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Effect of Jump Rope Skipping Exercise on Instep Kick Shooting Performance among Junior Football Players: A Quasi-Experimental Study

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ABSTRACT
Background:
Shooting skill in football requires both power and precision, which depend greatly on lower-body strength and coordination. Jump rope skipping offers a simple and affordable exercise to improve these physical abilities among young athletes.
Aims:
This study investigated how jump rope skipping exercises influence instep kick shooting performance among junior football players involved in extracurricular training at a middle school in Palembang, Indonesia.
Methods:
The research used a quasi-experimental design with one group undergoing pretest and posttest procedures. Thirty male students aged 13–15 years participated in a six-week skipping exercise program carried out three times a week. Shooting performance was assessed before and after the intervention, and statistical analysis employed a paired sample t-test with a 0.05 significance level.
Results:
After the training program, students demonstrated a clear improvement in shooting results. The mean score rose from 22.43 to 28.83, reflecting better kicking power and accuracy. The statistical test indicated a significant difference between pretest and posttest scores ($p < 0.05$).
Conclusion:
Jump rope skipping proved to be an effective, low-cost training method for enhancing the instep shooting performance of young football players. Its practical application makes it suitable for school-based sports programs seeking to develop fundamental skills and physical capacity.

Keyword: Skipping exercise; Shooting performance; Leg power; Youth football; Experimental study;

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INTRODUCTION

The growing competitiveness of modern football has increased the need for more efficient and accessible training strategies, particularly for youth development programs (Blake & Solberg, 2023a; Hamzah et al., 2025). Across many schools, coaches face the challenge of improving technical and physical performance without relying on advanced equipment or costly facilities. Football remains one of the world's most practiced sports, engaging people of all ages in both formal and informal environments (Acheampong, 2021; Rossing et al., 2022). It demands a balance of tactical awareness, endurance, and technical mastery to reach consistent performance levels. Among the essential techniques, shooting stands out as the action that determines scoring success and directly influences a team's results. Achieving accuracy and power in shooting requires an athlete to possess strong and well-coordinated leg muscles. Adolescents, however, are still in the stage of building coordination and strength, which makes appropriate conditioning especially important. Exploring simple yet effective forms of exercise becomes crucial to help them enhance performance at an early stage of development.

Within school-based football activities, the emphasis is often placed on drills to refine ball control and passing rather than strengthening the physical foundation behind those skills (Madsen et al., 2022; Zhang et al., 2024). Yet, the technical quality of a player's shot is inseparable from the muscular capacity that supports it. The force produced during an instep kick originates mainly from the strength and synchronization of the lower limbs (Palucci Vieira et al., 2021; Zheng et al., 2024). Players with weak leg power typically show unstable posture, poor accuracy, and reduced shooting distance. Consequently, incorporating structured conditioning routines becomes essential for young athletes to translate technical training into measurable improvements. Jump rope skipping has emerged as a feasible and enjoyable activity that simultaneously promotes strength, rhythm, and coordination. Its adaptability to limited environments makes it a promising addition to youth football programs.

Jump rope skipping is recognized as an exercise that blends aerobic endurance with muscular development (Maria et al., 2025; Zhao et al., 2023). It is inexpensive, requires minimal space, and can be practiced independently or in groups, aligning well with the realities of school sports. The rhythmic repetition of jumping activates key muscles in the lower body, especially the calves and thighs, enhancing strength and movement control. This continuous engagement improves coordination between the legs and core, leading to better balance and timing during physical activities (Lancere et al., 2023; Zhong et al., 2024). Over time, skipping helps refine neuromuscular patterns that contribute to explosive actions such as shooting. It also trains rhythm and focus—qualities vital for consistent execution in sport. These benefits make skipping an efficient way to prepare the body for more complex athletic movements.

In addition to improving strength, skipping develops endurance and cardiovascular capacity that support prolonged physical effort (Spiering et al., 2021; Zheng et al., 2022). Football players must sustain high activity levels through repeated sprints, jumps, and turns across matches and training sessions. The steady tempo of skipping mimics these dynamic movements while maintaining low impact on joints, reducing injury risks among adolescents. This activity conditions both aerobic and anaerobic systems, improving recovery and performance under fatigue (Behrens et al., 2023; Sandford et al., 2021). Furthermore, the repetitive pattern sharpens concentration and control,

allowing young athletes to sustain precision even as physical exhaustion sets in. These combined physiological effects make skipping a comprehensive form of exercise for youth football development.

In Indonesia, football is not only a popular sport but also a core part of physical education and extracurricular programs. However, disparities in resources between schools often limit access to professional training and specialized facilities. Many coaches rely solely on conventional drills that lack measurable conditioning benefits. In such circumstances, skipping offers a realistic and inclusive approach to physical development (Alasadi & Baiz, 2023a, 2023b). It can be implemented without complex infrastructure, yet still provides measurable improvements in coordination and leg power. This exercise aligns with the educational objectives of promoting participation, health, and skill enhancement simultaneously. It empowers both teachers and students to achieve training outcomes despite resource limitations.

Sports science has long emphasized the correlation between lower-limb strength and performance in football (Espada et al., 2023; Sašek et al., 2024). Methods such as plyometric drills and resistance training have proven effective in enhancing explosive power. Skipping represents a simplified adaptation of these methods that delivers similar physiological responses without requiring advanced supervision or equipment. The exercise enhances the stretch-shortening cycle of muscles, increasing their ability to produce force quickly (Fukutani et al., 2021; Groeber et al., 2021). Despite its potential, skipping has received little attention in empirical studies focusing on adolescent athletes, especially in school environments. Investigating its effect on specific skills such as shooting can fill this research gap and contribute to applied knowledge in youth sports training.

Young football players often face difficulties maintaining consistency in shooting performance due to underdeveloped muscle power and limited understanding of correct movement mechanics (Haddad, 2024; Hall et al., 2024). Many training sessions emphasize repetition rather than physical preparation, causing technical progress to stagnate. Without adequate conditioning, players are unable to fully control force, timing, and accuracy in their kicks. Incorporating skipping into training allows physical and technical improvements to occur concurrently. The activity builds leg strength while teaching rhythm and balance, resulting in more efficient kicking mechanics (Deng et al., 2023; Makaruk et al., 2023). Over time, this combination leads to greater shooting accuracy and velocity, improving both confidence and game performance.

Beyond its physical contributions, skipping also supports the psychological and pedagogical aspects of athletic training (Fernandez-Rio & Iglesias, 2024; Rodríguez et al., 2021). The exercise encourages persistence, focus, and rhythm, all of which are integral to skill learning and performance consistency. Group skipping activities foster cooperation and motivation among students, creating a positive environment that promotes continuous engagement. For young athletes, this enjoyable yet challenging activity enhances both discipline and enthusiasm toward sports. By integrating skipping into football training, educators can nurture physical competence alongside mental resilience (Blake & Solberg, 2023b). Therefore, skipping stands as a versatile, science-informed, and educationally valuable approach to strengthening technical abilities in youth football.

Recent investigations have shown that the integration of motor skills, mental focus, and physical conditioning plays a central role in improving shooting performance. Morzenti (2026) demonstrated how digital twin systems can help coaches analyze and refine shooting techniques, while Guo et al. (2025) found that short meditation in virtual environments improves accuracy and engagement. Research by Hassan (2025) revealed that sensory–motor balance training enhances

neural control and movement precision, whereas Garaszczuk et al. (2025) confirmed that visual stability contributes strongly to shot accuracy. Studies by Ünver et al. (2025) highlighted how fatigue and external factors influence performance, and Wang (2025) introduced smart insoles to track lower-limb coordination in football. Similarly, Guo et al. (2025) showed that efficient energy transfer enhances dynamic movement, while Söğüt et al. (2025) linked eye–body synchronization with consistent shooting outcomes. In developmental contexts, Orangi et al. (2025) emphasized that guided motor learning improves coordination among children, and Xu et al. (2023) demonstrated that predictive modeling can optimize athletic training strategies. Altogether, these findings reinforce that rhythmic and coordination-based exercises such as skipping provide an effective, low-cost approach to enhancing accuracy, balance, and leg power in youth football training.

Most training programs in football still emphasize technical drills rather than physical conditioning, especially at the school level where access to facilities and professional support is limited. As a result, many young players struggle to develop leg strength, coordination, and consistency in performing accurate shots. While various exercise models have been introduced to enhance power and endurance, only a few studies have examined simple, low-cost methods that can be practiced effectively in educational settings. This creates a research gap between advanced training systems and the needs of youth athletes who rely on basic physical activities. Exploring rhythmic and repetitive exercises such as skipping can provide a practical alternative to help improve balance, control, and shooting performance without requiring complex facilities or expensive equipment.

Skipping is a rhythmic form of physical activity that strengthens leg muscles, refines coordination, and builds endurance through repeated movement patterns. It encourages both physical and mental focus while promoting muscle balance and control—key factors that determine the quality of an instep kick. Because it requires only a rope and limited space, skipping is accessible to most schools and community sports programs. This makes it suitable for young players who are still developing their physical foundation. The exercise also introduces an element of rhythm that helps players improve timing and accuracy when kicking the ball. Understanding how skipping contributes to technical performance is important for designing affordable and effective training methods that can enhance shooting ability among junior football players.

The main purpose of this research is to examine the effect of jump rope skipping exercise on the instep kick shooting performance of junior football players. The study seeks to determine whether a structured skipping routine carried out regularly can significantly increase shooting accuracy and leg power. It is expected that players who perform skipping exercises consistently will show noticeable improvements in control, stability, and strength when kicking the ball. Based on this assumption, the hypothesis of the study is formulated as follows:

METHOD

Research Design

This research applied a quasi-experimental method using a single group with pretest and posttest procedures. The design aimed to determine how a structured skipping exercise program influenced the shooting performance of junior football players. Before the intervention began, participants performed a shooting test to identify their baseline performance. They then completed

a six-week skipping program conducted under supervision to ensure accuracy and consistency in training. After the training was completed, the same shooting test was administered to measure improvement. The comparison between the two results was used to identify the effect of the exercise program on shooting performance.

Participant

The study involved thirty male students aged between thirteen and fifteen years who were active members of the football extracurricular program at SMP Negeri 2 Palembang. Participants were chosen purposively based on their physical readiness, attendance record, and willingness to participate. All students were informed about the purpose and procedures of the study and gave consent before joining. The training and testing sessions were conducted under controlled conditions to maintain fairness, safety, and reliability of data. The students were encouraged to complete all sessions to ensure valid and consistent results.

Instrument

The instrument used in this research was a standardized shooting test designed to assess the accuracy and power of instep kicks. Each player performed several shots toward a goalpost marked with scoring zones, and each attempt was recorded based on accuracy. The skipping exercise program lasted for six weeks, consisting of three sessions per week. The duration and intensity increased gradually according to the participants' progress. Every session included warming-up activities, the main skipping exercises, and cooling-down routines. This structure ensured that the training improved strength, rhythm, and coordination while minimizing injury risks.

Data Analysis

All collected scores from pretests and posttests were processed using quantitative analysis. Descriptive statistics such as mean and standard deviation were calculated to summarize the overall data. A paired sample t-test was then used to determine whether the differences between pretest and posttest scores were statistically significant at a confidence level of 0.05. The analysis was aimed at verifying whether the skipping exercise effectively enhanced shooting performance in terms of leg power and precision.

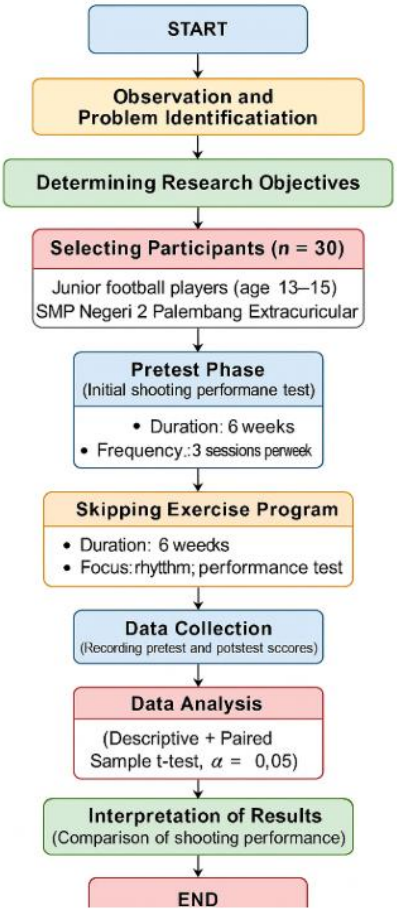

Figure 1. Flowchart of the Research Procedure

RESULTS AND DISCUSSION

Result

The implementation of the six-week skipping program was carried out smoothly with full participation from all thirty students involved in the football extracurricular activities. Each participant attended three training sessions per week, and all exercises were completed under supervision to ensure consistency and safety. Observations throughout the training period showed gradual changes in physical control, rhythm, and body balance. During the early sessions, several participants struggled to maintain coordination between hand and leg movement; however, by the middle of the program, most students demonstrated more stable posture and rhythm. The improvement was clearly visible in their ability to perform repetitive jumping movements with less fatigue and better control. The statistical results presented in Table 1 show that the participants' performance improved after the intervention. The mean shooting score before the training (pretest) was 22.43, while after completing the skipping program (posttest), it increased to 28.83. The difference of 6.4 points reflects an overall improvement in shooting accuracy and power. The highest

score increased from 40 to 45, and the lowest from 5 to 10, indicating consistent progress across the group. In addition, the standard deviation slightly decreased from 8.51 to 7.94, suggesting that participants' performances became more uniform after the skipping intervention.

Table 1. Descriptive Statistics of Shooting Performance

Test Type	Highest Score	Lowest Score	Mean	Standard Deviation
Pretest	40	5	22.43	8.51
Posttest	45	10	28.83	7.94

The improvement in mean scores suggests that skipping contributed effectively to strengthening the lower limbs and improving coordination. These changes positively influenced shooting performance, as players became more capable of generating controlled and powerful kicks.

The graphical comparison in Figure 2 further supports the quantitative findings. The posttest bar appears noticeably higher than the pretest bar, visually confirming that the skipping exercise produced measurable performance gains in shooting accuracy.

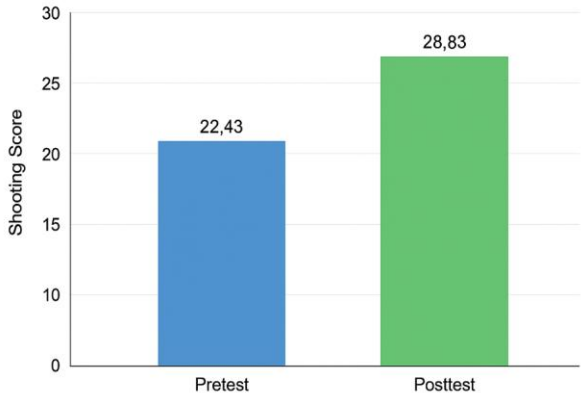

Figure 2. Comparison of Pretest and Posttest Shooting Scores

The visual difference between pretest and posttest scores indicates that participants achieved substantial improvement after six weeks of skipping practice. The increase in performance levels shows that rhythm-based physical activity directly enhances coordination and muscular control, both of which are essential for executing precise instep kicks.

To illustrate performance changes across the training period, Figure 3 presents the weekly average shooting scores from week one to week six.

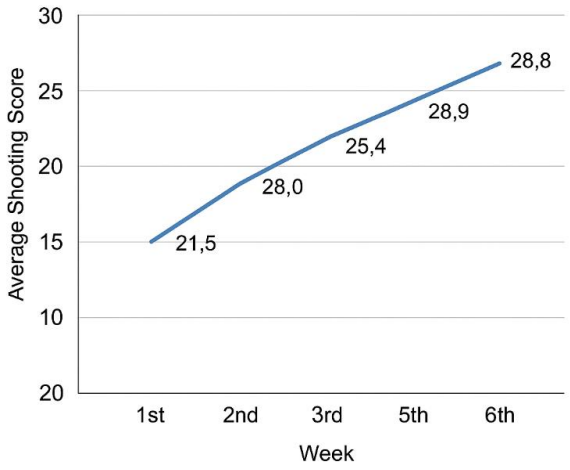

Figure 3. Shooting Performance Progress During Six Weeks of Training

The data show a steady upward pattern in average shooting performance. Most improvements occurred between the second and fourth week, when participants adapted to the movement pattern and developed greater leg power. Progress became more gradual toward the end of the program, suggesting that participants reached a phase of performance stabilization. The consistent upward trend demonstrates that skipping produces progressive physical adaptation through repetition and rhythm-based coordination. The visual difference between pretest and posttest scores indicates that participants achieved substantial improvement after six weeks of skipping practice. The increase in performance levels shows that rhythm-based physical activity directly enhances coordination and muscular control, both of which are essential for executing precise instep kicks.

To illustrate performance changes across the training period, Figure 2 presents the weekly average shooting scores from week one to week six.

Discussion

The present study shows that skipping exercises produced a significant improvement in the shooting performance of young football players. The positive change in the mean scores between pretest and posttest suggests that repetitive and rhythmic training contributes effectively to lower-limb development. The motion pattern in skipping builds a sense of timing and rhythm, helping players control their movements more efficiently when performing instep kicks. These results correspond with the ideas of Guo et al. (2025), who emphasized that motor rhythm and mental engagement influence precision during technical execution. In this research, participants demonstrated better control and coordination after six weeks of consistent skipping. The repetitive nature of the exercise encouraged synchronization between balance and force generation. The training routine, though simple, provided measurable benefits in strength and coordination. It confirms that structured rhythmic activity can lead to tangible improvements in shooting accuracy among school-aged athletes.

Enhanced coordination between the legs and core muscles became apparent as the program progressed. Players were able to maintain stable posture, produce stronger kicks, and recover balance more effectively after impact. According to Hassan (2025), neuromotor training improves brain–body communication and optimizes movement control, which explains the gains observed in this study. Participants developed smoother motion patterns through repetition and feedback during skipping practice. The rhythmic consistency trained their muscles to act in harmony, reducing

unnecessary movements that previously affected accuracy. This finding aligns with Garaszczuk et al. (2025), who linked visual stability and body coordination to precision in shooting performance. The combination of controlled vision and muscular timing improved players' accuracy during posttest assessments. These physiological changes reflect how coordination-based training enhances both perception and execution.

Skipping also promoted the development of muscular endurance and cardiovascular capacity, which are vital for sustaining energy during games. The repeated jumping motion activates major muscle groups in the legs, hips, and lower back, building strength without requiring external weights. Studies by Ünver et al. (2025) revealed that athletes exposed to consistent endurance training maintain better accuracy under fatigue, supporting the findings of this research. The students' gradual adaptation showed that fatigue resistance improved alongside technical performance. Likewise, Wang and He (2025) demonstrated that controlled rhythmic movement improves biomechanical efficiency, which corresponds with the participants' enhanced balance and stability. The exercise strengthened the kinetic chain connecting the legs to the trunk, producing more effective force transfer when shooting. As a result, accuracy and distance improved simultaneously. The physiological adaptations from skipping therefore underlie the positive outcomes reported in this study.

The data also highlight a gradual and consistent improvement rather than a sudden change in performance. Participants displayed a progressive increase in shooting accuracy from the first to the final week, suggesting a learning process built through repetition. This progression supports the findings of Guo, Xi, Zhao, and Wang (2025), who found that efficient energy use and movement repetition contribute to skill optimization. During the early weeks, participants adjusted to the rhythm of the skipping pattern, while later sessions reinforced muscle memory and timing. The repeated exposure to rhythmic motion allowed their nervous systems to coordinate more effectively. By the end of the sixth week, the improvements became more uniform across all participants. The results show that motor learning occurs gradually as the body adapts to repetitive and structured movements. Skipping thus provides both conditioning and long-term learning benefits.

In a developmental context, skipping offers particular value for adolescent athletes who are still refining their motor abilities. Structured rhythm training establishes fundamental coordination that supports the performance of more complex football skills. Orangi, Ghorbanzadeh, and Basereh (2025) found that guided motor learning in children strengthens coordination and technical ability, which corresponds closely to the results of this research. The simplicity of skipping enables students to engage actively without overexertion, making it ideal for school programs. Moreover, Xu and Xu (2026) noted that measurable and consistent practice patterns lead to predictable improvement, reflecting the gradual progression seen in this study. Each session reinforced neural pathways related to balance and timing. The participants not only improved physically but also gained confidence in their ability to control movement. Such confidence is essential for continued athletic development during adolescence. The findings of this study demonstrate that skipping can serve as an equalizing training method among players with different initial abilities. The reduction in score variability from pretest to posttest indicates that weaker participants improved at a faster rate, narrowing the gap with stronger players. This pattern supports the concept described by Söğüt et al. (2025), who observed that synchronization between visual focus and bodily motion can minimize performance disparities. As students practiced together, the rhythmic group environment encouraged cooperation and consistency. Each participant learned to match the pace and coordination of others, enhancing

collective discipline. The exercise thus contributed not only to individual progress but also to team cohesion. Group rhythm generated motivation, allowing players to support and learn from each other. Such outcomes reflect the social and collaborative potential of rhythmic physical training.

Psychological factors also played an important role in explaining the success of the skipping program. The activity required concentration, timing, and persistence, which helped cultivate mental discipline. Guo et al. (2025) reported that mental engagement improves physical precision, and similar effects were observed here as players became more focused during shooting drills. The repetitive rhythm of skipping fosters relaxation and attentiveness at the same time, creating a meditative state conducive to motor control. Students who previously rushed their movements began to show patience and confidence in executing shots. This balance between focus and enjoyment reduced performance anxiety and increased motivation. Over the six-week period, skipping transformed from a simple exercise into a habit that strengthened both body and mind. Such psychological adaptation is crucial in maintaining consistent performance under competitive conditions. The results also emphasize that sophisticated equipment is not necessary to achieve effective training outcomes. Skipping is a low-cost and accessible activity that can be implemented even in schools with limited resources. This practicality resonates with the educational values of inclusivity and equal opportunity in sports. Morzenti (2026) introduced digital twin models for analyzing shooting performance, but such technologies are often beyond the reach of basic training programs. In contrast, skipping provides similar developmental benefits through physical feedback rather than digital simulation. It encourages self-awareness, timing control, and adjustment through repetition. The exercise thus represents a realistic alternative to technology-based performance monitoring. Coaches and teachers can adopt this approach to achieve measurable improvement without depending on costly devices. The steady weekly improvement observed in this study demonstrates how human performance adapts naturally to repeated motion cycles. This progression supports the notion that rhythm and feedback are essential to sustainable skill development. The pattern is comparable to the adaptive process described by Hassan (2025), where consistent sensory feedback leads to long-term motor refinement. Participants in this research improved gradually, showing that proper structure and timing in training yield stable results. Each practice session reinforced movement patterns, allowing players to internalize efficient kicking techniques. This repetition built endurance, coordination, and precision simultaneously. The physical consistency gained from skipping carried over to the participants' shooting actions. Such evidence highlights the interplay between physical conditioning and learned coordination. Overall, the integration of previous findings and the present data confirms that skipping is an effective and scientifically sound method for enhancing youth football performance. The improvements recorded align with the multidimensional benefits noted by Orangi et al. (2025) and Morzenti (2026), both of whom stressed the role of structured feedback in motor skill acquisition. The rhythmic pattern of skipping combines endurance, coordination, and focus into a single training process that supports holistic athletic growth. It enhances not only technical execution but also the cognitive and emotional aspects of learning. The study demonstrates that meaningful progress can arise from simple, consistent practice grounded in scientific principles. Consequently, skipping should be considered a practical model for school-level sports training and early athlete development programs.

The findings of this study emphasize that skipping is not merely a simple exercise but a valuable method for developing fundamental skills in youth football training. The significant improvement in

shooting accuracy and leg power after six weeks of practice illustrates that repetitive, rhythm-based activity can effectively enhance coordination, balance, and control. This outcome carries important implications for sports educators and coaches who often work in schools with limited training resources. Skipping offers a practical, low-cost solution that can be implemented easily within existing physical education programs while still delivering measurable results. Beyond physical benefits, it cultivates rhythm, focus, and discipline—qualities that support overall character development in young athletes. Integrating skipping into structured training can therefore promote both technical growth and positive behavioral attitudes toward exercise, making it a sustainable model for school-based sports development. Although the research produced positive and consistent results, several factors should be considered as limitations. The study involved only thirty participants from a single school, which restricts the ability to generalize findings to a wider population. The training lasted for six weeks, and longer-term studies might reveal deeper or more sustained adaptations. Environmental aspects such as temperature, fatigue, and motivation were not strictly controlled and could have influenced the data. Additionally, the absence of a control group limits the extent to which improvements can be attributed exclusively to the skipping intervention. Variations in individual fitness levels and technique might also have contributed to differences in progress among participants. Despite these limitations, the study provides a useful reference for future research on rhythmic and coordination-based training methods in youth sports.

Future research is encouraged to include more diverse samples and apply control groups to verify the consistency of results across different populations. Expanding the duration of training and combining skipping with other forms of conditioning could provide a broader understanding of its impact on technical and physiological performance. Further analysis might also incorporate biomechanical and psychological measurements to explore how rhythmic movement affects both physical capability and mental focus. For practical application, coaches and physical education teachers should integrate skipping into their training routines with careful attention to technique, gradual progression, and student motivation. This exercise can be used not only as a warm-up but also as a structured conditioning program to improve endurance and shooting ability. Through consistent practice, skipping has the potential to become a foundational component of youth football programs aimed at holistic athletic development.

CONCLUSIONS

This study concludes that consistent skipping exercises bring a measurable improvement in the shooting performance of young football players. After six weeks of rhythmic training, participants demonstrated greater control, balance, and leg power, which directly enhanced their ability to perform accurate instep kicks. The steady rise in average scores from the pretest to the posttest indicates that skipping contributes to both physical adaptation and better coordination of movement. Through repetitive motion, students developed stronger muscular response, improved timing, and greater stability during shooting execution. The results also highlight that meaningful progress in football performance can be achieved through simple and low-cost exercises without advanced equipment. Skipping proved to be not only an effective conditioning method but also a way to build discipline, rhythm, and confidence among junior athletes. Overall, structured skipping training can

serve as a reliable model for developing technical and physical abilities in school-based football programs.

AUTHOR'S CONTRIBUTION

All parts of this research were conceptualized, designed, and conducted by Anggiat Mangatur Sinaga as the main author and researcher. He was responsible for developing the research framework, preparing the instruments, collecting and analyzing the data, and writing the manuscript.
Hartati served as the primary academic supervisor, providing guidance in methodological design, data interpretation, and critical refinement of the manuscript to ensure academic rigor.
Syafaruddin acted as the secondary supervisor, offering expert feedback in the field of sports education, validating the research procedures, and ensuring that the experimental design met ethical and scientific standards. Both supervisors contributed equally in reviewing, revising, and validating the final version of the manuscript, while the author maintained full responsibility for the originality, accuracy, and integrity of the research findings.

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