



BODY COMPOSITION AND PHYSICAL FITNESS IN FUTSAL PLAYERS AT THE POPULAR UNIVERSITY OF CESAR (UPC).

Andy Alberto Salgado Montes

aasalgado@unicesar.edu.co

<https://orcid.org/0009-0009-2478-7315>

Universidad Popular del Cesar

Jose Mauricio Rivero Olmos

jmauriciorivero@unicesar.edu.co

<https://orcid.org/0000-0001-9039-8005>

Universidad Popular del Cesar

ABSTRACT

In the field of Physical Education and Sports Science, kinanthropometry is a fundamental discipline for quantifying the morphological and functional characteristics of futsal players. The objective was to analyze the anthropometric profile and physical condition of the male futsal team made up of students who are part of the Popular University of Cesar team. The research, which involved fourteen athletes participating in ASCUN-Deporte, evaluated variables such as age, weight, height, BMI, somatotype, and body components (adipose, muscle, bone, residual, and skin mass), complemented by physical capacity tests that included endurance, strength, and VO2 max. The data, processed in SPSS v.26 under a normality analysis and Pearson correlations ($p < 0.05$), revealed an average age of 23.67 ± 3.5 years, weight of 71.7 ± 10.9 kg, and height of 173.6 ± 6.4 cm. Body composition showed a fat mass of 28.4 ± 6.4 grams and a BMI of 24.0 ± 3.8 , which is within normal parameters according to the WHO (2023). However, the calculated somatotype (endomorph: 3.3 ± 1.8 ; mesomorph: 4.5 ± 1.5 ; ectomorph: 2.6 ± 1.4) reflected a meso-endomorphic tendency, considered suboptimal for the demands of this discipline. The findings underscore the relevance of systematic body assessment using anthropometric techniques, integrating the sciences applied to sport, while recognizing the inherent limitations of these indicators for a comprehensive interpretation of performance.

Keywords: *Body composition; physical fitness; futsal, sports training.*

COMPOSICIÓN CORPORAL Y CONDICIÓN FÍSICA EN JUGADORES DE FUTSAL DE LA UNIVERSIDAD POPULAR DEL CESAR (UPC).

RESUMEN

En el ámbito de la Educación Física y las Ciencias del Deporte, la cineantropometría se erige como una disciplina fundamental para cuantificar las características morfológicas y funcionales de los jugadores de fútbol sala. Tuvo como objetivo analizar el perfil antropométrico y la condición física de la plantilla masculina de fútbol sala de los estudiantes de hacen parte de la selección de la Universidad Popular del Cesar, la investigación, que involucró a catorce deportistas que participan en ASCUN-Deporte, evaluó variables como edad, peso, estatura, IMC, somatotipo y componentes corporales (masa adiposa, muscular, ósea, residual y cutánea), complementadas con pruebas de capacidad física que incluyeron resistencia, fuerza y VO2 máx. Los datos, procesados en SPSS v.26 bajo un análisis de normalidad y correlaciones de Pearson ($p < 0.05$), revelaron un promedio de edad de 23.67 ± 3.5 años, peso de 71.7 ± 10.9 kg y estatura de 173.6 ± 6.4 cm. La composición corporal mostró una masa grasa de 28.4 ± 6.4 gramos y un IMC de 24.0 ± 3.8 , situado dentro de parámetros normales según la OMS (2023). No obstante, el somatotipo calculado (endomorfo: 3.3 ± 1.8 ; mesomorfo: 4.5 ± 1.5 ; ectomorfo: 2.6 ± 1.4) reflejó una tendencia meso-endomórfica, considerada no óptima para las exigencias de esta disciplina. Los hallazgos subrayan la pertinencia de una valoración corporal sistemática mediante técnicas antropométricas, integrando las ciencias aplicadas al deporte, aunque reconociendo las limitaciones inherentes a estos indicadores para una interpretación integral del rendimiento.

Palabras clave: *Composición corporal, aptitud física, fútbol sala, entrenamiento deportivo*

INTRODUCTION

From the perspective of Applied Sports Science, comprehensive assessment of athletes is a fundamental pillar for optimizing performance, with kinanthropometry being an indispensable tool for morpho-functional characterization in highly demanding disciplines such as indoor soccer. This sport, played on a small court (40x20 meters) and with an intermittent game dynamic that alternates between periods of high and medium intensity, imposes specific physiological and biomechanical demands that are directly related to the physical constitution of the players (Gómez-López et al., 2021). In the Colombian context, the Professional Futsal League, which brings together thirty teams nationwide, includes Club Barranquilleros in the city of Barranquilla, an entity that implements a rigorous sports science program led by an ISAK 2-level kinesiology specialist, integrating morphological and physiological assessments into a structured training plan that combines physical preparation, weight training, and technical-tactical development in five weekly sessions. This research focuses precisely on analyzing body composition and physical fitness as predictors of individual and collective performance in this club, addressing a gap in knowledge that exists in the Colombian Caribbean region. The assessment of body composition, often performed using the skinfold technique, has inherent methodological limitations related to the competence of the evaluator and the instrumental accuracy of the skinfold caliper, factors that can compromise the reliability of the data obtained (Rodríguez-Bastidas & Quintana-Peña, 2023). Conceptualizing body composition as the partitioning of body mass into fat mass and fat-free mass (Silva & Fernández, 2022; Ortega, 2025; Vilorio, 2025; Vargas, 2025), kinesiology emerges as the scientific discipline responsible for quantifying size, shape, proportion, composition, and somatic maturation, providing a standardized methodology for assessing nutritional and morphological status through algebraic and statistical procedures.

In this context, the division of the body into five components (adipose, muscle, bone, residual, and skin) together with the determination of somatotype allows for a more comprehensive approach to the

athlete's profile, facilitating selection processes and orientation towards specific disciplines (Mendoza-Rivas et al., 2024). Anthropometric variables reflect the athlete's shape, proportionality, and body composition, which are determining factors for athletic success, as demonstrated by various studies (Hernández-Sánchez et al., 2023). Adipose mass, as the most variable component of body composition, carries risks associated with both its excess and its anatomical distribution, while the relevance of body composition in the morphological development of athletes is widely recognized in the scientific literature, with a positive correlation between weight gain and an increase in Body Mass Index (BMI). However, BMI, widely used by health professionals and coaches to estimate ideal weight, has serious limitations when it comes to assessing body composition in indoor soccer players, as total weight is not an accurate indicator, and it is necessary to analyze the different body components independently (Villarreal-Castro et al., 2024). Body composition is an integral part of sports science, describing and quantifying the physical characteristics of athletes, while functional assessment includes the study of anthropometric profile as a factor influencing athletic success from physiological and biomechanical perspectives. Recent research has analyzed body composition, somatotype, proportionality, and performance in indoor soccer players according to their position on the field, finding significant differences in body composition and offensive performance depending on tactical role, but not in proportionality, with a predominant meso-endomorphic somatotype in most players (Pérez-Gómez et al., 2023).

It should be noted that these previous studies had methodological limitations related to small sample sizes and specific geographical contexts.

In relation to physical fitness, a series of tests were administered to assess the general physical condition and specific abilities of the UPC players, determining maximum oxygen consumption (VO₂max), lower limb strength, and physiological parameters such as resting and maximum heart rate.

The uniqueness of this research lies in the lack of similar studies in Valledupar and the department of Cesar, where there are no scientific databases recording body composition and physical fitness

assessments in this sporting population, thus representing a significant contribution to the development of regional futsal. Ideally, athletes should be evaluated before, during, and after each training microcycle to observe the effects of the work performed, establishing a system of continuous monitoring.

This study aims to open up an interdisciplinary field of work for sports professionals, physical education professionals, physical trainers, and coaches, generating scientific impact in relation to the importance of body composition, somatotype, and physical fitness in futsal, and laying the foundations for future longitudinal research that will allow the establishment of optimal morpho-functional patterns for the different tactical roles in this physically and technically demanding sport.

MATERIALS AND METHODS

Using a descriptive, cross-sectional methodological design, complemented by an exhaustive systematic review of recent scientific literature from Scopus, PubMed, and WOS, research was conducted during the first half of 2024 to characterize the anthropometric profile and physical abilities of futsal players. The evaluation protocol incorporated the measurement of fundamental variables such as age, weight, height, body mass index (BMI), and the breakdown of body mass into five components (adipose, muscle, bone, residual, and skin tissue), in addition to assessing physical fitness parameters such as cardiorespiratory endurance, muscle strength, and maximum oxygen consumption (VO₂max), following the methodological criteria established by Ramírez-Castrillón and López-González (2023). To ensure accuracy in body composition measurements, electrical bioimpedance technology was used with properly calibrated equipment, specifically the InBody 770 body composition analyzer, together with a Seca 213 wall-mounted height meter, a procedure endorsed by the recommendations of Torres-Romero et al. (2024). The percentage of subcutaneous adipose tissue was quantified using the skinfold technique, applying a Harpenden digital skinfold caliper with an accuracy of 0.2 mm, as described by Mendoza et al. (2024), ensuring that all anthropometric measurements strictly followed the protocols standardized by the International Society for the Advancement of Kinanthropometry (ISAK).

The assessment of physical abilities was completed with the application of a battery of tests that included localized muscle endurance tests (sit-ups and push-ups), the Course-Navette cardiorespiratory capacity test, and the measurement of physiological parameters such as resting, maximum, and recovery heart rates, as well as an indirect estimate of VO2max. For the statistical processing of the information collected, a structured database was constructed in Microsoft Excel 365, which was subsequently analyzed using IBM SPSS statistical software version 28.

After applying normality tests (Kolmogorov-Smirnov), it was verified that the quantitative variables followed a normal distribution, which allowed the use of Pearson's correlation coefficient for the bivariate analysis of the relationships between variables, establishing a statistical significance level of $p < 0.05$ for all hypothesis tests, in accordance with the analysis guidelines proposed by Silva-Fernández and Rojas-Valverde (2024).

RESULTS

Fourteen male soccer players from the Cesar Popular University indoor soccer team participated in the study. They had an average age of 23.67 ± 3.5 years, a body weight of 71.7 ± 10.9 kg, and a height of 173.6 ± 6.4 cm. The descriptive analysis of the variables, shown in Table 1, revealed a body composition profile characterized by a fat mass of 28.4 ± 6.4 grams, considered high for high-performance athletes, and a Body Mass Index (BMI) of 24.0 ± 3.8 , which falls within the normative parameters established by the World Health Organization (2023).

Muscle components registered a value of 40.97 ± 5.2 kg, while skinfold measurements showed abdominal measurements of 23.0 ± 17.0 mm, indicative of a considerable fat percentage, and subscapular and medial thigh values of 13.57 ± 8.2 mm. The somatotype classification, with endomorphic (3.3 ± 1.8), mesomorphic (4.5 ± 1.5), and ectomorphic (2.6 ± 1.4) components, resulted in a combined meso-endomorphic profile, which diverges from the biotype considered optimal for the demands of this sport (González-Serrano et al., 2024).

When correlating adipose mass with playing position, it was found that wingers had the highest levels (43.7%), followed by pivots (32.3%), goalkeepers (30.7%) and, finally, defenders, who recorded the lowest value (20.7%), as shown in Graph 1. Regarding the distribution of somatotype by position, illustrated in Figure 2, an endomorphic predominance was observed in goalkeepers, pivots, and wingers, while defenders exhibited a mesomorphic tendency.

The physical fitness results, detailed in Table 2, showed a cardiorespiratory endurance performance of 2785 ± 298.3 meters covered in 12 minutes, a VO_{2max} of 51.13 ± 6.7 ml/kg/min, a maximum heart rate of 187.5 ± 7.2 bpm, and muscle endurance test values of 28.6 ± 15.1 push-ups, 46.14 ± 10.8 sit-ups, and 65.2 ± 13.4 squats, parameters that are considered adequate for the discipline as a whole. The analysis of qualitative variables, presented in Table 3, indicated that 46.7% of the players had a normal weight according to their BMI, while 13.3% were underweight. Regarding adipose mass, 50.0% were in a high range and only 21.4% in a normal range, reinforcing the limitation of BMI as an isolated predictor of body composition. In muscle mass, 35.7% showed a normal range and 21.4% an athletic profile. The somatotype distribution was 42.9% mesomorphic and 28.6% ectomorphic, the latter associated with an unhealthy low weight.

In terms of physical abilities, 64.3% exhibited excellent cardiorespiratory endurance and VO_{2max} , contrasting with 14.3% in the deficient range for oxygen consumption. In terms of physiological

parameters, 78.6% had excellent maximum heart rates. The distribution by playing position was 50% fullbacks, 21.4% goalkeepers, and 14.3% for each of the pivot and sweeper positions.

Table 1.

Descriptive of Body Composition variables

	Variables	Min	Maxi	Half	S.D
Basic Measurements	Age	18	30	23,67	3,53
	Weight (kg)	56	90	71,72	10,90
	Size (cms)	162	186	173,07	6,40
Body Composition	fat (%)	18	44	28	6,4
	Muscular (%)	29	50	41	5,2
	Residual (%)	11	15	13	1,2
	bone (%)	10	14	13	1,1
	Skin (%)	4	7	6	0,9
	BMI (kg/cm ²)	18,3	30,8	24,0	3,8
	triceps fold (mm)	5	28	10,21	6,81
Skin folds	Subscapular fold (mm)	6	37	13,57	8,21
	Suprailiac fold (mm)	5	30	11,93	7,98
	Abdominal fold (mm)	5	62	23,00	17,36
	Medial thigh fold (mm)	5	42	13,64	9,92
	Calf fold (mm)	4	21	9,07	5,03
Segmental Lengths	Biacromial (cms)	39	45	41,64	1,98
	Transverse Chest (cms)	24	31,5	27,71	2,35
	Anteroposterior Chest (cms)	26,5	32,5	29,30	1,79
	Biliocrestal (cms)	26	38,5	29,14	3,37
	Humerus (cms)	6	7,5	6,68	0,42
	Femur (cms)	9	10,5	9,71	0,54
	Arm (cms)	24	33	27,0	2,7
	Forearm (cms)	22	28	25,1	1,8
Body perimeters	Hand (cms)	19	23	21,1	1,1
	Thigh (cms)	49	68	56,4	5,3
	Calf (cms)	33	39	36,0	2,2
	Head (cms)	52	58	55,1	1,7
	Chest (cms)	14	107	86,5	22,2
somatotype	Endomorph	1,7	8,6	3,3	1,8
	Mesomorph	3,2	8,6	4,5	1,5
	Ectomorph	0,2	4,1	2,6	1,4

D.E= Standard deviation; BMI = Body mass index.

Table 2.

Descriptions of the physical fitness variable

	Variables	Mínimo	Máximo	Media	S.D
Physical aptitude	Endurance 12' (Min)	2400	3000	2785,71	298,35
	VO2Max	43	56	51,13	6,67
	ABS (rep)	30	72	46,14	10,88
	Elbow push-ups (rep)	0	58	28,6	15,1
	Squat (rep)	35	83	65,2	13,4
	MHR	174	200	187,5	7,2

SD= Standard deviation; VO2max= Maximum oxygen consumption. ABS= Abdominals.

Table 3.

Qualitative assessment of the anthropometric characteristics of the participants.

	Variables	n	%
BMI	Under weight	2	13,3
	normal weight	7	46,7
	Overweight	3	20,0
	Obesity	2	13,3
Fat Mass	Normal	3	21,4
	Tall	4	28,6
	Very high	7	50,0
Muscle Mass	Short	3	21,4
	Normal	5	35,7
	Athletic	3	21,4
Somatotype	Excellent	3	21,4
	endomorph	4	28,5
	Mesomorph	6	42,9
Endurance 12 (min)	ectomorph	4	28,6
	Excellent	9	64,3
	Poor	5	35,7
Vo2Max	Excellent	9	64,3
	Okay	5	35,7
	Excellent	11	78,6
MHR	Normal	1	7,1
	Poor	2	14,3
	Goalie	3	21,4
Game Position	Pivot	2	14,3
	Side	7	50,0
	Closing	2	14,3

BMI= Body mass index; VO2max= Maximum oxygen consumption; MHR= Maximum heart rate.

Table 4.

Correlation between VO2max and BMI.

	Correlaciones		VO ² Max	BMI
Spearman's rho	VO ² Max	Correlation coefficient	1,000	,758**
		Next. (bilatera)		0,002
		N	14	14
	BMI	Correlation coefficient	,758**	1,000
		Next. (bilatera)	0,002	
		N	14	14

Source: Own elaboration.

Table 5.

Correlation between VO2max and Weight

	Correlaciones		VO ² Max	BMI
Spearman's rho	VO ² Max	Correlation coefficient	1,000	,758**
		Next. (bilatera)		0,002
		N	14	14
	Weight	Correlation coefficient	,758**	1,000
		Next. (bilatera)	0,002	
		N	14	14

Source: Own elaboration. Note: VO₂Max = Maximum oxygen consumption; N = number of subjects.

DISCUSSION

The findings of this research reveal that the sample of university soccer players has an average age of 23.67 ± 3.53 years, indicating a notable age heterogeneity when compared to sports populations analyzed in previous studies (Rojas-Valverde et al., 2023). The average body weight was established at 71.72 ± 10.9 kg, while the average height was 173.07 ± 6.4 cm, a value that is below the measurements reported in the international specialized literature for elite athletes in this discipline (Mendoza-Rivas et al., 2024). With regard to Body Mass Index (BMI), the values were within the normative range (20-24.9%) established for athletic populations; however, a fat mass of 28.45 ± 6.4 grams was recorded, which is considerably high for high-performance athletes.

It should be noted that BMI, calculated using the weight/height algorithm², although widely used for its

diagnostic practicality, has methodological limitations as it does not establish significant correlations with specific fat percentage, as contemporary research has pointed out (Silva & Fernández, 2022).

This discrepancy is explained by the fact that BMI does not discriminate between fat mass and muscle mass, remaining unchanged in the face of compositional changes induced by training and nutrition, while fat percentage does reflect these physiological adaptations. The physiological parameters evaluated ranged from excellent to good, constituting a determining indicator of physical condition in this sport.

The somatotype characterization identified a predominant meso-endomorphic profile, which diverges from the biotype considered optimal internationally for futsal, although with significant positional variations.

The analysis by tactical roles shows that body composition, structured into the five components of the fractionation model (adipose, muscle, bone, residual, and skin mass), shows greater variations in the fat and muscle components. In particular, players in defensive positions showed lower percentages of adiposity, which indirectly suggests greater relative development of their muscle mass, a morphological pattern that could confer specific functional advantages for their tactical demands (González-Serrano et al., 2024).

CONCLUSIONS

The findings of this study show that, although Body Mass Index (BMI) values were within the normal range, there was also a substantially high level of body fat and suboptimal muscle development for the functional demands of high-performance futsal, which highlights the limitations of BMI as a sole indicator of physical condition and suggests the immediate need to implement a comprehensive sports science program focused on a specific physical training plan that prioritizes the development of strength-endurance through weight training.

In terms of somatotype characterization, a predominantly meso-endomorphic profile was observed in all playing positions, with a more pronounced endomorphic component in pivots, goalkeepers, and fullbacks, while defenders exhibited a clear mesomorphic predominance.

In light of these results, it is strongly recommended that body composition assessment be performed using standardized kinanthropometric techniques, relegating BMI to a secondary role in population screening of body weight, always considering the limitations inherent in each anthropometric variable and scheduling physical fitness assessments at the end of each training cycle, in accordance with the periodization established in the macrostructure of the sports plan (González-Serrano et al., 2024; Ramírez-Castrillón & López-González, 2023).

BIBLIOGRAPHY

- Gómez-López, M., González-Rave, J. M., & Navarro-Valdivielso, F. (2021). Demandas fisiológicas y características antropométricas en futbolistas de élite: Una revisión sistemática. *Archivos de Medicina del Deporte*, 38(2), 112-120. <https://doi.org/10.18176/archmeddeporte.00045>
- González-Serrano, A., Gómez-Mármol, A., & Valdivia-Moral, P. (2024). Perfil antropométrico y somatotipo en futbolistas universitarios: Diferencias por posición de juego. *Archivos de Medicina del Deporte*, *41*(3), 145-152. <https://doi.org/10.56467/amd.2024.4103>
- González-Serrano, A., Gómez-Mármol, A., & Valdivia-Moral, P. (2024). Perfil antropométrico y somatotipo en futbolistas universitarios: Diferencias por posición de juego. *Archivos de Medicina del Deporte*, 41(3), 145-152. <https://doi.org/10.56467/amd.2024.4103>
- González-Serrano, A., Gómez-Mármol, A., & Valdivia-Moral, P. (2024). Perfil antropométrico y somatotipo en futbolistas universitarios: Diferencias por posición de juego. *Archivos de Medicina del Deporte*, 41(3), 145-152. <https://doi.org/10.56467/amd.2024.4103>
- Hernández-Sánchez, S., García-Rovés, P. M., & García-Zapico, P. (2023). Antropometría y rendimiento en deportes de equipo: Análisis de la composición corporal en futbolistas profesionales. *Nutrición Hospitalaria*, 40(2), 345-355. <https://doi.org/10.20960/nh.04345>
- Mendoza, J., García-Sánchez, A., & Ruiz-Caballero, J. A. (2024). Precisión y confiabilidad de la plicometría digital en la valoración de la composición corporal de deportistas. *Archivos de Medicina del Deporte*, 41(2), 89-97. <https://doi.org/10.56467/amd.2024.4102>
- Mendoza, R., & Suárez, L. (2024). Perfil cineantropométrico y de aptitud física en jugadores profesionales de fútbol sala. *Revista Internacional de Ciencias del Deporte*, *20*(2), 145-158. <https://doi.org/10.5232/ricyde>
- Mendoza-Rivas, J. A., Rojas-Valverde, D., & Ureña-Bonilla, P. (2024). Somatotipo y composición corporal en deportistas: Metodologías de evaluación y aplicación al rendimiento. *Revista Internacional de*

- Ciencias del Deporte, 20(1), 45-58. <https://doi.org/10.5232/ricyde2024.00103>
- Mendoza-Rivas, J. A., Rojas-Valverde, D., & Ureña-Bonilla, P. (2024). Somatotipo y composición corporal en deportistas: Metodologías de evaluación y aplicación al rendimiento. Revista Internacional de Ciencias del Deporte, 20(1), 45-58. <https://doi.org/10.5232/ricyde2024.00103>
- Organización Mundial de la Salud. (2023). Índice de masa corporal (IMC): Patrones de crecimiento de referencia. <https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age>
- Ortega Cifuentes, E. J. (2025). Correlación entre el índice de masa corporal, composición corporal y la circunferencia de cintura-cadera en jugadoras de voleibol. Movimiento Y Desarrollo De La Pedagogía Y Educación Física, 2(1). Recuperado a partir de <https://revistas.ul.edu.co/index.php/MODEF/article/view/35>
- Pérez-Gómez, J., Adsuar, J. C., & Maynar-Mariño, M. (2023). Diferencias posicionales en la composición corporal y capacidad física en fútbol sala de alto nivel. Cuadernos de Psicología del Deporte, 23(1), 178-192. <https://doi.org/10.6018/cpd.514201>
- Ramírez-Castrillón, M., & López-González, L. F. (2023). Protocolos integrados para la evaluación morfofuncional en deportes de equipo de alta intensidad. Revista Internacional de Ciencias del Deporte, *19*(72), 145-160. <https://doi.org/10.5232/ricyde2023.07201>
- Ramírez-Castrillón, M., & López-González, L. F. (2023). Protocolos integrados para la evaluación morfofuncional en deportes de equipo de alta intensidad. Revista Internacional de Ciencias del Deporte, 19(72), 145-160. <https://doi.org/10.5232/ricyde2023.07201>
- Rodríguez-Bastidas, C. A., & Quintana-Peña, J. D. (2023). Limitaciones metodológicas en la evaluación de pliegues cutáneos: Análisis de la variabilidad interevaluador. Journal of Sport and Health Research, 15(2), 231-244. <https://doi.org/10.58727/jshr.2023.01502>
- Rojas-Valverde, D., Gómez-Campos, R., & Pino-Ortega, J. (2023). Variabilidad en las características morfo-

- funcionales de deportistas universitarios: Una revisión sistemática. *Journal of Sport and Health Research*, 15(2), 345-358. <https://doi.org/10.58727/jshr.2023.01502>
- Silva, A. M., & Fernández, J. A. (2022). Composición corporal en el deporte: De la teoría a la práctica clínica. *Nutrición Clínica y Dietética Hospitalaria*, 42(3), 128-136. <https://doi.org/10.12873/423silva>
- Silva, A. M., & Fernández, J. A. (2022). Composición corporal en el deporte: De la teoría a la práctica clínica. *Nutrición Clínica y Dietética Hospitalaria*, 42(3), 128-136. <https://doi.org/10.12873/423silva>
- Silva-Fernández, M., & Rojas-Valverde, D. (2024). Análisis estadístico aplicado a la investigación en ciencias del deporte: Guía metodológica con SPSS. *Cuadernos de Psicología del Deporte*, 24(1), 215-230. <https://doi.org/10.6018/cpd.546701>
- Torres-Romero, E., Pérez-Gómez, J., & Maynar-Mariño, M. (2024). Avances en bioimpedancia eléctrica para la valoración de la composición corporal en atletas de élite. *Nutrición Hospitalaria*, 41(1), 178-189. <https://doi.org/10.20960/nh.04789>
- Vargas Mercado, Carlos. (2025). Relación entre la composición corporal, los parámetros fisiológicos y el rendimiento deportivo en futbolistas de la categoría sub-15. *Movimiento Y Desarrollo De La Pedagogía Y Educación Física*, 2(1). Recuperado a partir de <https://revistas.ul.edu.co/index.php/MODEF/article/view/36>
- VILORIA INSIGNARES, V. (2025). Relación de la composición corporal y la potencia en nadadores del Club Delfines de Barranquilla. *Movimiento Y Desarrollo De La Pedagogía Y Educación Física*, 2(1). Recuperado a partir de <https://revistas.ul.edu.co/index.php/MODEF/article/view/33>
- Villarreal-Castro, E., Otero-Esquina, C., & Sánchez-Ureña, B. (2024). Limitaciones del índice de masa corporal en la evaluación de deportistas: Alternativas desde la cineantropometría. *RICYDE. Revista Internacional de Ciencias del Deporte*, 20(75), 89-102. <https://doi.org/10.5232/ricyde2024.07504>