ANALYSIS OF PHYSICAL CHARACTERISTICS, ANTHROPOMETRIC FACTORS, NUTRITIONAL HABITS AND PSYCHOSOCIAL CHARACTERISTICS IN FEMALE YOUTH SOCCER PLAYERS

ANÁLISIS DE LAS CARACTERÍSTICAS FÍSICAS, LOS FACTORES ANTROPOMÉTRICOS, LOS HÁBITOS NUTRICIONALES Y LAS CARACTERÍSTICAS PSICOSOCIALES EN JUGADORAS JUVENILES DE FÚTBOL

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Physical, Anthropometric, Nutritional and Psychosocial Characteristics in U-16 Female Youth Soccer Players

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Abstract

The objective was to determine the relationships between physical, anthropometric, nutritional and psychosocial characteristics of Colombian female youth players. The final sample consisted of 78 players evaluated in a cross-sectional study. Statistical treatment was performed using the principal component analysis, multiple factor analysis, and RV coefficient methods. The results reveal that the players of a group of localities (socioeconomic stratum 3 - Moderate) are characterized by having high values in variables such as net force at 100 m/s, 150 m/s, and 200 m/s both left and right, as well as vertical peak strength variables, there are also some players of the subsidized regime and are characterized by living in small families. Meanwhile, the players of another group of locations (socioeconomic stratum 2 - Low) were characterized by achieving high levels in variables such as Peak Power (W/kg), jump height (cm), modified RSI, eccentric deceleration (N/s/kg), maximum peak speed (m/s), concentric average force (m/s), eccentric average force (m/s) and are characterized by living in more prominent families. It can be determined that the context of the players significantly influences the profile of manifestation of muscle strength and that eating habits are related to maximum oxygen consumption.

Keywords: Sports performance, evaluation, interdisciplinarity, social context, youth sport.

Resumen

El objetivo fue determinar las relaciones entre las características físicas, antropométricas, nutricionales y psicosociales de jugadoras juveniles colombianas. La muestra final estuvo constituida por 78 jugadoras evaluadas en un estudio transversal. El tratamiento estadístico se realizó mediante los métodos de análisis de componentes principales, análisis factorial múltiple y coeficiente RV. Los resultados revelan que los jugadores de un grupo de localidades (estrato socioeconómico 3 - Moderado) se caracterizan por tener valores altos en variables como fuerza neta a 100 m/s, 150 m/s, y 200 m/s tanto izquierda como derecha, así como variables de fuerza pico vertical, también hay algunos jugadores del régimen subsidiado y se caracterizan por vivir en familias pequeñas. Mientras tanto, los jugadores de otro grupo de localidades (estrato socioeconómico 2 - Bajo) se caracterizaron por alcanzar altos niveles en variables como Potencia pico (W/kg), altura de salto (cm), RSI modificado, desaceleración excéntrica (N/s/kg), velocidad pico máxima (m/s), fuerza media concéntrica (m/s), fuerza media excéntrica (m/s) y se caracterizan por vivir en familias más prominentes. Se puede determinar que el contexto de los jugadores influye significativamente en el perfil de manifestación de la fuerza muscular y que los hábitos alimentarios están relacionados con el consumo máximo de oxígeno.

Palabras clave: Rendimiento deportivo, evaluación, interdisciplinariedad, contexto social, deporte juvenil.

Introduction

The evolution of sports is closely related to scientific, technological (Frevel et al., 2022; Kos et al., 2018), and research advancements (Becerra Patiño & Escorcia-Clavijo, 2023; Martínez Benítez et al., 2024), aiming to determine and understand the changes in sports development and the manifestation of sports performance (Dyer, 2015).

Thus, a narrative review on the implications for movement, skill acquisition, sports performance, and injuries in young athletes concluded that the athlete's body undergoes natural stress due to growth, making it susceptible to adaptations that coaches must recognize to adjust training loads in response to the athlete's condition (Corso, 2018). However, scientific evidence reveals the need to integrate training programs with multidisciplinary approaches that include nutritional and morphofunctional factors (França et al., 2024), as well as other interdisciplinary approaches aimed at generating a greater understanding of the athlete in response to physical, anthropometric, psychosocial, nutritional variables (Becerra Patiño et al., 2023; Becerra-Patiño et al., 2026).

This is how Sports Sciences tirelessly seek constant work that allows them to intertwine new methodologies and training systems aimed at the integral improvement of players (Pons Alcalá et al., 2020). In short, it is then that scientific knowledge provides methodological guidelines that help favor training processes (Bartlett & Drust, 2021; Kilic & Ince, 2015; Ospina León et al., 2022; Parpa et al., 2024; Sannicandro et al., 2024). In this same line, from 2000 to date, there has been an exponential increase in publications focused on social and educational results related to youth sports and soccer being the most researched activity (Montenegro Bonilla et al., 2024; Schulenkorf et al., 2016). Football's social impact makes it the most viewed and practiced compared to other sports (Bonetti et al., 2017); however, the interest in researching women's soccer has not been relevant compared to men's football (Pappalardo et al., 2021). That is why, in recent times, science has shown a growing tendency for the understanding of players (Reyes-Laredo et al., 2024).

This opens the possibility of interdisciplinarity, thus allowing to glimpse processes in the totality of the player (Pinder et al., 2011; Tarragó et al., 2019) to expand the approaches in the relations of sports talent (Fernández Ortega et al., 2021; Serra-Olivares et al., 2019), the training capacity and of course, of the integral performance of the athlete, as an invariable and indeterminable process in time (Hristovski et al., 2011) that needs to be studied from the non-linear relationships that are established in her environment. The interest of scientific research in women's soccer is closely related to methodological proposals (Emmonds et al., 2019), characterizations of physical capacities such as strength and speed (De Oliveira et al., 2023), determination of anthropometric profiles (Pedrero-Tomé et al., 2022), athletic performance evaluation (Alanen et al., 2023; Fernández Ortega et al., 2020) and injury prevention programs (Crossley et al., 2020).

According to this, game actions depend on the interaction with the changing environment, so sports contemplate conditional demands and psychological, emotional, and socio-affective ones, as mentioned by Seirul·lo (2017) led the Sports Sciences community to adopt new strategies by consolidating the complex and interindividual processes that football conducts (Saunders et al., 2019). Women's soccer research in Colombia has been diverse, dealing with understanding the athlete from the incidence and characterization of physical demands (Becerra Patiño et al., 2022), neuromuscular processes (Roso-Moliner et al., 2023) and physiological demands (Trombiero et al., 2023) and nutritional demands (Oliveira et al., 2017) and also, in the complexity of soccer in its multiple dimensions, along with psychophysiological manifestations such as emotional intelligence (Berastegui-Martínez et al., 2024; Campo et al., 2019; Castro-Sánchez et al., 2018).

That is why Sports Sciences must continue researching in the Colombian and international context to understand the different variables that influence the sports performance of young female soccer players. Therefore, the objective of this study was to determine the relationships between the physical, anthropometric, nutritional, and psychosocial characteristics of the players pre-selected in the sports process of the Bogotá women's soccer team under-16 category.

Material and Methods

Study Design

This cross-sectional study (O'Donoghue, 2010) is based on the characterization of the physical, anthropometric, nutritional, social, personal, family, and educational variables that converge within the sports performance process of the female soccer player. This study is based on a diagnostic evaluation at the beginning of the 2022 sports season. Each player signed the consent and the parents the informed consent of voluntary participation, in which the study's objective, scope, and procedure were explained in detail.

Procedure

Different protocols were defined for evaluating body composition, physical capacities, and nutritional and psychosocial characteristics. The evaluation was divided into three moments for each category: i) evaluation of body composition, ii) evaluation of physical capacities, and iii) evaluation of nutritional and psychosocial characteristics.At the first moment, she had four days of evaluation for body composition. The basic anthropometric measurements were taken: body mass (kg) and height (cm), then the somatotype was evaluated. To do this, two certified researchers established the analysis of body composition following the ISAK kinanthropometry evaluation protocol (Silva & Vieira, 2020) by measuring the folds (triceps, biceps, subscapular, pectoral, axillary media, iliac supra iliac, abdominal and thigh medial leg), perimeters (wrist, forearm, relaxed arm, contracted arm, chest, waist, hip, upper thigh, middle thigh and leg) and diameters (wrist, elbow and knee). In the second moment, she had three days to evaluate her physical abilities. On the first day, the strength was evaluated; on the second day, the intermittent resistance capacity was evaluated for an extended period with intermittent work-pause efforts with the Yo-Yo of intermittent resistance level I (YYIR1); and on the third day, the speed was evaluated and, subsequently the repetition test of actions at high intensity and the percentage of fatigue with the Repeated Sprint Ability (RSA) (Bangsbo, 1994). At the third moment, she had two days of application, one for 40 players and the other for 41 players. The questionnaire was applied with the accompaniment of the research group members. Cell phones were made at his way for the diligence. The answers were collected through Google Forms. Finally, all data was collected under standard environmental conditions concerning the weather (4:00 to 6:00 pm) and temperature (between 15° and 22°) from April to August 2022. Each player was summoned 15 minutes before the start of the training to develop the 8-minute warm-up protocol consisting of stand and joint movements and lateral and frontal displacements.

Instruments

The weight determination was used by an Omron scale (Kyoto, Japan), which has an accuracy of 0.1kg. The height was measured with an accuracy of 0.01 cm using a stadiometer (SECA 213, Hamburg, Germany), while the body composition was evaluated by anthropometry. The skin folds were taken with a Slim Guide picometer; the perimeters were measured with a CESCORF measuring tape, and finally, a CESCORF pachymeter was used to measure the diameters (Esparza-Ros et al., 2019). Strength was assessed using PASCO Passport Force Platform PS-2141 (California, USA) uniaxial platforms, which have a frequency of 1000 Hz. The information provided by the force platform was processed using the ForceDecks software, where the most determining variables for the study were peak power (W/kg), jump height (cm), reactive force index (m/s), eccentric deceleration (N/s/kg), maximum peak speed (m/s), concentric average force, eccentric average force and hamstring force at 100 m/s, 150 m/s and 200 m/s. The intermittent resistance capacity for an extended period with intermittent work-pause forces was evaluated using the YYIR1 test (Bangsbo et al., 2008) to determine the maximum oxygen consumption and the distance traveled. Speed was evaluated by linear sprints made at 10, 20, and 30 m, starting from a stationary position from a stopwatch (Stopwatch W073, SEIKO, Tokyo, Japan) with a time resolution of 0.01 s, while the Bangsbo Sprint test was used to evaluate the ability to repeat high-intensity actions RSA, the percentage of fatigue (Bangsbo, 1994). The questionnaire was evaluated by the criteria of five experts in training pedagogy and women's soccer, seeking to determine the validity of the questionnaire's content, reaching an agreement rate of 91%. It was created through Google Forms. After validation by experts, the structured questionnaire was used to evaluate the variables of interest related to nutritional and psychosocial characteristics (social, personal, family, and educational).

Sample

Sampling included study groups, and randomization was obtained by the harmful coordinated method. The sample size was determined by power analysis to determine the correlation of variables. Taking a type I error of 5%, a nominal power of 80%, and a significant detection by the hypothesis system for correlations around .4, the sample size was determined with a lower limit of 68 participants. The final sample size is 78 players.

Participants

The characteristics of the sample evaluated are shared below in Table 1. The training frequency of the players oscillated between four and five sessions per week, plus a game during the weekend at the national level. The players were informed of the scope, possible risks, and requirements, deciding to voluntarily participate in the process from the signing of the informed consents and consents. Each procedure was carried out according to the principles established by the Helsinki Declaration (World Medical Association, 2014) on Human Research and Resolution 8430 of the Ministry of Health of Colombia (1993). The study received approval from the National Pedagogical University's ethics committee (340ETIC-2024). The inclusion criteria were: 1) not having previous injuries in the last eight months of lower and upper limbs; 2) not developing the questionnaire or one of the physical or anthropometric assessment tests; 3) training at least three times a week; 4) having a minimum of 2 years of competitive experience.

Table 1

Basic Data of the Sample Evaluated

Variable	Players (n = 81)
Age (years)	15.58 ± 0.85
Weight (kg)	54.55 ± 6.82
Height (cm)	159.4 ± 5.36
BMI (kg/m²)	21.5 ± 0.68

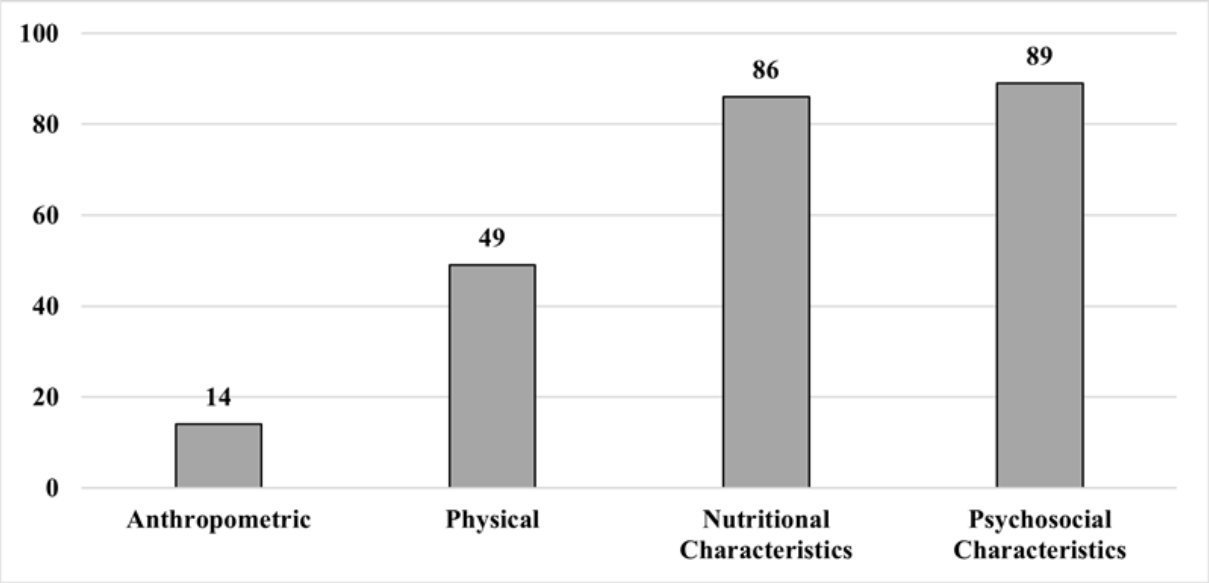
Note. yrs: years; kg: kilograms; cm: centimeters; BMI: Body mass Index.

Evaluated Variables

Taking into account the associations of interest and that the characterization focuses on the groups of variables related to sports performance, the groups were arranged as follows: i) Active variables: position, RSA, lower train strength, aerobic power, and speed; ii) Supplementary variables: social factors, family nucleus, economic situation, characteristics of breakfast - Lunch - Dinner, eating habits, adipometry, classifications, and educational situation. A consistency and coherence analysis were performed for the data presented. A total of 238 variables were consolidated. A total of 21 groups of variables were defined and, finally, they were grouped into four major categories (Figure 1).

Figure 1

Categories, Variables and Number of Variables Analyzed



Data Analysis

The multivariate technique was used. The correlation coefficient was used to determine the importance of each group of variables and the relationships within each one. The evaluation of synthetic group distances using multiple factor analysis (MFA) and evaluation of the RV statistic for the characterization with the position variable (of related groups). According to the results, relationship measures were applied with categorical variables (Phi Coefficient or Correlation Ratios) and description of the partial representations (Intra Variance). Statistical software ® version 4.1.0 was used for statistical processing (RStudio, INC, Boston, 2016).

The statistical procedure had a series of stages that are discussed below:

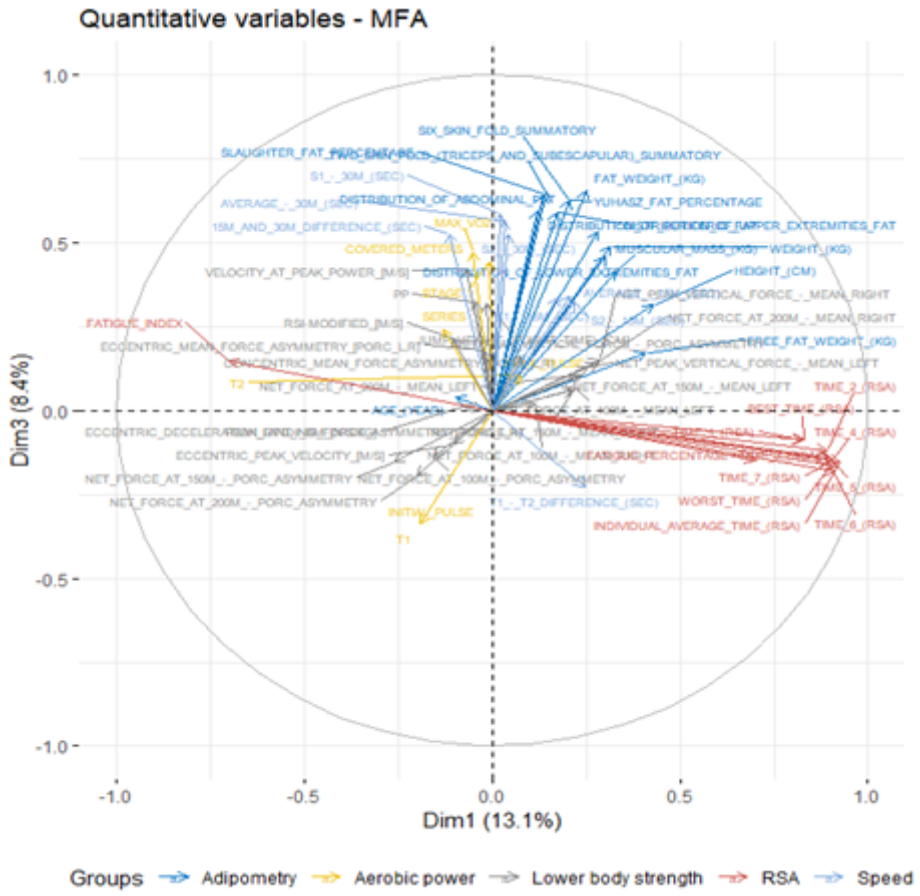
- A consistency and consistency analysis were performed for the data presented, then the variables were redefined, and the categories were standardized.
- Variables were redefined, and categories were standardized.
- A total of 238 variables were consolidated.
- To use multiple factor analysis, groups were defined according to the nature of the phenomena evaluated and the variables.
- A total of 21 groups of variables were defined, which were subsequently clustered into 4 major categories.
- Scenarios of group variables were defined according to the researcher's objectives.

Results

For the analysis by groups in the partial representation, the strong vertices are the players' positions (active variable). The representations of each of the groups were evaluated. According to the group of variables and the positions, it is observed that the position with the most minor agreement between the profiles generated by the groups of variables is the goalkeeper position. Being in this position, what stands out most are the low levels in the characteristics of RSA, while, in the rest of the positions, the profile given by the groups of variables is more concordant with each other. However, the central steering wheel position is the one who stands out the most in RSA. Meanwhile, figure 2 from the analysis of the quantitative variables reveals the interactions that occur in each of the planes of the axis. It is highlighted that dimensions one and three are the ones that provide the most information (21.5%) on the total inertia.

Figure 2

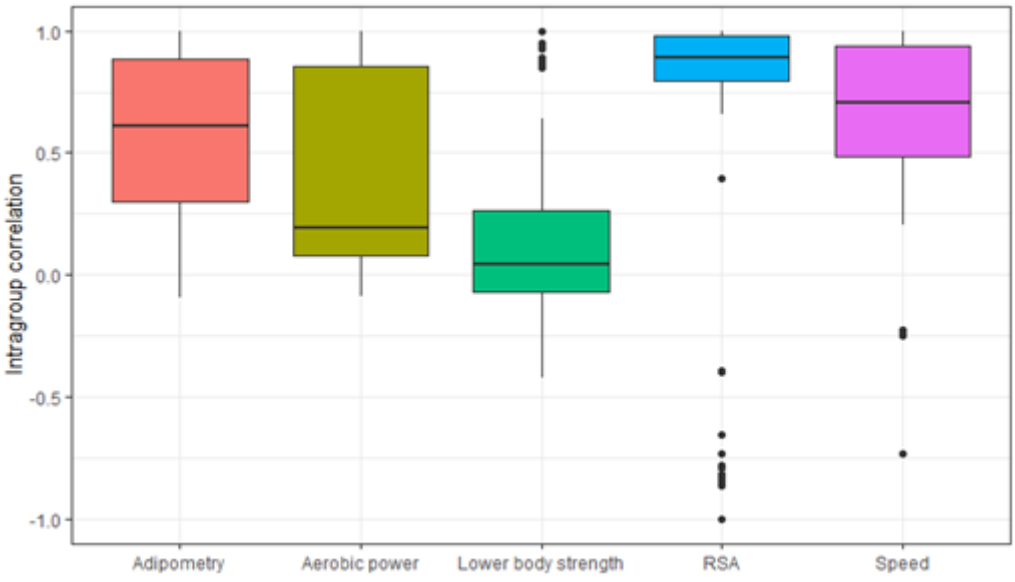
Group Analysis in Response to the Game Position



Finally, the analysis of Figure 3 boxes and whiskers reveals differences in the variables evaluated, such as the strength of the lower train, RSA, and speed, which demonstrate more significant variability.

Figure 3

Chart of Boxes and Whiskers for the Relationship of the Main Conditional Variables



On the other hand, the RV coefficient makes it possible to determine whether the profile induced by one variable correlates with another. Thus, the most vital relationships established were given between adipometry classifications, characteristics of lunch, educational situation, characteristics of breakfast-eating habits, characteristics of lunch-eating habits, and social relations-social factors. Table number 2 reflects how the most significant correlations between nutritional and psychosocial variables are established.

Table 2

Induced Correlations Between Groups of Variables from the RV Coefficient

Group 1	Group 2	RV
Adipometry	Classifications	0.459
Lunch Characteristics	Educational Situation	0.427
Breakfast Characteristics	Eating Habits	0.419
Lunch Characteristics	Eating Habits	0.407
Social Relationships	Social Factors	0.376
Lunch Characteristics	Breakfast Characteristics	0.372
Lunch Characteristics	Dinner Characteristics	0.363
Dinner Characteristics	Breakfast Characteristics	0.340
Dinner Characteristics	Afternoon Snack Characteristics	0.332
Breakfast Characteristics	Nutritional Habits	0.330
Lunch Characteristics	Afternoon Snack Characteristics	0.327
Breakfast Characteristics	Afternoon Snack Characteristics	0.311
Dinner Characteristics	Social Relationships	0.308
Eating Habits	Nutritional Habits	0.305
Economic Situation	Social Factors	0.301
Lunch Characteristics	Morning Snack Characteristics	0.300
Social Relationships	Economic Situation	0.298
Lunch Characteristics	Nutritional Habits	0.282
Lunch Characteristics	Economic Situation	0.279
Nutritional Habits	Social Factors	0.273
Breakfast Characteristics	Morning Snack Characteristics	0.272
Morning Snack Characteristics	Nutritional Habits	0.271
Morning Snack Characteristics	Afternoon Snack Characteristics	0.268
Dinner Characteristics	Morning Snack Characteristics	0.257
Training Characteristics	Social Relationships	0.252
Afternoon Snack Characteristics	Nutritional Habits	0.250
Afternoon Snack Characteristics	Educational Situation	0.250
Family Core	Social Relationships	0.245
Dinner Characteristics	Nutritional Habits	0.242
Morning Snack Characteristics	Educational Situation	0.241
Training Characteristics	Afternoon Snack Characteristics	0.231
Economic Situation	Educational Situation	0.206
Family Core	Economic Situation	0.205
Nutritional Habits	Educational Situation	0.195

Discussion

The objective of this study was to determine the relationships between the physical, nutritional and psychosocial characteristics of the pre-selected players in the sports process of the Bogota U-16 women's national soccer team. In this sense, the main findings were the following: (i) players who are characterized by having high values in variables such as net hamstring strength at 100 m/s, 150 m/s and 200 m/s both left and right, as well as variables of net peak vertical strength, there are also some players of subsidized regime and are characterized by living in small families, while, another group of players were characterized by reaching high levels in variables such as peak power (W/kg), jump height (cm), reactive force index (m/s), eccentric deceleration (N/s/kg), peak maximum velocity (m/s), concentric mean force and eccentric mean force and, finally, they are characterized by living in more prominent families. Likewise, players who eat breakfast very early in the

day are associated with better levels of Vo2 max and distance covered in YYIR1. They also consume little or no food such as cereals, bread, eggs, cheese and fried potatoes.

As for the food consumed in the morning snack, the players with more levels in the variables of maximum Vo2 and distance traveled are associated with consuming few or no portions of food such as sausages, cheese, cereals, and arepa. However, they consume more portions of fruit and natural juice. In front of the afternoon snack, the players with a higher level in the variables above usually take this food at the end of the night. They are associated with low consumption of foods such as ham, sausage, cereal, bread, energy bars, hot drinks, and packages. However, they consume more portions of fruit the players who recorded longer times in the speed tests were characterized by having low or no consumption of foods such as dairy, eggs, meat or chicken, cereals, fried foods, sugars, and sweets. However, they are also associated with frequent consumption of soft drinks and packages, as well as the use of supplements. On the other hand, these players, with longer times in speed tests, are associated with food allergies and intolerances, mainly sausages and milk. These results suggest the importance of nutritional habits and the impact that nutrition has on the processes of recovery and development of sports performance (American Dietetic Association, 2009; Martín-Rodríguez et al., 2024). In the same way, there is a need to make athletes aware of the need to generate links between nutrition, diet and the sports preparation process (Kaufman et al., 2023; Stavitz & Koc, 2024).

Based on the above, it is confirmed that no previous studies have yet been found in women's soccer that have examined the relationship between physical, anthropometric, nutritional, and psychosocial variables in Colombian players. However, there are some similarities based on multivariate analysis for the study of field hockey performance (Arboix-Alió et al., 2022), approaches that show the importance of interdisciplinarity in sport. For all described above, the training process must broaden its horizons and begin to rethink how the social context (Pain & Harwood, 2008; Travassos et al., 2014) and nutritional (Gibson et al., 2011) play a decisive role in sports performance.

These performance improvements are associated with the preparation process and the complexity of the athlete's adaptive systems (García Manso et al., 2010; Seifert et al., 2017). Therefore, it is necessary to mention that studies aim to relate interdisciplinarity in soccer (Arjun, 2007), expanding the research horizons and the scope of the findings for improving sport and the athlete. Thus, a study sought to establish opportunities for interdisciplinarity in managing musculoskeletal injuries in soccer by incorporating psychology and nutrition (Rollo et al., 2021). Therefore, the players' behaviors are related to the behavior and actions of the coaches to generate favorable environments for the athlete's development (Carson et al., 2022). Likewise, communication must be mediated between the coach-player relationship since it can lead to overestimating effort and errors in the periodization of physical condition (Doeven et al., 2017; Scantlebury et al., 2018).

Soccer is a practice that experiences constant physical and technical changes, leading to an increase in the intensity of play (Lago-Peñas et al., 2023). The level of competence conditions the physical effort, affecting dietary consumption (Chryssanthopoulos et al., 2024). Consequently, nutrition allows to mitigate fatigue rates, increase recovery, and prolong the quality of life (Petri et al., 2024), so non-visible habits are fundamental to the integrity of the athlete (Mujika et al., 2018).

The present study reinforces that the nutritional aspects depend on other athlete processes. The association of the related variables of this study shows the following correlations: aerobic power-breakfast characteristics, aerobic power-snack characteristics, speed-food intolerance, speed-eating habits and aerobic power-characteristics of the snack, these findings are related to the conclusions of the systematic review on the effects of nutritional interventions on the sports performance of soccer players, where supplementation, the ingestion of bicarbonate and minerals, as well as a diet high in carbohydrates influences various variables of soccer performance, among them the intermittent resistance capacity stands out For a long period with intermittent efforts of work-pause, speed, agility, strength, power, explosiveness and anaerobic capacity (Aguinaga-Ontoso et al., 2023).

Because of this, the need arises to investigate the correlation between the interrelated systems to achieve the athletes' performance. Thus, dietary intake becomes relevant, which responds to the optimization of the result and, in the same way, establishes the differences that respond to physiological demands in sport (Dobrowolski et al., 2020) and the specificity of the game position (Jenner et al., 2019). In that sense, nutrition becomes a personal, environmental, and genetic factor (Saunders et al., 2019) determining the sports potential of players (Rollo & Williams, 2023). According to this, the critical aspects of the consumption of meals are found in the selection, the set, and the process with which the foods that make up the athletes' plates are treated (Reguant-Closa et al., 2020). Some research, as mentioned by Danielik et al. (2022), has found that players

in performance soccer do not comply with the dietary recommendations suggested by professionals, especially regarding vitamins and minerals. This is related to the results of the present study, which found that the consumption of vitamins was deficient. It has been shown that other non-visible factors, such as sociodemographic factors, affect the process of training in sports, among which capacities such as strength, power, speed, and changes of direction stand out (Becerra-Patiño et al., 2023). Along the same line, the study developed by Kelly et al. (2024) concluded that children with more significant sports potential come from families with lower social classifications compared to those with lower potential, a case similar to the results of this study where it refers that player with lower social condition (stratum 2 - Low) have higher performances in most of the physical tests performed.

Adding to the above, the psychological and social factors in team sports are of utmost importance, codependent on mental health (Zuckerman et al., 2021), quality of life promoted in interaction spaces (Filbay et al., 2019), and success in the sports performance of players (Pedersen, 2000). Here, the relationships of this study show that the psychosocial conditions of the players, including the educational situation, economic situation, social relations, and family nucleus, impact the nutritional habits and the characteristics of the food consumed by the players. With this, it is determined that there is a need to develop multivariate studies that increasingly consider diverse characteristics that influence the long-term sports performance process. This corresponds to the study of Kelly et al. (2024), which reports that interdisciplinary research is helpful for researchers and professionals in considering the role of social factors and psychological characteristics when selecting and developing sports potential. Likewise, interdisciplinary studies can enable an understanding of sports performance closer to the athlete's reality (Piggott et al., 2019 y 2020).

Conclusions

There is a myriad of variables that influence the sporting performance of players, and two profiles are determined according to the sociodemographic context: a manifestation of strength centered on the hamstring strength of both legs and a high net peak vertical strength and players who manifest a better peak power capacity, jump height, reactive strength index, eccentric deceleration, peak maximum speed and concentric-eccentric average strength.

Likewise, it is determined that the players' physical performance varies according to their sociodemographic stratum, demonstrating that, in the group of players evaluated, those who come from lower social classifications perform better in skills such as strength, speed, power, explosiveness, and anaerobic capacity. The quality of food and the nutritional habits of the players are sensitive to the development and manifestation of high aerobic power in the group of players evaluated in this study. Snacks in the morning and afternoon seem to be essential meals for the players, mainly to maintain an energy balance against the expense derived from their sports preparation process.

The training process must expand its horizons and begin to rethink how context, social, and nutritional variables determine sports performance and how these performance improvements are interrelated.

Future Perspectives and Practical Applications

The study of the variables that affect players' performance needs much more research. Interdisciplinary approaches are suggested, and multivariate methods that consider the contributions of Sports Science professionals, researchers, and coaches are invited to consolidate lines of research to favor a deeper approach to sports preparation and performance.

Ethics Committee Statement

Each procedure was carried out according to the principles established by the Helsinki Declaration (World Medical Association, 2014) on Human Research and Resolution 8430 of the Ministry of Health of Colombia (1993) The study received approval from the National Pedagogical University's ethics committee (340ETIC-2024) in September 2024.

Conflict of Interest

The authors do not declare any conflict of interest.

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Author Contributions

Conceptualization B.A.B.-P. & J.D.P.-U.; Methodology B.A.B.-P. & J.D.P.-U; Software B.A.B.-P. & J.D.P.-U.; Validation B.A.B.-P. & D.A.R.-P.; Formal Analysis B.A.B.-P. & D.A.R.-P.; Investigation B.A.B.-P. & J.D.P.-U.; Resources B.A.B.-P. & J.D.P.-U.; Data Curation B.A.B.-P. & D.A.R.-P.; Writing – Original Draft B.A.B.-P. & D.A.R.-P.; Writing – Review & Editing B.A.B.-P., D.A.R.-P. & J.D.P.-U.; Visualization B.A.B.-P.; D.A.R.-P. & J.D.P.-U.; Supervision B.A.B.-P.; Project Administration B.A.B.-P.; Funding Acquisition B.A.B.-P. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

Data available upon request from the corresponding author: babecerrap@pedagogica.edu.co

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