough	81,25	Good
ADZ	50	Not enough	87,5	Very good
AJR	25	Not enough	50	Not enough
DJA	31,25	Not enough	75	Good
FAP	50	Not enough	87,5	Very good
GAP	25	Not enough	56,25	Enough
HNA	25	Not enough	56,25	Enough
LI	43,75	Not enough	81,25	Good
MFJ	31,25	Not enough	62,5	Enough
MIS	37,5	Not enough	68,75	Enough
MKA	37,5	Not enough	75	Good
QCW	37,5	Not enough	75	Good
RYID	43,75	Not enough	75	Good
SPMP	37,5	Not enough	68,75	Enough
Y	31,25	Not enough	68,75	Enough

The **Table 1** shows that all students were still in the Poor category before receiving the jumping step-up training. After completing the training, the posttest results showed improvement, particularly in long jump takeoff accuracy. The takeoff accuracy categories changed to Fair, Good, and Very Good for the majority of students. This indicates that the jumping step-up

training had a positive impact on improving students' long jump takeoff accuracy.

Table 2. Descriptive Statistics of Pretest and Posttest

Statistics	Pretest	Posttest
N	19	19
Mean	6.05	11.42
Std. Deviation	1.311	1.865
Minimum	4	8
Maximum	8	14

Based on the descriptive statistics **Table 2**, the number of research participants (N) in the pretest and posttest each consisted of 19 students. The average pretest score was 6.05, while the average posttest score increased to 11.42. These changes indicate an increase in student abilities after receiving treatment. The standard deviation in the pretest was 1.311 and increased to 1.865 in the posttest, which indicates that the variation in student scores after treatment was greater than before. The lowest score in the pretest was 4 and the highest score was 8, while in the posttest the lowest score increased to 8 and the highest score reached 14. Overall, student learning outcomes showed an increase from the pretest to the posttest.

Table 3. Normality Test Results (Shapiro-Wilk)

Class	P	Sig.	Information
Pretest	.917	.099	Normal
Posttest	.937	.236	Normal

Based on the **Table 3.** Normality test using the Shapiro–Wilk method, the significance value (Sig.) for the pretest data was 0.099 and for the posttest data was 0.236. Both significance values are greater than 0.05, thus it can be concluded that the pretest and posttest data follow a normal distribution. Thus, this research data meets the assumption of normality and is suitable for further parametric statistical analysis.

Based on the results of the hypothesis test using the Paired Sample t-test method, it was found that the average value of the difference (mean difference) reached -5.368, which indicates a significant difference between the pretest and posttest scores. The t-value obtained was -24.500 with 18 degrees of freedom (df) and a significance value (Sig. 2-tailed) of less than 0.001. Because the significance value is less than 0.05 (Sig. <0.05), it can be concluded that there is a significant difference between the pretest and posttest results. Thus, the alternative hypothesis (H_1) is accepted and the null hypothesis (H_0) is rejected, which means that the treatment given has a significant impact on improving student learning outcomes.

Providing jumping step-up training in long jump learning has been shown to improve elementary school students' push-off rhythm skills. This improvement suggests that training that emphasizes repetitive up-and-down movements can help students understand and practice the correct push-off movement pattern. A good push-off rhythm is crucial in the long jump because it determines how energy can be effectively transferred from the run-up to the push-off and jump phases. Jumping step-up training is a simple type of plyometric exercise, focusing on increasing leg muscle strength and explosive power; previous research has shown that exercises involving repetitive jumping movements, such as jump rope training, can improve elementary school students' leg muscle strength (Yani, S., Domitilla, 2020). By increasing leg muscle strength, students' ability to perform rhythmic, stable, and powerful push-offs also improves. Therefore, jumping step-up training not only trains push-off rhythm coordination but also strengthens the leg muscles, which are a key component of successful long jump push-offs.

Jumping step-up exercises provide movement stimulation that aligns with the characteristics of elementary school students: they are simple, repetitive, and involve coordination between leg muscle strength and rhythmic gait regulation. Through these exercises, students are trained to control the timing of the push-off, maintain body balance, and increase self-confidence when performing the push-off movement. This has a positive impact on improving the quality of the push-off movement, both in terms of accuracy and continuity. Furthermore, developing media and forms of athletic learning tailored to the characteristics of elementary school students has been shown to increase student participation, understanding of movement, and performance quality in athletic(Da'i et al., 2024). Thus, jumping step-up exercises are not only physically relevant but also align with the principles of athletic learning for elementary school students, making them more effective in developing rhythm, accuracy, and consistency in the long jump push-off.

Jumping step-ups also play a role in functionally improving leg muscle strength and propulsion. Stronger and more coordinated leg muscles can help students produce better push-offs. With a more optimal push-off, students are able

to perform jumps with more effective technique, thereby improving overall long jump performance. This exercise is also beneficial in reducing technical errors, such as taking off too quickly, too late, or lacking stability. Jumping step-ups are included in the plyometric training group, which is scientifically proven to increase explosive power and leg muscle strength through rapid and repeated eccentric-concentric contraction patterns (Da'i, M., Setijomo, Hari., Minarto, 2018)

Systematic reviews show that various forms of plyometric training consistently improve components of physical condition, particularly leg muscle strength, speed, and explosive power, which are important factors in determining the quality of the long jump push-off (Susanti et al., 2021). Thus, the application of step-up jump training not only improves the strength and propulsion aspects of the leg muscles, but also directly supports the improvement of the quality of elementary school students' push-off techniques in the long jump.

Physical education learning, jumping step-up exercises provide an active and enjoyable learning experience. Simple training tools, such as steps, make it easier for teachers to manage the learning process and allow students to practice safely. This situation encourages optimal student engagement in learning, so that the learning objectives of long jump skills can be achieved more effectively. Physical education lessons designed through fundamental movement activities and games have been shown to increase learning motivation, active participation, and motor skill mastery in elementary school students (Aliriad, H., Saifuddin, H.Fahmi, D, A., 2025).Furthermore, mastery of fundamental movement skills, such as jumping, pushing, and landing, is an important foundation for student success in learning athletics, including the long jump (Nurcahyo, J, P., Kusnandar., Budi, R, 2021). Thus, jumping step-up exercises not only provide physical benefits but also support an active, enjoyable learning process that focuses on developing fundamental movement skills in elementary school students.

These findings suggest that implementing appropriate and organized training can enable elementary school students to gradually master basic sports skills. Jumping step-up training not only improves physical aspects but also helps students understand concepts such as movement, rhythm, and coordination in the long jump. The ability to perform basic long jump techniques depends not only on physical condition but is also influenced by psychological readiness, self-confidence, and students' understanding of the stages of movement performed, so a systematic learning approach is very important (Henjilito et al., 2024). Thus, jumping step-up training can be recommended as an effective form of training to improve the rhythm of the push-off in physical education learning at the elementary school level, because it can support students' physical, cognitive, and psychological development in an integrated manner through structured movement learning experiences.

CONCLUSION

Jumping step-up exercises have been proven to be highly effective in improving the takeoff rhythm of elementary school students' long jumps. This exercise not only strengthens and increases the explosive power of the leg muscles, but also helps students develop a correct, rhythmic, stable, and powerful takeoff pattern. Simple, repetitive movements that are in line with children's motor development allow this exercise to improve the accuracy, fluency, and quality of the takeoff technique. Furthermore, this exercise encourages active and enjoyable learning participation, increases self-confidence, and helps students master basic movement skills. Pedagogically, the application of jumping step-up exercises can support students' physical, cognitive, and psychological development in a balanced manner. Therefore, this exercise is highly recommended as an effective form of training in physical education, particularly for improving the takeoff rhythm and long jump performance of elementary school students.

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