REVISTA ELETRÔNICA NACIONAL DE EDUCAÇÃO FÍSICA
RENEF

A PROPOSAL FOR A NORMATIVE TABLE FOR COUNTERMOVEMENT JUMP AND SQUAT JUMP OF YOUNG SOCCER PLAYER

UMA PROPOSTA DE TABELA NORMATIVA DO SALTO COM CONTRAMOVIMENTO E SALTO PARTINDO DA POSIÇÃO AGACHADO DE JOVENS JOGADORES DE FUTEBOL

UNA PROPUESTA DE TABLA NORMATIVA DEL SALTO CON CONTRAMOVIMIENTO Y DEL SALTO PARTIENDO DE LA POSICIÓN AGACHADA DE JÓVENES JUGADORES DE FÚTBOL

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ABSTRACT

This study aimed to present a normative table for the performance of countermovement jump height and squat jump height in U-15 soccer players. The second objective was to compare the performance of players grouped by best and worst performance in these tests. The study included 88 male players (14.1 ± 1.0 years old) who trained twice weekly for 120 minutes per session. The normative table was created using five performance rating scales based on the 5th, 25th, 50th, 75th, and 95th percentiles, ranging from 'Very Poor' (≤5) to 'Excellent' (>95). The average countermovement jump performance was 31.2 ± 5.1 centimeters, while the squat jump was 27.4 ± 4.3 centimeters. As expected, grouping players by top and lower performance allowed a clear differentiation between them in both the countermovement jump ($t(58) = 14.516$; $p < 0.001$; effect size = 0.89 [very large]) and the squat jump ($t(42) = 14.635$; $p < 0.001$; effect size = 0.91 [almost perfect]). The results may assist strength and conditioning coaches in decision-making, as the normative table and jump performance comparison can provide valuable information for evaluations, training, fatigue monitoring, and neuromuscular recovery and serve as a reference for U-15 players.
Keywords: Sport performance. team sport. physical performance. sports science.

RESUMO

O presente estudo teve como objetivo apresentar uma tabela normativa para o desempenho da altura do salto com contramovimento e do salto partindo da posição agachada para jogadores de futebol da categoria sub-15. O segundo objetivo foi comparar o desempenho dos jogadores agrupados em relação ao melhor e ao pior desempenho nesses testes. Participaram do estudo 88 jogadores do sexo masculino (idade: 14,1 ± 1,0 anos), com frequência de treinamento de duas vezes por semana, durante 120 minutos em cada sessão. A tabela normativa foi criada usando cinco escalas para classificação do desempenho conforme os percentis 5, 25, 50, 75 e 95, desde ‘Muito ruim’ (≤5) até ‘Excelente’ (>95). O desempenho médio dos jogadores no salto com contramovimento foi de 31,2 ± 5,1 centímetros, enquanto no salto partindo da posição agachada foi de 27,4 ± 4,3 centímetros. Como esperado, o agrupamento dos jogadores de melhor desempenho e daqueles de desempenho inferior permitiu uma clara diferenciação entre os eles, tanto no salto com contramovimento ($t(58) = 14,516$; $p < 0,001$; tamanho do efeito = 0,89 [muito grande]), quanto no salto partindo da posição agachada ($t(42) = 14,635$; $p < 0,001$; tamanho do efeito = 0,91 [quase perfeito]). Os resultados encontrados podem auxiliar treinadores de força e condicionamento físico em suas tomadas de decisão, tendo em vista que a tabela normativa e a comparação do desempenho dos saltos podem fornecer informações para avaliações, treinamento, monitoramento da fadiga e recuperação neuromuscular, além de servir como referência para os jogadores da categoria sub-15.
Palavras-chave: Desempenho esportivo. modalidade esportiva coletiva. desempenho físico. ciência do esporte.

RESUMEN

El objetivo de este estudio fue presentar una tabla normativa para el rendimiento de la altura del salto con contramovimiento y el salto en posición de cuclillas en jugadores de fútbol de la categoría sub-15. El segundo objetivo fue comparar el rendimiento de los jugadores agrupados en función del mejor y el peor rendimiento en estas pruebas. El estudio incluyó a 88 jugadores masculinos (edad: 14,1 ± 1,0 años) que entrenaron dos veces por semana durante 120 minutos por sesión. La tabla normativa se creó utilizando cinco escalas de clasificación de rendimiento según los percentiles 5, 25, 50, 75 y 95, desde ‘Muy malo’ (≤5) hasta ‘Excelente’ (>95). El rendimiento promedio de los jugadores en el salto con contramovimiento fue de 31,2 ± 5,1 centímetros, mientras que en el salto en posición de cuclillas fue de 27,4 ± 4,3 centímetros. Como era de esperar, el agrupamiento de los

jugadores con mejor y peor rendimiento permitió una clara diferenciación entre ellos, tanto en el salto con contramovimiento (t(58) = 14,516; p < 0,001; tamaño del efecto = 0,89 [muy grande]), como en el salto en posición de cuclillas (t(42) = 14,635; p < 0,001; tamaño del efecto = 0,91 [casi perfecto]). Los resultados encontrados pueden ayudar a los entrenadores de fuerza y acondicionamiento en la toma de decisiones, ya que la tabla normativa y la comparación del rendimiento de los saltos pueden proporcionar información útil para evaluaciones, entrenamiento, monitoreo de la fatiga y recuperación neuromuscular, además de servir como referencia para jugadores de la categoría sub-15.
Palabras clave: Rendimiento deportivo. deporte de equipo. rendimiento físico. ciencia del deporte.

INTRODUCTION

Soccer is one of the most widely practiced and appreciated sports globally, playing a crucial role in the physical and social development of young athletes. (Giulianotti; Robertson, 2004). In Brazil, soccer holds significant social, cultural, and economic importance, being one of the main sports practiced since childhood. (Rech-Wachelke, 2008; Cavichiolli *et al*., 2011). In this context, the development and performance evaluation of young players become fundamental for identifying talents and guiding specific training programs. (Unnithan *et al*., 2012).

The under-15 (U15) category represents a crucial phase in the development of young athletes, as it is during this period that many begin to specialize in the sport, participating in more structured competitions and receiving more intensive training. (Kozieł *et al*., 2024a; Malina *et al*., 2024a; Kozieł *et al*., 2024b; Monasterio *et al*., 2024; Malina *et al*., 2024b; Konarski *et al*., 2021; Malina *et al*., 2021). To evaluate players' performance in an objective and comparative manner, it is essential to have normative tables that reflect the expected performance standards for this age group (Selmi et al., 2018), serving as a reference for young Brazilian football players. Normative tables are tools that allow comparative evaluation of athletes in relation to their peers, assisting coaches and professionals in identifying strengths and areas needing improvement (Nughes et al., 2020). However, there is a lack of studies establishing these standards for U15 players, especially in the Brazilian context. Thus, the present study aims to fill this gap by presenting a normative table for U15 soccer players.

Furthermore, this article aims to compare the performance of players grouped by those within the best and worst performance in this category. We believe that the

results of this study will contribute to the field of sports training, providing a scientific basis for the evaluation and development of young soccer athletes.

METHODS

Experimental design

This study was developed with the aim of describing and classifying the vertical jump performance of young soccer players. Participants were already familiar with the procedures and performed the test in a single session during a training day, before putting on their boots to begin the session. After completing three attempts for each type of jump, the highest height achieved, measured in centimeters (cm), was considered. For the creation of the Normative Table, the highest jumps of each player were considered and classified based on the following percentiles: Excellent (percentile >95); Good (percentile >75-95); Regular (percentile >25-75); Poor (percentile >5-25); and Very poor (percentile ≤5). Grouping and comparison were also conducted between the 30 best and 30 worst performances in the countermovement jump, as well as between the 22 best and 22 worst performances in the squat jump.

Participants

The study included 88 male U15 soccer players (age: 14.1 ± 1.0 years). All players were familiar with the tests and were under a regular training routine (twice a week for 120 minutes). Before the tests began, all participants were informed about the potential risks and benefits of the procedures. The Informed Consent Form was read and signed by their guardians, and the Informed Assent Form was signed by the players. All players were free from any musculoskeletal injuries. The procedures described in this study were approved by the Human Research Ethics Committee of the State University of Montes Claros (CEP/UNIMONTES, n. 6.262.628/2023).

Procedures

Players performed the countermovement jump and the squat jump. The best performance among three attempts for each type of jump was considered, with a 20-second rest minimum interval between attempts. In the countermovement jump, the player stood with hands on hips. During execution, the player performed a squat (eccentric phase), followed immediately by the concentric phase. During the airborne phase, players were instructed not to flex their hips or knees. Upon landing, players

were allowed to cushion the fall (ground contact). In the squat jumps, starting on a ~90° knee joint angle, players did not perform the eccentric phase of the movement. All jumps were performed on a contact mat (Hidrofit, Jump Test, Belo Horizonte-MG, Brazil).

Statistical analysis

After confirming normality through the Levene's test (*p>0.05*), the results were presented as mean and standard deviation. A five-point classification scale was used in this study: Excellent (percentile >95); Good (percentile >75-95); Regular (percentile >25-75); Poor (percentile >5-25); and Very poor (percentile ≤5). To analyze the difference between players with best and worst performance, an independent *t*-Test was used. The effect size was calculated using the following equation: $r=\sqrt{(t2)/(-t2+df)}$ (Field, 2021) and classified using the scale proposed by Hopkins (Hopkins, 2006): 0.0 (trivial); 0.1 (small); 0.3 (moderate); 0.5 (large); 0.7 (very large); 0.9 (nearly perfect); 1.0 (perfect). A significance level of $p\leq 0.05$ was adopted. Data analysis was conducted using the Statistical Package for the Social Sciences (IBM, SPSS, version 25).

RESULTS AND DISCUSSION

The aim of the present study was to develop a normative table for the countermovement jump and the squat jump for U15 soccer players and compare the ten best performances with the ten worst. The normative table was created using five performance classification scales, ranging from 'Very poor (≤5)' to 'Excellent (>95)'. The average performance of players in the countermovement jump was 31.2 ± 5.1 centimeters, while in the squat jump it was 27.4 ± 4.3 centimeters. A significant difference in performance was identified when comparing the best and worst jumps. The performance in the heights of the countermovement and squat jumps is presented in Table 1.

Table 1 – Normative table for young soccer players for the countermovement jump and the squat jump.

Ranking (Percentile)	Countermovement jump (cm) (n=88)	Squat jump (cm) (n=65)
Very poor (≤5)	≤ 22	≤19
Poor (>5 - 25)	>22 – 28	>19 – 24
Regular (>25 – 75)	>28 – 35	>24 – 30
Good (>75- 95)	>35 – 40	>30 – 34
Excelent (>95)	>40	>34

Source: Own Authorship

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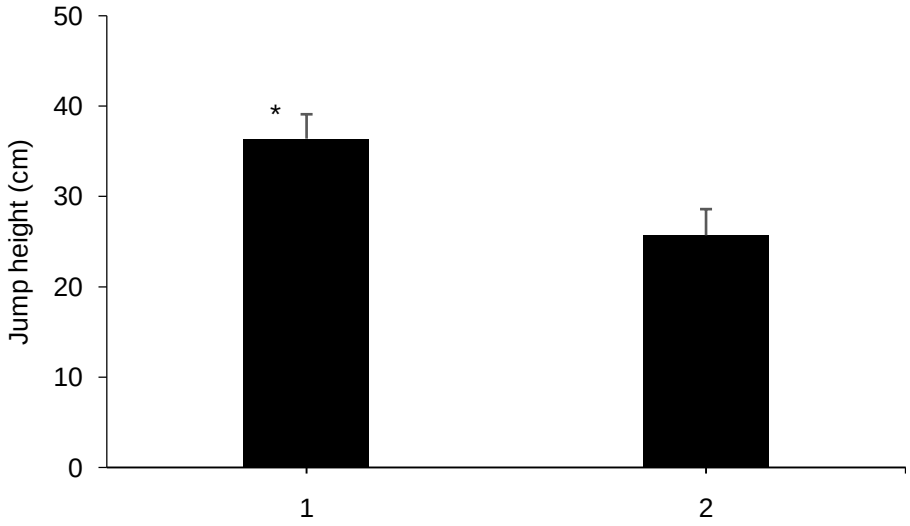
The main contribution of this study was to provide performance information in the context of young Brazilian soccer players, based on vertical jump performance using the contact mat. For better evaluation of physical performance, it is essential to present specific information according to age, sex, and practiced modality (Petridis et al., 2019). A previous study presented normative data and physical determinants in young soccer players (age: 14.0 ± 0.6 years) (Selmi et al., 2018). In the study (Selmi et al., 2018), players showed average values of 28.2 ± 5.2 cm in the countermovement jump and average values of 27.0 ± 5.3 cm in the squat jump, a performance similar to that found in the present study. In the present study, players showed average jump heights, which are in line with those reported in the literature for the studied age group, both in the squat jump (24 – 44 cm) and in the countermovement jump (27 – 47 cm) (Smpokos et al., 2022). This information can be used by sports professionals, especially in soccer, for the identification, selection, and promotion of sports talents.

The development of a normative table assists sports professionals in decision-making, allowing comparative evaluations, performance classification according to the reference group, and monitoring player progression (Sale, 1991; Ackland; Elliott; Bloomfield, 2011). Previous studies have presented reference values (Hammami et al., 2020; Romero-Caballero; Varela-Olalla; Loëns-Gutiérrez, 2021) or created normative tables for vertical jumps involving soccer players of both sexes from different regions of the world (Petridis et al., 2019; Smpokos et al., 2022; Vescovi et al., 2011). Most of these studies used a force platform as an instrument to identify performance (Petridis et al., 2019; Smpokos et al., 2022). However, the contact mat was used for this purpose in only one study (Vescovi et al., 2011). The contact mat is more accessible compared to the force platform and, therefore, more frequently found in clubs and training centers. This equipment meets the criteria of scientific authenticity, being a valid instrument for measuring, testing, and monitoring the performance of soccer players.

To evaluate the discriminatory capacity of our normative table between high-performing and low-performing players, the players were grouped according to performance, as presented in Figures 1 and 2. As expected, the high performance group was superior both in the countermovement jump ($t(58) = 14.516$; $p < 0.001$;

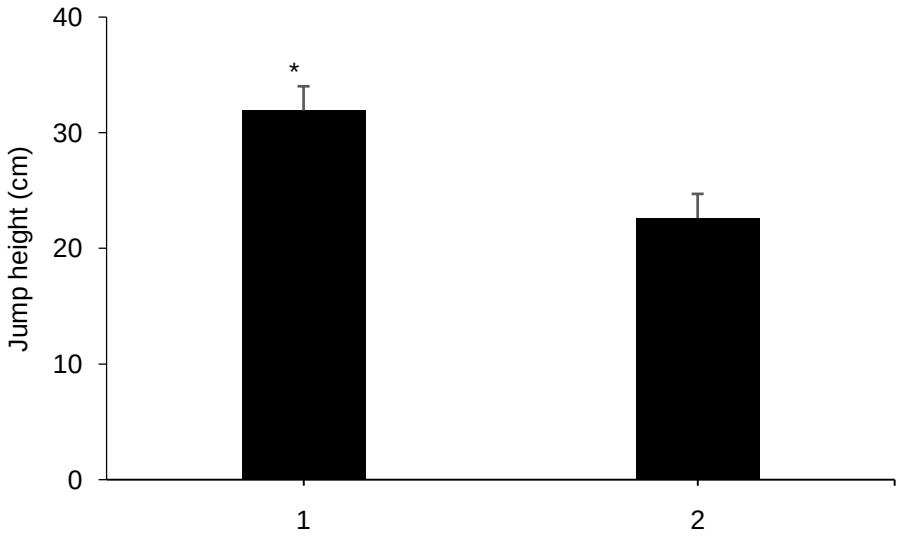
effect size = 0.89 [very large]) and in the squat jump (t(42) = 14.635; p < 0.001; effect size = 0.91 [nearly perfect]).

Figure 1 – Comparison of the first 30 jumps with the last 30 jumps for the countermovement jump.



*= represents a difference compared to the group with the worst performance
Source: Own Authorship

Figure 2 – Comparison of the first 22 jumps with the last 22 jumps for the squat jump.



*= represents a difference compared to the group with the worst performance
Source: Own Authorship

Performance comparison between different groups (starters and substitutes, professionals and amateurs, among others) is often used to understand physical differences, anthropometric profiles, technical-tactical skills, among other variables (Nughes et al., 2020; Malina et al., 2007; Rebelo et al., 2013). In a study comparing

starters and substitutes, it was identified that starters showed better performance in physical variables compared to substitutes (Gravina et al., 2008). The same study found that the jump performance of substitutes decreased from the beginning to the end of the season, unlike the starters, who maintained their performance. Comparisons between groups, such as those conducted in the present study and previous studies, can help coaches identify responses to physical training and the competitive season, as well as assist in the selection, promotion, and assembly of the team.

Finally, vertical jumps are widely used in training routines to improve the performance of soccer players, particularly in increasing speed in straight-line running, changing direction, and jumps, which are high-intensity actions that frequently precede a goal (Loturco et al., 2015; Loturco et al., 2016; Loturco et al., 2019; Loturco et al., 2022; Weldon et al., 2021). Furthermore, vertical jumps are a useful tool for monitoring players' fatigue and neuromuscular recovery (Claudino et al., 2017) and can serve as a parameter, along with other variables, in identifying talented players (Larkin et al., 2023).

CONCLUSIONS

The results found in the present study can assist strength and conditioning coaches of the U15 category in their daily decision-making. The normative table and the comparison of jump performance can provide valuable information for assessments, training, monitoring players' fatigue and neuromuscular recovery, as well as a reference for athletes´ and their parents in this category.

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