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Original article

Technical lateral drills to develop balance in youth soccer

[*Ejercicios técnicos de lateralidad para desarrollar el equilibrio en el fútbol formativo*]

[*Exercícios técnicos de lateralidade para desenvolver o equilíbrio no treinamento de futebol*]

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ABSTRACT

Introduction: This research addressed a fundamental issue in youth soccer training: improving balance in footballers through a program of technical lateral drills. The research was carried out with a quantitative approach, using an experimental longitudinal design and an explanatory scope.

Objective: To determine the effects of technical lateral drills on the development of balance in youth soccer players.

Materials and methods: The Illinois test was used to compare a numerical variable in the same group at two different times, pre- and post-test, collecting and analyzing quantitative data using statistical methods such as the Shapiro-Wilk normality test and

Student's t test. These assessment instruments allowed obtaining precise results in an authentic environment, since the research was carried out on the field.

Results: After the implementation of the laterality technical drill program for eight weeks, a significant improvement in the balance of the athletes was observed. In the evaluation without implement, the percentage of athletes in the "excellent" category increased from 8.3% (1 of 12 footballers) to 50% (6 of 12 footballers), while those in the "average" category decreased from 91.7% (11 of 12 footballers) to 33.3 % (4 of 12 footballers). Similarly, in the evaluation with implement, the percentage of athletes in the "excellent" category increased from 0% to 41.7% (5 of 12 footballers), and in the "good" category from 0% to 25% (3 of 12 footballers).

Conclusions: the results highlight a considerable improvement in balance after the intervention, demonstrating the effectiveness of the laterality technical drill program.

Keywords*:* technical drills, lateral, balance, youth soccer.

RESUMEN

Introducción: el presente estudio abordó una cuestión fundamental en el entrenamiento deportivo del fútbol formativo: la mejora del equilibrio en futbolistas a través de un programa de ejercicios técnicos de lateralidad. El estudio se llevó a cabo con un enfoque cuantitativo, utilizando un diseño longitudinal experimental y un alcance explicativo.
Objetivo: determinar los efectos de los ejercicios técnicos de lateralidad en el desarrollo del equilibrio en jugadores de fútbol formativo.
Materiales y métodos: se empleó el test de Illinois para comparar una variable numérica en el mismo grupo en dos momentos distintos, pre y postest, recolectando y analizando datos cuantitativos mediante métodos estadísticos como la prueba de normalidad de Shapiro-Wilk y la t de Student. Estos instrumentos de evaluación permitieron obtener resultados precisos en un entorno auténtico, ya que la investigación se desarrolló en la cancha.
Resultados: tras la implementación del programa de ejercicios técnicos de lateralidad durante ocho semanas, se observó una mejora significativa en el equilibrio de los

deportistas. En la evaluación sin implemento, el porcentaje de deportistas en la categoría "excelente" aumentó del 8.3 % (1 de 12 futbolistas) al 50 % (6 de 12 futbolistas), mientras que aquellos en la categoría "regular" disminuyeron del 91.7 % (11 de 12 futbolistas) al 33.3 % (4 de 12 futbolistas). De igual modo, en la evaluación con implemento, el porcentaje de deportistas en la categoría "excelente" aumentó del 0% al 41.7 % (5 de 12 futbolistas), y en la categoría "bueno" del 0% al 25 % (3 de 12 futbolistas).

Conclusiones: los resultados destacan una mejora considerable en el equilibrio tras la intervención, demostrando la efectividad del programa de ejercicios técnicos de lateralidad.

Palabras clave: ejercicios técnicos, lateralidad, equilibrio, fútbol formativo.

RESUMO

Introdução: o presente estudo abordou uma questão fundamental no treinamento esportivo do futebol juvenil: a melhoria do equilíbrio em jogadores de futebol por meio de um programa de exercícios técnicos de lateralidade. O estudo foi realizado com abordagem quantitativa, utilizando delineamento experimental longitudinal e escopo explicativo.

Objetivo: determinar os efeitos de exercícios técnicos de lateralidade no desenvolvimento do equilíbrio em jogadores de futebol juvenil.

Materiais e métodos: utilizou-se o teste de Illinois para comparar uma variável numérica de um mesmo grupo em dois momentos distintos, pré e pós-teste, coletando e analisando dados quantitativos por meio de métodos estatísticos como teste de normalidade de Shapiro-Wilk e teste t de Student. . Esses instrumentos de avaliação permitiram obter resultados precisos em um ambiente autêntico, já que a pesquisa foi realizada em campo.

Resultados: após a implementação do programa de exercícios técnicos de lateralidade durante oito semanas, foi observada melhora significativa no equilíbrio dos atletas. Na avaliação sem implemento, o percentual de atletas da categoria "excelente" aumentou de 8,3 % (1 de 12 jogadores de futebol) para 50 % (6 de 12 jogadores de futebol), enquanto

os da categoria "regular" diminuíram de 91,7%. (11 de 12 jogadores de futebol) para 33,3 % (4 de 12 jogadores de futebol). Da mesma forma, na avaliação com implemento, o percentual de atletas na categoria "excelente" aumentou de 0% para 41,7 % (5 de 12 jogadores de futebol), e na categoria "bom" de 0 % para 25 % (3 de 12 jogadores de futebol).

Conclusões: os resultados destacam uma melhora considerável no equilíbrio após a intervenção, demonstrando a eficácia do programa de exercícios técnicos de lateralidade.

Palavras-chave: exercícios técnicos, lateralidade, equilíbrio, treino de futebol.

INTRODUCTION

In the context of youth soccer, balance is positioned as an essential element that transcends mere technical skill, constituting a fundamental component that amalgamates motor control and tactical execution. From maintaining stability when receiving the ball to the ability to maneuver between opponents, every action on the field demands a refined balance, which not only strengthens technical competence, but also prevents injuries and promotes the development of proprioception in players. These solid foundations are crucial for comprehensive development in youth soccer, offering a stable motor base that drives both growth in technical skills and understanding of the game, thus ensuring a complete evolution on the field.

The development of balance emerges as a fundamental motor skill in soccer, indispensable for the effective execution of movements and skills specific to the sport. Within the field of youth soccer, this progress is of vital importance, as it allows young footballers to improve their stability, coordination and body control, especially during the stages of growth and physical maturation, where the foundations of their motor skills are established.

Based on what was previously mentioned, Alvarado (2021) states that balance is essential for the development of ball control, a fundamental skill both in training and in matches. Currently, in the soccer field, more emphasis is being placed on balance due to its importance in the ball control technique, as it contributes to cognitive development and the motor skills necessary to perform precise sports movements. However, in Ecuadorian soccer, balance training does not receive the attention it deserves, being considered secondary compared to other skills such as passing and precision. Despite the multiple benefits that balance brings when receiving the ball, it is not given adequate emphasis in training planning.

It should also be said that a lack of balance in children could manifest itself in difficulties in carrying out various physical and academic activities, which highlights the importance of knowing the state of dynamic balance in athletes in order to promote their motor development. Soccer, with its multiple motor actions, generates a continuous imbalance in the body, especially at an early age. In this sense, the development of laterality becomes a key strategy to improve balance in beginning footballers, facilitating more symmetrical and stable motor control.(Vallejo *et al*., 2019).

It should also be mentioned that laterality and balance have a significant influence on the motor development of individuals, and their correct maturation is essential to guarantee optimal growth and evolution in these areas. (Quilca, 2022). In that dynamic, laterality, or the preference of one side of the body over the other, is an important aspect of motor control that can influence balance. In soccer, where players must be able to use both sides of the body effectively, working both the dominant and non-dominant sides can contribute to greater stability and control on the field. Integrating laterality exercises into training programs encourages a more balanced and symmetrical development of motor control.

Similarly, the lack of well-developed laterality can influence language, orientation and cognitive development problems, which increases the risk of injuries due to physical instability in contact situations during sports practice (Orellana *et al*., 2020). In this sense, to reach elite levels, it is essential to have a high degree of bilateral technical efficiency

from childhood. However, it is common to observe errors in key plays due to the incorrect choice of the leg to use. This underlines the importance of bilateral performance in footballers and suggests the inclusion of offensive situations that promote the indiscriminate use of both legs in training sessions (Díaz *et al.,* 2024).

Despite the recognized importance of balance and laterality in sports performance, there is a lack of specific research on how technical lateral exercises can influence balance development in young footballers. Most traditional training programs tend to focus on general technical and physical skills, without paying enough attention to the integration of exercises that address laterality in a systematic way.

It is essential to recognize the importance of developing coordination skills, proprioception, balance and laterality during early childhood, between two and eight years, since in this period the motor base necessary for future specific competence in soccer is established (Gracia *et al.,* 2019). The consolidation of laterality, which generally occurs around the age of seven, not only allows the inclination towards sport to be predicted, but also offers more precise guidance in the training of footballers, influenced by social, genetic and neurophysiological factors. (Farfan & Portocarrero del Castillo, 2020).

The above implies that balance and laterality are intrinsically related in soccer, and laterality exercises that involve the alternating use of both sides of the body can significantly contribute to the development of dynamic and static balance in footballers. The ability to change direction quickly, maintain stability after a jump or turn, and perform complex movements under pressure are skills that are improved through training that integrates laterality. In addition, practicing activities that require the use of both feet can help balance motor skills and prevent muscle imbalances. (Loli & Silva, 2007).

Youth soccer is crucial for developing technical and physical skills in players, with balance playing a fundamental role in ball control and passing accuracy. Lack of specific balance training can limit performance, affecting the ability to stand and make precise movements, essential for effective performance on the field. Furthermore, a lack of

balance increases the risk of injury and affects the response to unforeseen situations during the game, which hinders sporting development (Pullupaxi & Bravo, 2016; Sánchez & Briones, 2021; Vasquez & Usquiano, 2020).

It should be added that studies have pointed out the importance of balance in the comprehensive development of children, with a shortage of professionals and adequate programs being observed in Ecuador. (Campo *et al*., 2022; Y *et al*., 2017). Specifically in soccer, lack of balance negatively impacts sports performance and daily activities. This study aims to fill the gap in national literature on balance and laterality in Ecuadorian child footballers, providing evidence to implement most effective training programs (Cuitiva & Rodríguez, 2019).

The inclusion of these exercises in the training regime is based on a sound theoretical perspective, which is a key factor in enhancing the balance of players. This approach not only deepens the understanding of how these exercises influence balance skills, but also seeks to determine the specific effects on the development of the balance of footballers. To do so, various assessments and analyses are carried out that enrich our understanding of the relationship between the practice of these drills and the improvements observed in the balance of footballers during their training period. Therefore, the objective of the present research is to evaluate the impact of a program of technical lateral drills on the development of the balance of footballers in training.

MATERIALS AND METHODS

The research was carried out with a quantitative approach, using an experimental longitudinal design and an explanatory scope to evaluate the effects of technical lateral drills on balance. Tests were used to compare a numerical variable in the same group at two different times, collecting and analyzing quantitative data with statistical methods. These assessment tools allowed obtaining precise results in an authentic setting, as the research was conducted on the field.

The research included two different evaluation moments: a pretest and a posttest, which measured the balance, variable in the same group of athletes before and after implementing the laterality technical drill program. Initially, the athletes were evaluated using the Illinois Test to determine their balance both without and with an implement, classifying the results as "regular", "good" and "excellent" according to the times recorded.

For eight weeks, a specific program of technical lateral drills was carried out, with training sessions held three times a week, each lasting 60 minutes. The program included a variety of activities and exercises focused on improving the footballers' balance.

At the end of the program, the Illinois Test was administered again to re-evaluate the athletes' balance under the same conditions (without and with an implement). The results of the pretest and posttest were compared to determine the improvements in balance. The data collected allowed for an exhaustive statistical analysis, demonstrating the effectiveness of the laterality technical drill program in developing the athletes' balance.

The population and sample of the research consisted of 12 footballers in training, aged between 6 and 8 years, who formed the experimental group. These footballers are part of the sports schools of the GAD Rumiñahui. The measurements and tabulation of the test results were carried out using specific scales adapted to children within the age range mentioned.

Statistical analysis

In order to provide a detailed and accurate description of the most important aspects of the data collected in the research, descriptive statistics were used for the balance times in the pretest and posttest, both without implement and with implement. Statistical validation of the data was performed using SPSS version 29.0, with results expressed in tables. This analysis included the mean, variance and standard deviation. The results showed an improvement in the mean times and a lower dispersion of the data in the posttest. To verify the normality of the data distribution, the Shapiro-Wilk test was

applied because the study population is small; the p values obtained were greater than 0.05, indicating that the data come from a normal distribution.

Finally, the Student t test for related samples was used to compare the pretest and posttest means. The results revealed statistically significant improvements in balance after the application of the laterality technical drill program, both without and with an implement (Table 1).

RESULTS AND DISCUSSION

Based on the analysis of the results of the initial Illinois test, it is evident that the majority of the 12 athletes evaluated show a level of balance ability that falls within the "regular" category. In the group evaluated without implements, 11 athletes are in this category, while only one manages to reach the "excellent" category, with an average of 24.93 seconds. On the other hand, in the group evaluated with implements, 12 athletes are in the "regular" category, and none in the "good" or "excellent" categories, with an average of 44.14 seconds.

These results highlight considerable deficiencies in the ability to maintain balance with and without an implement. Given the predominance of results in the "regular" category and the crucial importance of balance for sports performance and injury prevention, the implementation and application of a specific program of technical lateral drills to develop balance is proposed. This program is designed to be carried out for eight weeks, with 60-minute sessions, three times a week to develop balance (Table 1).

Table 1. - Illinois Initial Test

Without Implement			**With Implement**	
Pre-test	Scale		Pre-test	Scale
D 1	28.1	Regular	39.4	Regular
D 2	19.4	Regular	50.0	Regular

D 3	30.1	Regular	40.0	Regular
D 4	20.2	Regular	39.2	Regular
D 5	41.3	Regular	63.0	Regular
D 6	32.2	Regular	70.0	Regular
D 7	18.7	Regular	32.2	Regular
D 8	25.6	Regular	43.1	Regular
D 9	22.4	Regular	50.0	Regular
D 10	16.9	Excellent	30.0	Regular
D 11	19.2	Regular	28.8	Regular
D 12	25.1	Regular	44.0	Regular
Average	24.93	-	44.14	-

The data from the post-test, which evaluated 100 % (12) of the athletes, showed that, without equipment, six athletes (50%) obtained an "Excellent" evaluation, 2 athletes (16.7%) were categorized as "Good" and 4 athletes (33.3%) as "Fair". With equipment, five athletes (41.7%) reached the "Excellent" category, three athletes (25%) the "Good" category and 4 athletes (33.3%) the "Fair" category. In both cases, the "Excellent" category is the dominant one, although the distribution varied slightly between the evaluations with and without equipment (Table 2).

Table 2. - Final test, Illinois

Without implement					**With implement**			
	Pre-test	Scale	Post test	Scale	Pre-test	Scale	Well then	Scale
D1.	28.1	Regular	15.8	Excellent	39.4	Regulates	25.7	Excellent

D2.	19.4	Regular	16.7	Excellent	50.0	Regulates	28.2	Well
D3	30.1	Regular	18.2	Well	40.0	Regulates	27.3	Well
D4	20.2	Regular	16.3	Excellent	39.2	Regulates	33.4	Regular
D5	41.3	Regular	17.7	Well	63.0	Regulates	38.2	Regular
D6	32.2	Regular	20.6	Regular	70.0	Regulates	50.4	Regular
D7	18.7	Regular	14.1	Excellent	32.2	Regulates	23.6	Excellent
D8	25.6	Regular	15.3	Excellent	43.1	Regulates	45	Regular
D9	22.4	Regular	20.5	Regular	50.0	Regulates	39.8	Regular
D10	16.9	Excellent	16.5	Excellent	30.0	Regulates	28.1	Well
D11	19.2	Regular	16.2	Excellent	28.8	Regulates	21.1	Excellent
D12	25.1	Regular	18.5	Regular	44.0	Regulates	26.8	Excellent

After applying the Shapiro-Wilk normality test and comparing the significance values with the alpha level of 0.05, it was observed that in all four cases the balance variable, both before and after the implementation of the laterality technical drill program, presented a p value greater than 0.05. This indicates that the data come from a normal distribution, for this reason, the Student t test was applied for related samples where the following results were obtained that show the comparison of means before and after the application of the program, as well as the correlation and significance (Table 3).

Table 3. - Shapiro-Wilk Normality Test

P-Value r		Alpha level
P- Value (Balance without Implement Before) = 0.177	>	α = 0.05
P- Value (Balance without Implement After) = 0.528	>	α = 0.05
P- Value (Balance with Implement Before) = 0.276	>	α = 0.05
P- Value (Balance with Implement After) = 0.205	>	α = 0.05

Analysis of the table reveals that, in the balance without implement, the pretest mean was 24.93 with a variance of 50.324 and a standard deviation of 7.094, while, in the posttest, the mean decreased significantly to 17.20, with a variance of 3.920 and a standard deviation of 1.979, indicating a considerable improvement in balance and less dispersion of the data.

Regarding balance with implement, the pretest mean was 44.14, with a variance of 157.823 and a standard deviation of 12.56. In the posttest, the mean was reduced to 32.30, with a variance of 83.233 and a standard deviation of 9.123, which indicated an improvement in balance, although with a greater dispersion of the results compared to the test without implement. This greater dispersion is attributed to the added difficulty of incorporating the ball in the execution of the test in a real game situation (Table 4).

Table 4. - Statistics of related samples

Balance	Dep.	Average	Variance	Des. Standard
Balance without implement Pre test	12	24.93	50,324	7,094
Balance without implement Post test	12	17.20	3,920	1,979
Balance with implement Pre test	12	44.14	157,823	12.56
Balance with implement Post test	12	32.30	83,233	9,123

The analysis of the correlation table of related samples shows the significant impact of the technical laterality drill program on the development of the balance of footballers.

For balance without implement (Pair 1), the correlation between the pretest and posttest was 0.401, with a significance of 0.002. Although the correlation is moderate, the improvement in the posttest results indicates that the laterality technical drill program had a positive effect on balance.

As a final result of the study, it was observed that, for balance with implements (Pair 2), the correlation between the pretest and the posttest was much stronger, with a value of 0.768 and an extremely low significance (0.000), indicating a statistically significant improvement in the balance of the footballers after the application of the program. The previous evidence demonstrated that the laterality technical drill program had a notably positive impact on the development of balance when implements were used; reflecting an effective adaptation of the players to more challenging and realistic game conditions (Table 5).

Table 5. - Related samples T test

	Peers	N	Correlation	Significance
Pair	1 Pretest without IILINOIS implement & Post test without ILLINOIS implement	12	,401	,002
Pair	2 Pretest with ILLINOIS implement & Post test with ILLINOIS implement	12	,768	,000

This study addressed a fundamental issue in sports training in youth soccer: improving balance in athletes through a program of technical lateral drills. Authors such as (Carlos, 2021; Sánchez & Briones, 2021) have conducted similar research confirming that the implementation of a laterality drill program is a viable and timely option to reduce motor skills and profile problems, with the purpose of providing more opportunities for better performance in the soccer development of children.

The results obtained provided significant evidence on the efficacy of such a program, revealing significant improvements in balance in both the implement and non-

implement conditions. Initially, analysis of the Illinois tests revealed a notable deficiency in the balance of the tested athletes. The majority of the 12 athletes were classified in the "fair" category in both testing conditions (with and without implement), underlining the need for intervention and improvement, especially under more challenging conditions involving the use of implements. Only one athlete reached the "excellent" category without an implement, and none did so with an implement, indicating a low starting point in terms of balance.

Following the implementation of the laterality technical drill program for eight weeks, a significant improvement in the athletes' balance was observed. In the assessment without implement, the percentage of athletes in the "excellent" category increased from 8.3% (1 of 12 footballers) to 50% (6 of 12 footballers), while those in the "average" category decreased from 91.7% (11 of 12 footballers) to 33.3% (4 of 12 footballers). Similarly, in the assessment with implement, the percentage of athletes in the "excellent" category increased from 0% to 41.7% (5 of 12 footballers), and in the "good" category from 0% to 25% (3 of 12 footballers). These results highlight a considerable improvement in balance after the intervention, demonstrating the effectiveness of the laterality technical drill program.

The positive and significant impact of technical lateral drills on balance is evident not only in the improvement of balance times, but also in the consistency of the athletes' performance. The mean balance without implement decreased significantly from 24.93 seconds in the pretest to 17.20 seconds in the posttest, with a notable reduction in variance and standard deviation.

Similarly, in the implement assessment, the mean decreased from 44.14 seconds to 32.30 seconds, although with a greater spread of results. This greater spread reflects the additional complexity introduced by the use of implements, suggesting that although athletes improved their balance, they still faced additional challenges when using implements. However, the improvement in times and the greater number of athletes classified in the "good" and "excellent" categories indicate that laterality exercises were effective in improving balance under more challenging conditions.

The Shapiro-Wilk normality test confirmed that the data followed a normal distribution, allowing the application of the Student t-test. The t-test results showed statistically significant improvements in balance, both with and without an implement, after the application of the laterality technical drill program. The moderate correlation for balance without an implement (0.401) and the strong correlation for balance with an implement (0.768) highlight the effectiveness of the program, especially under more challenging conditions.

These findings confirm that the laterality technical drill program had a positive and significant effect on the development of athletes' balance. The findings of this study contribute significantly to the development of balance in youth soccer, providing evidence on the effectiveness of technical lateral drills.

The improvement in balance had significant implications for the sporting performance of footballers, as good balance is essential for the execution of precise and efficient movements. Furthermore, this improvement has a positive impact on injury prevention. (Figueroa *et al.,* 2024.; Montealegre-Mesa *et al.,* 2019; Valverde, 2023), in their research, corroborate what has been stated, stating that the risk of sports injuries decreases thanks to the increase in balance in footballers and that balance is influenced by laterality, since it requires the ability to stand in a controlled manner, thus avoiding motor and functional difficulties.

The researchers detail that systematic training, combined with agility exercises that include laterality, reaction speed and balance, not only improves physical abilities, but also has a complementary effect on perfecting technical fundamentals in soccer. Therefore, the laterality technical drill program not only improves sports performance, but also contributes to the overall health and well-being of youth footballers.

This research provides strong evidence that the laterality technical drill program is effective in improving balance in youth soccer. The observed improvements in balance times and the greater consistency in athletes' performance underline the effectiveness of these exercises. These findings have important implications for sports training, suggesting that the adoption of laterality technical drill programs may be beneficial in

developing and maintaining athletes' balance. Ultimately, technical lateral drills represent a valuable tool to improve balance and sports performance, contributing to the overall development of athletes.

CONCLUSIONS

The theories relating to the variables of this research enrich the theoretical framework by practically validating the importance and influence of technical lateral drills in improving balance. The findings demonstrate the effectiveness of the applied program and its impact on motor control of the actions of youth footballers.

The results of the analysis of the data collected in the pretest showed difficulties in balance. However, after the application of the laterality technical drill program, the results of the posttest showed a significant improvement in the development of balance with and without an implement. These improvements were confirmed by moderate to strong correlations and a high statistical significance, demonstrating the effectiveness of the program.

The proposal of technical lateral drills is viable and has a great impact on the development of balance in youth footballers. The results show tangible improvements in balance, which is why the implementation of the program in regular training is validated, suggesting that it be implemented in youth soccer.

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