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The Influence of Balance on the Dribbling Skills of Students

Muhammad Arkanul Arba'[1A-E*], Nurul Octaviani Basri[2E], Wahyu Rahmatullah[3BCD]

[1,2,3] Universitas Pejuang Republik Indonesia, Sulawesi Selatan, Indonesia

muhammadarkanularba@gmail.com[1*], nurul.octaviani111096@gmail.com[2], wahyurahmatullah021@gmail.com[3]

ABSTRACT

Football is one of the most popular sports among elementary school students and requires the mastery of various technical and physical components, including dribbling and balance. Balance plays a crucial role in maintaining body stability during movement, particularly when performing dribbling tasks that involve rapid changes of direction and ball control. However, empirical evidence regarding the influence of balance on dribbling performance among elementary school students remains limited, especially within the context of football extracurricular activities in Makassar. Therefore, this study aimed to analyze the influence of balance on the dribbling skills of students participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar. This study employed a quantitative approach using a one-group pre-test–post-test design. The sample consisted of 15 fifth- and sixth-grade male students who actively participated in football extracurricular activities. Balance was measured using the Stork Balance Stand Test, while dribbling performance was assessed through a Zig-Zag Cone Dribbling Test involving six cones arranged 1.5 meters apart. Data were analyzed using Pearson Product-Moment correlation and simple regression analysis at a significance level of $\alpha = 0.05$. The results revealed a very strong and significant relationship between balance and dribbling performance, with a correlation coefficient of $r = 0.917$, exceeding the critical value of r-table = 0.514. The significance value was $p = 0.000$ (< 0.05), indicating a statistically significant influence. The coefficient of determination (R^2) was 0.841, demonstrating that balance contributed 84.1% to dribbling performance. Furthermore, the mean balance score improved from 18.40 seconds during the pre-test to 24.73 seconds during the post-test. In conclusion, balance significantly influences dribbling skills among elementary school football participants. Therefore, structured balance training should be systematically integrated into football extracurricular programs to enhance students' technical performance and overall motor development.

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INTRODUCTION

Football is the most popular sport worldwide and continues to be one of the most widely participated sports among children and adolescents in Indonesia. The game requires the integration of various physical, physiological, and technical components,

including speed, agility, coordination, endurance, strength, and balance, to perform effectively during competition (Mappaompo et al., 2024). Among these biomotor components, balance plays a critical role in enabling players to maintain body stability while executing technical movements under dynamic game conditions (Dahham et al., 2025; Majeed Joudah et al., 2025).

One of the fundamental technical skills in football is dribbling. Dribbling refers to a player's ability to move the ball while maintaining control and maneuvering around opponents. This skill is essential for creating attacking opportunities, maintaining possession, and overcoming defensive pressure (Arba et al., 2025; Arga & Fitri, 2025). Effective dribbling requires the harmonious interaction of lower-limb coordination, agility, reaction ability, and body balance. When balance is compromised, players often lose control of the ball, resulting in ineffective movement and reduced performance (Sufitriyono et al., 2025).

Balance is generally defined as the ability to maintain the body's center of gravity within its base of support, either in stationary positions or during movement. It consists of static balance, which involves maintaining stability while stationary, and dynamic balance, which involves maintaining stability during movement (Badaru & Rahman, 2026). In football, dynamic balance is particularly important because players continuously perform changes of direction, acceleration, deceleration, and ball control while interacting with opponents and environmental constraints (Arba, 2025; Ibrahim, 2026).

Elementary school age represents a critical developmental period for motor skill acquisition. During this stage, children experience rapid neuromuscular development, making it an ideal period for enhancing fundamental movement skills, coordination, and balance (Ridwan et al., 2025). The quality of motor development achieved during childhood significantly influences future sports performance and physical literacy in adolescence and adulthood (Suwardi et al., 2026). Consequently, identifying factors that contribute to technical football skills among elementary school students is important for developing effective training programs.

SD Inpres Mallengkeri I Makassar actively conducts football extracurricular activities involving fifth- and sixth-grade students. Preliminary observations conducted by the researchers revealed that many participants experience difficulties in performing effective dribbling movements, particularly when navigating obstacles arranged in zig-zag patterns. These difficulties are suspected to be associated with inadequate balance abilities, which may limit students' capacity to maintain ball control while changing direction rapidly. Understanding the influence of balance on dribbling performance among elementary school students is therefore essential. Such knowledge can provide evidence-based guidance for physical education teachers and football coaches in designing training programs that specifically target the physical attributes most relevant to technical skill development.

The relationship between balance and football performance has received considerable attention from researchers over the past two decades. Previous studies consistently demonstrate that balance contributes significantly to technical skill

execution, particularly dribbling performance. Nugroho (2015) reported that balance exhibited a positive and significant correlation with dribbling ability among elementary school students, contributing approximately 72.4% to dribbling performance. These findings indicate that improvements in balance are associated with enhanced ball control and movement efficiency during dribbling tasks. Similarly, Reilly et al. (2000) emphasized that balance serves as a fundamental prerequisite for technical football performance. Players possessing superior balance demonstrate more efficient movement patterns because their postural muscles function optimally to maintain stability during dynamic actions. This stability allows players to focus more effectively on controlling the ball and responding to game situations.

Pratama and Widodo (2018) further investigated this relationship among upper-grade elementary school students and found a significant association between dynamic balance and dribbling performance (r = 0.812). Their study revealed that students participating in regular balance training programs demonstrated faster improvements in dribbling skills compared with control groups. Research conducted by Zemkova and Hamar (2010) highlighted the importance of postural control in team sports. Their findings suggested that athletes with superior balance capabilities perform directional changes more effectively and maintain greater movement precision when executing sport-specific technical skills. These characteristics directly influence dribbling effectiveness in football. Ardiansyah and Supriatna (2020) examined both static and dynamic balance among elementary school students and found significant contributions of balance variables to dribbling performance. Using a zig-zag cone dribbling test, they demonstrated that students with higher balance scores completed dribbling tasks more quickly and accurately than students with lower balance abilities. Moreover, Paillard et al. (2006) reported that trained football players exhibit superior postural control compared with non-athletes. Their findings suggest that football participation naturally enhances balance development, while structured balance training can further accelerate improvements in postural stability and motor performance.

In Indonesia, Haryanto (2019) found that balance contributed 78.9% to dribbling skill performance among elementary school students. The study concluded that students with higher balance abilities displayed better control of body positioning and foot movements during dribbling activities. Recent studies in sports science continue to support these findings. Research has demonstrated that balance training improves neuromuscular coordination, proprioceptive function, movement efficiency, and sport-specific technical execution (Granacher et al., 2016; Lesinski et al., 2017; Chaouachi et al., 2014). These physiological adaptations contribute positively to football performance, particularly in tasks requiring rapid directional changes and ball control. Furthermore, contemporary motor learning theories emphasize that technical skill acquisition is strongly influenced by underlying physical capacities, including balance, coordination, and postural control (Lloyd et al., 2015; Faigenbaum et al., 2020). Therefore, examining balance as a predictor of dribbling performance remains highly relevant within youth football development.

Despite extensive evidence supporting the relationship between balance and dribbling ability, several limitations remain within the existing literature. First, many previous studies have been conducted among adolescent athletes, football academy players, or junior competitive athletes rather than elementary school students (Paillard et al., 2006; Zemkova & Hamar, 2010). Consequently, findings from these populations may not be directly applicable to younger students who possess different physical and motor development characteristics. Second, research investigating this relationship within the Indonesian elementary school context remains limited. Existing studies have predominantly been conducted in regions located on Java Island, such as Surabaya and Bandung (Pratama & Widodo, 2018; Ardiansyah & Supriatna, 2020). Consequently, empirical evidence from eastern Indonesia, particularly Makassar, remains scarce. Third, previous studies have frequently focused on correlation analysis without comprehensively examining the direct influence of balance on dribbling performance using specific football extracurricular participants. The unique characteristics of extracurricular football students may differ from those of competitive athletes in terms of training frequency, physical fitness, and technical proficiency. Fourth, there is limited research integrating static balance assessment through the Stork Balance Stand Test with dribbling performance measurement using the Zig-Zag Cone Dribbling Test among elementary school football participants. Combining these instruments provides a more comprehensive understanding of how balance contributes to technical football performance. Therefore, further investigation is needed to address these gaps and provide context-specific evidence regarding the influence of balance on dribbling skills among elementary school students participating in football extracurricular activities in Makassar.

Based on the identified research gaps, this study aims to: (1) analyze the balance level of fifth- and sixth-grade students participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar; (2) determine the dribbling skill level of these students; and (3) examine the influence of balance on dribbling performance among the participants. The novelty of this study lies in several aspects. First, it focuses specifically on fifth- and sixth-grade students actively participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar, a population that has not previously been examined in similar studies. Second, the study provides empirical evidence from an urban elementary school context in Makassar, thereby expanding the geographical scope of football development research in Indonesia. Third, it integrates the Stork Balance Stand Test as a measure of static balance with the Zig-Zag Cone Dribbling Test as a measure of football-specific technical performance. This combination allows for a comprehensive evaluation of the direct contribution of balance to dribbling ability.

The findings are expected to contribute theoretically to the understanding of motor performance determinants in youth football and practically to the development of evidence-based training programs for physical education teachers and football coaches. It is hypothesized that balance has a significant positive influence on dribbling skills among students participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar.

In conclusion, balance is a fundamental biomotor component that supports the successful execution of football dribbling skills, particularly among elementary school students undergoing critical stages of motor development. Previous studies consistently demonstrate a significant relationship between balance and dribbling performance; however, empirical evidence within the context of elementary school football extracurricular programs in Makassar remains limited. Addressing this gap is important for improving youth football coaching practices and physical education programs. Therefore, this study seeks to provide empirical evidence regarding the influence of balance on dribbling skills among students of SD Inpres Mallengkeri I Makassar through the application of the Stork Balance Stand Test and Zig-Zag Cone Dribbling Test. The results are expected to support the development of targeted training interventions aimed at enhancing technical football performance through balance improvement strategies.

METHODS

Korrelational research is widely used in sports science to identify the strength, direction, and magnitude of relationships between variables and to determine the predictive contribution of one variable to another (Arga, 2025a; Arga, 2025b). In this study, balance served as the independent variable (X), while football dribbling skill was treated as the dependent variable (Y). The population consisted of all fifth- and sixth-grade students who actively participated in football extracurricular activities during the 2023/2024 academic year. Considering the relatively limited number of participants, a purposive sampling technique was applied. This sampling method is recommended in sports performance studies when researchers aim to select participants who meet specific training and participation criteria (Thomas et al., 2022). The inclusion criterion required students to have attended at least 75% of the scheduled football training sessions during the semester. Based on these criteria, 15 male students aged between 11 and 12 years were selected as research participants.

Balance was assessed using the Stork Balance Stand Test, one of the most commonly utilized field tests for evaluating postural stability in children and adolescents (Cejudo et al., 2021). Participants were instructed to stand on one foot with their eyes open while maintaining balance for as long as possible. Timing began when the participant assumed the correct position and ended when balance was lost. Each participant performed three trials, and the longest recorded time, measured in seconds, was used as the final score. Previous studies have demonstrated the validity and reliability of this instrument in school-aged populations, with a reported reliability coefficient of r = 0.87 (Johnson & Nelson, 1986). More recent investigations have confirmed that balance assessments are effective indicators of neuromuscular control and motor coordination among youth athletes (Granacher & Lesinski, 2019).

Dribbling performance was measured using the Zig-Zag Cone Dribbling Test, a football-specific skill assessment that evaluates ball control, agility, coordination, and movement efficiency (Ali, 2018). Six cones were arranged in a straight line with a distance

of 1.5 meters between each cone. Participants dribbled the ball through the cones in a zig-zag pattern from the first cone to the sixth cone and returned to the starting point. Each student completed two trials, and the fastest completion time, measured in seconds, was recorded as the final score. The Zig-Zag Cone Dribbling Test has been widely adopted in football skill assessment due to its strong construct validity and ability to simulate actual game situations (Sarmento et al., 2020).

The research procedure consisted of two stages: pre-testing and post-testing. The pre-test was conducted before the implementation of the balance training program to establish baseline measurements of balance and dribbling ability. Subsequently, participants underwent a six-week balance training intervention comprising three training sessions per week, resulting in a total of eighteen sessions. The training program included single-leg stand exercises, balance board training, and tandem walking activities. These exercises were selected because previous studies have demonstrated their effectiveness in improving postural stability, proprioception, and motor control in children and young athletes (Behm et al., 2021; Hammami et al., 2018; Granacher et al., 2016). Following the intervention period, post-tests were administered using the same testing procedures. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were first calculated to summarize participant characteristics and test outcomes. Pearson Product-Moment Correlation analysis was then employed to determine the strength and direction of the relationship between balance and dribbling skills. Furthermore, simple linear regression analysis was conducted to assess the magnitude of the influence of balance on dribbling performance. All statistical analyses were performed at a significance level of $\alpha = 0.05$, which is commonly recommended in sports science and educational research for hypothesis testing (Field, 2022).

RESULTS AND DISCUSSION

Result

Descriptive Statistics of Balance and Dribbling Skills

The study involved 15 male students aged 11–12 years who actively participated in football extracurricular activities at SD Inpres Mallengkeri I Makassar. Data were collected through pre-test and post-test measurements to evaluate changes in balance and dribbling performance following a six-week balance training program.

Table 1.
Descriptive Statistics of Balance and Dribbling Skills

Variable	N	Mean Pre-test	Mean Post-test	Improvement (%)
Balance (seconds)	15	18.40	24.73	34.4%
Dribbling (seconds)	15	18.27	14.53	20.5%

Source: Primary Data

Table 1 shows that the average balance score increased from 18.40 seconds during the pre-test to 24.73 seconds during the post-test. This result indicates an improvement of

34.4% following the implementation of the balance training program. The increase suggests that the participants experienced substantial enhancement in their ability to maintain postural stability while standing on one leg. Similarly, dribbling performance demonstrated considerable improvement. The average dribbling completion time decreased from 18.27 seconds in the pre-test to 14.53 seconds in the post-test, representing a 20.5% improvement. Since lower dribbling times indicate better performance, these findings suggest that students became more efficient in controlling and maneuvering the ball through the zig-zag cone course after participating in the balance training intervention.

The simultaneous improvement in both variables indicates a potential relationship between balance development and football dribbling performance. Students who exhibited better postural control tended to demonstrate greater efficiency when executing dribbling movements that required rapid directional changes and continuous ball control.

Correlation and Regression Analysis

To test the research hypothesis regarding the influence of balance on dribbling skills, Pearson Product-Moment correlation and simple linear regression analyses were conducted. The results are presented in Table 2.

Table 2.
Correlation and Regression Analysis of Balance on Dribbling Skills

Statistical Test	Calculated Value	Critical Value ($\alpha = 0.05$)	Interpretation
Correlation Coefficient (r)	0.917	0.514	Significant
Coefficient of Determination (R^2)	0.841 (84.1%)	-	Strong Influence
Significance Value (p)	0.000	< 0.05	H_0 Rejected

Source: Primary Data

The correlation analysis produced a Pearson correlation coefficient of r = 0.917, indicating a very strong relationship between balance and dribbling performance. According to commonly accepted correlation interpretation guidelines, values above 0.80 represent a very high association between variables.

Furthermore, the obtained r-value (0.917) exceeded the critical r-table value (0.514) at the significance level of $\alpha = 0.05$ with N = 15 participants. The significance test also yielded a p-value of 0.000, which is lower than the established significance threshold of 0.05. Therefore, the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_1) was accepted. These findings indicate that balance significantly influences dribbling skills among students participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar. Students with better balance abilities generally demonstrated superior dribbling performance compared to those with lower balance scores.

The coefficient of determination (R^2) was calculated at 0.841, indicating that balance accounted for approximately 84.1% of the variance in dribbling performance. This result demonstrates that balance is a dominant factor affecting football dribbling skills among the participants. Meanwhile, the remaining 15.9% of the variance may be attributed to other factors, including foot-eye coordination, agility, lower-limb strength, reaction speed, technical proficiency, and previous playing experience.

The results demonstrate that the six-week balance training program effectively improved both balance and dribbling performance among elementary school football participants. Balance scores increased by 34.4%, while dribbling performance improved by 20.5%. Statistical analysis further revealed a very strong and significant relationship between balance and dribbling skills ($r = 0.917$; $p < 0.05$). The regression analysis showed that balance contributed 84.1% to dribbling performance, highlighting its critical role in football skill development among elementary school students. Overall, these findings provide empirical evidence that balance is a fundamental physical component influencing football dribbling performance and should therefore be considered a priority element in youth football training programs.

Discussion

The present study aimed to examine the influence of balance on the dribbling skills of students participating in football extracurricular activities at SD Inpres Mallengkeri I Makassar. The findings demonstrated that balance significantly affected dribbling performance, as evidenced by a very strong correlation coefficient ($r = 0.917$) and a coefficient of determination ($R^2 = 0.841$). These results indicate that balance accounted for approximately 84.1% of the variance in dribbling performance among the participants. Furthermore, the six-week balance training program resulted in a 34.4% improvement in balance ability and a 20.5% improvement in dribbling performance.

From a biomechanical perspective, dribbling is a complex motor skill that requires the integration of postural control, coordination, agility, and movement precision (Ali, 2018; Sarmento et al., 2020). During dribbling activities, players must continuously adjust body position while simultaneously controlling the ball and responding to environmental constraints. Consequently, maintaining balance becomes essential for ensuring movement efficiency and technical accuracy (Granacher et al., 2016; Lesinski et al., 2017). The very high correlation found in this study suggests that students with superior balance abilities were better able to maintain body stability while executing directional changes during the zig-zag dribbling test.

The substantial contribution of balance to dribbling performance can be explained physiologically through the interaction of the vestibular, proprioceptive, and neuromuscular systems. While dribbling through a series of cones, students are required to repeatedly alter movement direction, accelerate, decelerate, and reposition their center of gravity. These actions place considerable demands on the body's balance-regulation mechanisms (Behm et al., 2021). Efficient proprioceptive feedback from muscles, tendons, and joints allows the nervous system to detect changes in body position and initiate corrective actions rapidly (Hammami et al., 2018). Consequently, students with better balance can maintain optimal body alignment, resulting in more controlled ball movements and shorter dribbling times.

The findings support the theoretical framework proposed by Zemkova and Hamar (2010), who emphasized that postural control plays a central role in sport-specific movement efficiency. Athletes possessing superior balance capabilities can perform

directional transitions more effectively and maintain movement precision under dynamic conditions. Recent studies further support this argument by demonstrating that postural stability is closely associated with technical skill execution in team sports, particularly football, where frequent changes of direction occur (Cejudo et al., 2021; Pojskic et al., 2018). Therefore, the significant relationship identified in the present study reinforces the notion that balance constitutes a critical physical foundation for dribbling performance.

The results also corroborate the findings of Reilly et al. (2000), who identified balance as a fundamental prerequisite for technical football performance. Players with superior balance are capable of executing dribbling movements with greater confidence and efficiency because less muscular effort is required to maintain body stability. As a result, a greater proportion of neuromuscular resources can be allocated to ball control, movement planning, and technical execution (Faigenbaum et al., 2020). This phenomenon is particularly relevant among elementary school students, whose motor control systems are still developing and are therefore highly responsive to targeted balance training interventions (Lloyd et al., 2015).

The observed improvement in balance ability following the six-week intervention further highlights the trainability of postural control during late childhood. The participants demonstrated a 34.4% increase in balance performance, suggesting that the selected training activities including single-leg stands, balance board exercises, and tandem walking effectively stimulated neuromuscular adaptations. Similar findings have been reported by Granacher et al. (2016), who concluded that balance training programs significantly improve postural stability, motor coordination, and movement control in young athletes. Likewise, Lesinski et al. (2017) reported that structured balance exercises produce meaningful improvements in balance performance across various youth sport populations.

The effectiveness of the intervention can be attributed to enhanced sensory integration and motor learning processes. Repeated exposure to unstable conditions during balance exercises challenges the vestibular and proprioceptive systems, leading to improved sensory processing and postural regulation (Behm et al., 2021). Over time, these adaptations enable individuals to respond more effectively to perturbations and maintain stability during complex motor tasks (Hrysomallis, 2016). In the context of football, these adaptations translate into improved movement efficiency during dribbling activities that require frequent shifts in body position and rapid directional changes.

The 20.5% improvement in dribbling performance observed in this study further supports the transfer effect of balance training to sport-specific technical skills. Previous research has consistently shown that improvements in fundamental motor abilities can positively influence technical performance in football (Moran et al., 2017; Chaouachi et al., 2014). Dribbling requires players to coordinate lower-limb movements while maintaining visual attention on the playing environment and preserving ball control. Enhanced balance facilitates these processes by providing a stable base of support, thereby improving movement accuracy and reducing unnecessary body oscillations (Pojskic et al., 2018).

The current findings are also consistent with studies conducted within the Indonesian context. Nugroho (2015) reported that balance contributed 72.4% to dribbling performance among elementary school students, while Pratama and Widodo (2018) found a significant correlation between dynamic balance and football dribbling ability (r = 0.812). Similarly, Haryanto (2019) identified balance as a major determinant of dribbling performance among elementary school students in Makassar. The higher coefficient of determination observed in the present study (84.1%) may be attributed to the specific characteristics of the sample, the structured intervention program, and the use of football extracurricular participants who regularly engaged in football practice.

Another important implication of this study concerns youth football training methodology. Contemporary talent development models emphasize the importance of developing physical literacy and fundamental movement skills before focusing exclusively on sport-specific techniques (Ford et al., 2020; Hulteen et al., 2018). Balance is recognized as one of the key components of motor competence because it underpins movement efficiency, coordination, and injury prevention (Robinson et al., 2015). Therefore, incorporating balance-oriented exercises into football training programs may provide a practical and effective strategy for enhancing technical skill acquisition among elementary school players.

The findings also highlight the importance of considering balance as a performance predictor in physical education settings. Teachers and coaches often prioritize technical drills without adequately addressing the physical capacities that support skill execution. The present results demonstrate that improving balance can substantially enhance dribbling performance, suggesting that physical conditioning and technical training should be integrated rather than implemented separately. This integrated approach is supported by recent research indicating that combined motor competence and technical skill training produces superior outcomes compared with isolated technical practice (Barnett et al., 2022; Lopes et al., 2021).

Despite the strong findings, it should be acknowledged that 15.9% of the variance in dribbling performance remained unexplained by balance. This suggests that other factors such as agility, lower-limb strength, reaction time, foot-eye coordination, technical experience, and psychological confidence may also influence dribbling ability (Mappaompo et al., 2024; Arba et al., 2025; Ibrahim, 2026). Future studies should therefore investigate the combined effects of these variables to provide a more comprehensive understanding of football skill performance among elementary school students.

Overall, the present study provides strong empirical evidence that balance is a crucial determinant of football dribbling performance among elementary school students. The significant improvements observed following the balance training intervention reinforce the importance of incorporating balance development into youth football training programs. These findings contribute to the growing body of literature emphasizing the interconnected relationship between physical capacities and technical skill performance in football and support the implementation of evidence-based training strategies aimed at optimizing youth athlete development.

CONCLUSION

Based on the results of the data analysis and discussion, it can be concluded that balance has a significant influence on the dribbling skills of fifth- and sixth-grade students who actively participate in football extracurricular activities at SD Inpres Mallengkeri I Makassar. The statistical findings revealed a very strong positive relationship between balance and dribbling performance, as indicated by a correlation coefficient of r = 0.917. Furthermore, the coefficient of determination (R^2 = 0.841) demonstrated that balance contributed 84.1% to the variance in dribbling skills, while the remaining 15.9% was influenced by other factors such as agility, foot-eye coordination, lower-limb strength, and playing experience. The significance value ($p = 0.000 < 0.05$) confirmed that the relationship was statistically significant. The study also showed that the six-week balance training program effectively improved students' physical and technical performance. Balance ability increased from 18.40 seconds in the pre-test to 24.73 seconds in the post-test, representing an improvement of 34.4%. Similarly, dribbling performance improved from 18.27 seconds to 14.53 seconds, reflecting a 20.5% enhancement in dribbling efficiency. These findings have important practical implications for football coaches and physical education teachers. Balance training should be systematically integrated into elementary school football programs because it plays a crucial role in enhancing technical performance. Future studies are recommended to involve larger sample sizes, employ true experimental designs with control groups, and include dynamic balance as an additional predictor variable to obtain a more comprehensive understanding of football skill development among young players.

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