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Anthropometric Profile of Futsal Players: A Cross-Sectional, Descriptive and Comparative Study in Six Argentine Clubs

Perfil Antropométrico de Jugadores de Fútbol Sala: Un Estudio Transversal, Descriptivo y Comparativo en Seis Clubes Argentinos

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SUMMARY: Optimal body composition is a key factor influencing performance in elite sports, including futsal, high-intensity, intermittent team sport with increasing global professionalization. Although Argentine futsal has a strong tradition, anthropometric reference data specific to its professional players and inter-club comparisons remain scarce. This study aimed to describe the anthropometric and body composition profile of professional players in the Argentine and to assess morphological variability between clubs. A descriptive, cross-sectional study was conducted with 126 male professional futsal players from six clubs during the 2017–2019 seasons. Anthropometric measurements were obtained by ISAK Levels 3 and 2 certified anthropometrists, and body composition was estimated using the Ross and Kerr five-way fractionation method of body mass. The overall anthropometric profile showed a median muscle mass of 48.2 % [IQR: 46.1–50.1], adipose tissue mass of 22.1 % [IQR: 20.0–24.2], a sum of six skinfolds of 54.0 mm [40.1–70.0], and a muscle–bone index of 4.12 [IQR: 3.86–4.43]. Five of the seven variables showed no significant differences between clubs, suggesting a largely homogeneous physical profile. However, significant differences were observed in BMI (p = 0.002) and the sum of six skinfolds (p = 0.010. Professional futsal players in Argentina exhibit a relatively homogeneous anthropometric and body composition profile, with inter-club differences primarily reflected in adiposity indicators. These findings provide sport-specific reference values for elite futsal and underscore the need for further optimization of body composition in certain teams.

KEY WORDS: Anthropometry; Body composition; Soccer; Indoor soccer; 5-a-side soccer; Team sports; Sports nutritional sciences.

INTRODUCTION

Futsal is a high-intensity indoor team sport characterized by rapid transitions, frequent changes of direction, repeated accelerations and decelerations, and continuous technical involvement in reduced spaces. These demands differentiate it from traditional 11-a-side football and impose specific physiological, biomechanical, and tactical requirements. Match analyses have demonstrated that professional futsal requires substantial involvement of both aerobic and anaerobic pathways, with frequent high-speed efforts interspersed with short recoveries and considerable neuromuscular load (Barbero-Alvarez *et al*., 2008; Castagna *et al*., 2009). This profile is further modulated by playing position and competitive level, reinforcing the need for sport-specific monitoring tools and normative data to interpret performance-related physiological stressors (Casanova *et al*., 2024).

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Within this context, optimal body composition emerges as a key modifiable factor influencing agility, repeated sprint ability, and jump performance (Rios-Limas *et al*., 2025). Although body composition alone does not determine performance, it can be strategically manipulated through nutritional interventions and training periodization (Sekulic *et al*., 2021). To monitor and quantify these characteristics, sports science professionals commonly employ anthropometric variables such as body mass, stretch stature, body mass index, estimates of muscle and fat mass, the sum of skinfolds, and the muscle–bone index. These indicators enable cost-effective longitudinal monitoring and facilitate comparisons across teams and institutions (Bonilla *et al*., 2022). Recent evidence indicates that higher fat mass is negatively associated with agility and change-of-direction performance, whereas greater lower-limb power and lean mass are positively related to sprinting and jumping, particularly when assessments are futsal-specific (Sekulic *et al*., 2021; Casanova *et al*., 2024).

Despite the growing professionalization of futsal, the scientific literature addressing the anthropometric characteristics of players remains limited and methodologically heterogeneous compared with conventional football. Systematic reviews have highlighted the scarcity of large, multi-club samples and the predominance of single-team designs, with geographical representation concentrated in countries such as Spain, Brazil, Portugal, Australia, Croatia and Italy (Naser *et al*., 2017). This heterogeneity encompasses measurement protocols and estimation methods, complicating cross-study comparisons. It has been noted that regression equations may not be the most accurate approach for evaluating body composition, with absolute values of skinfolds and lean mass indices being preferable (Bonilla *et al*., 2022). Furthermore, longitudinal evidence on within- and between-season changes is still emerging, limiting the development of reference ranges applicable to training load management, nutritional planning, and selection processes (Stubbs-Gutierrez & Medina-Porqueres, 2021).

In Argentina, despite a strong futsal tradition and a competitive national league, there is a notable lack of studies systematically describing the anthropometric characteristics of professional players and enabling inter-club comparisons to establish sport-specific reference values. Generating updated, context-sensitive data may enhance player monitoring, guide talent identification and recruitment, and inform multidisciplinary interventions in training and nutrition.

Considering these aspects, the present study aimed to describe the anthropometric profile of professional futsal players in the Argentine context, using standardized measurement protocols and emphasizing variables known to be related to performance-relevant physiological outcomes. The study seeks to provide practical reference ranges for applied monitoring, selection, and specific programming within futsal.

MATERIAL AND METHOD

Study Design. A descriptive, cross-sectional study was conducted. Participants attended the assessment location once to collect anthropometric data. The study followed the Strengthening Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Elm *et al*., 2008; Vandenbroucke *et al*., 2014).

Setting and Ethical statement. This study was conducted between September 2017 and April 2019. All assessments were carried out at the respective participating clubs within Argentina. This study used pre-existing data obtained from quarterly or semi-annual assessments routinely conducted by the medical staff of the participating clubs as part of the players' contractual and health-monitoring obligations. Under these circumstances, individual informed consent was not obtained. According to Winter & Maughan (2009), the principles of informed consent may not be fully applicable in professional sports when medical and performance data arise from routine evaluations carried out throughout the competitive season and the off-season. The Institutional Ethical Committee of the Mariano and Luciano de la Vega Hospital, Moreno, Buenos Aires, Argentina approved this study. All data used in this study were fully anonymized prior to analysis, in accordance with the Personal Data Protection Act (PDPA) of Argentina (Law 25.326).

Participants. A total of 126 male professional futsal players from six clubs participated in the study: Due to the retrospective nature of the data analysis and the inability to obtain the necessary authorisation from each institution, the clubs have been anonymised and are identified as Team 1 (n= 21), Team 2 (n = 19), Team 3 (n=21, Team 4 (n = 15), Team 5 (n=19), and Team 6 (n = 31). Data were collected between September 2017 and April 2019. Participants had a median age of 23.0 years [IQR: 20–27], stretch stature of 174.4 cm [IQR: 170.0–178.8] and body mass of 72.95 kg [IQR: 68.23–78.63]. It is important to note that the squads evaluated corresponded to the first teams of each club and that, during this period, not all of them were participating in the same official competitions.Team 1, Team 3, Team 4, Team 5 and Team 6 were competing in tournaments organized by the Argentine Football Association (AFA), with the first four clubs playing in the First Division and Team 6 in Division C. In contrast, Team 2 participated in competitions governed by the Metropolitan Futsal Association (AMF).

Assessments

Anthropometric Measurements. Certified levels 3 and 2 anthropometrists conducted all measurements following the standards of the International Society for the Advancement of Kinanthropometry (CITA). Body mass was assessed using a digital scale Omron® HBF-514C (Omron Corporation, Kyoto, Japan), which provides a precision of 0.1 kg. Stretch stature and sitting height were measured with a stadiometer SECA® 217 (SECA GmbH & Co. KG, Hamburg, Germany), using a 40 cm anthropometric box for sitting height. Skinfolds were measured with a SlimGuide caliper (Creative Health Products, Plymouth, Michigan, USA) at the triceps, subscapular, supraspinale, abdominal, mid-thigh, and medial calf sites. Girths were obtained with a flexible and non-elastic anthropometric tape Lukfin® W606PM (Apex Tool Group, Sparks, Maryland, USA), including head, relaxed arm, flexed arm, forearm, chest, waist, hip, maximal thigh, mid-thigh, and medial calf circumferences. Bone diameters were measured with two Rosscraft® sliding calipers, one small and one large (Rosscraft Research Ltd., Vancouver, Canada). The following breadths were assessed: biacromial, transverse thoracic, anteroposterior thoracic, bi-iliocristal, and biepicondylar for both the humerus and femur. All instruments were calibrated prior to evaluation.

All anthropometric variables were measured at least twice. A third measurement was obtained when the difference between the first two exceeded 5 % for skinfolds or 1 % for any other variable. When two measurements were taken, the mean value was used for analysis; when three were required, the median value was retained (Esparza *et al*., 2019).

Body Composition. Anthropometric data were used to derive composite variables for body composition estimation, including the Ross and Kerr five-way fractionation method of body mass, the muscle-bone index, and the sum of skinfold thickness (Ross & Kerr, 1991); additionally, adiposity was analyzed using the sum of six skinfolds. This sum included the triceps, subscapular, supraspinale, abdominal, thigh, and calf skinfolds (S6 SKF).

Study Size. A non-probabilistic convenience sampling method was used.

Statistical Methods. The Shapiro–Wilk test assessed the distributional behavior of all variables. Because most variables showed a non-parametric distribution, the analysis reported descriptive statistics using the median and interquartile range (IQR). The Kruskal–Wallis test examined differences among clubs, and Dunn's post hoc test with Bonferroni correction adjusted for multiple comparisons. All statistical procedures were run in R version 4.4.1 (R Core Team, Vienna, Austria), using the RStudio integrated development environment, version 2023.06.2+561 "Mountain Hydrangea" (Posit, PBC, Boston, MA, USA).

RESULTS

The anthropometric characteristics of the elite futsal players are detailed throughout this section, presented across Tables 1 to 3 and Figures 1 to 2. The overall results of the players, without distinguishing by institution, are first presented in Table I.

The total sample of elite futsal players had a median Body Mass of 72.95 kg [IQR: 68.23-78.63] and a median Stretch stature of 174.40 cm [IQR: 170.03-178.80]. The overall median Body Mass Index (BMI) was 23.95 kg/m^2 [IQR: 22.58-25.81]. Regarding body composition, the median Muscle Mass was 48.20 % (35.33 kg), while the median Adipose Tissue Mass was 22.09 % (16.16 kg). The overall median for the Sum of 6 Skinfolds was 54.00 mm [IQR: 40.13-70.00]. Finally, the median Muscle–Bone Index (MBI) for the entire sample was 4.12 [IQR: 3.86-4.43].

Table I. General characteristics of the players (Overall sample).

Variable	Median	IQR	Minimum	Maximum
Age (y)	23.10	20.2-27.0	15.30	36.00
Body mass (kg)	72.95	68.23–78.63	54.00	112.40
Stretch stature (cm)	174.40	170.03–178.80	160.90	192.50
BMI (kg/m^2)	23.95	22.58–25.81	18.30	34.12
Muscle mass (%)	48.20	46.11–50.09	41.25	54.00
Muscle mass (kg)	35.33	32.40–38.28	22.73	55.59
Adipose tissue mass (%)	22.09	20.00–24.17	15.68	32.72
Adipose tissue mass (kg)	16.16	14.21–18.52	10.82	31.25
Sum of 6 skinfolds (mm)	54.00	40.13–70.00	21.50	142.50
MBI (Muscle–Bone Index)	4.12	3.86–4.43	2.73	5.50

Values are presented as median and interquartile range (IQR).

The anthropometric and body composition characteristics of the players by football club are presented in Table II. Analysis of the anthropometric variables by club showed relatively similar characteristics, particularly for Stretch stature and MBI. The club with the lowest median body mass was Team 1 at 70.1 kg (66.2–73.3), while Team 6 registered the highest at 76.1 kg (69.2–79.7). A more notable difference was observed in

Table II. Anthropometric and body composition characteristics of the players by futsal teams.

Variable	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6
Body mass (kg)	70.1 (66.2–73.3)	75.8 (70.6–78.8)	70.8 (67.1–77.8)	75.0 (67.0–76.8)	71.9 (68.5–79.5)	76.1 (69.2–79.7)
Stretch stature (cm)	173.7 (171.0–178.0)	173.6 (169.0–177.0)	175.7 (173.0–179.0)	175.8 (172.0–178.0)	174.0 (169.0–180.0)	173.9 (169.0–177.0)
BMI (kg/m^2)	23.1 (22.5–23.6)	25.3 (23.9–26.6)	22.8 (21.9–24.6)	23.8 (22.2–24.7)	24.0 (22.9–24.5)	25.0 (23.5–27.0)
Muscle mass (kg)	34.0 (31.6–36.5)	37.4 (33.8–38.7)	34.9 (31.5–37.9)	36.4 (32.4–38.7)	34.2 (32.6–39.1)	36.5 (32.4–38.6)
Fat mass (kg)	15.3 (13.7–16.2)	16.4 (15.0–19.3)	15.9 (14.6–17.5)	15.9 (13.3–16.9)	16.7 (13.1–19.0)	17.9 (15.4–20.3)
Sum of 6 skinfolds (mm)	46.5 (36.5–57.0)	55.5 (47.2–73.0)	50.5 (37.5–59.0)	47.5 (40.2–55.2)	56.0 (35.8–70.0)	68.5 (47.8–87.0)
MBI (Muscle–Bone Index)	4.0 (3.8–4.5)	4.1 (3.9–4.2)	4.1 (3.9–4.3)	4.3 (3.9–4.4)	4.0 (3.8–4.3)	4.3 (4.0–4.5)

Values are presented as median and interquartile range (IQR).

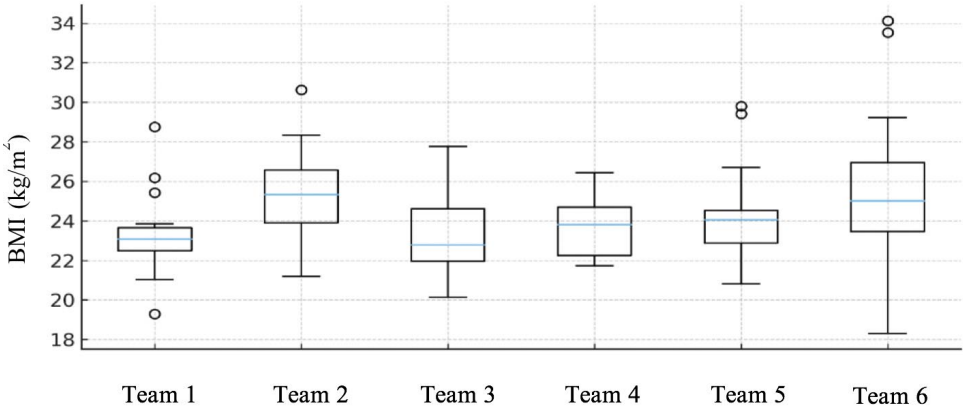

Fig. 1. Boxplot of the BMI (kg/m^2) Across Clubs.* Indicates a statistically significant difference between Team 2 and Team 1 ($p < 0.05$).
** Indicates a statistically significant difference between Team 6 and Team 1 ($p < 0.05$).

the BMI, where Team 1 displayed the lowest median at 23.1 kg/m^2 (22.5–23.6), contrasted by Team 2 with the highest median at 25.3 kg/m^2 (23.9–26.6), closely followed by Team 6 at 25.0 kg/m^2 (23.5–27.0). This distribution of BMI across the clubs is visually represented in Figure 1.

The Kruskal–Wallis test results, presented in Table III, indicated a statistically significant difference between the clubs for two keyanthropometric indicators: BMI (p = 0.002) and Sum of 6 Skinfolds (p = 0.010). No significant differences were found for Body Mass (p = 0.234), Strech stature (p = 0.715), Muscle Mass (p = 0.448), Fat Mass (p = 0.07), or MBI (p = 0.422).

The Kruskal–Wallis test showed significant differences in BMI among the six futsal teams (H(5) = 18.42, p = 0.002). The post hoc Dunn test revealed significant between-team differences in body mass index (BMI). Specifically, Team 2 and Team 6 exhibited significantly higher BMI values compared to Team 1 (Team 2 *vs.* Team 1: z = –3.03, r_rb = 0.56, p_holm = 0.034; Team 6 *vs.* Team 1: z = –3.15, r_rb = 0.51, p_holm = 0.024). No other pairwise comparisons remained significant after Holm correction (p_holm > 0.05), indicating that Team 1, Team 3, Team 4 and 5 formed a homogeneous low-BMI group. In contrast, Team 2 and Team 6 constituted a distinct higher-BMI cluster.

Table III. Kruskal–Wallis test results for anthropometric differences between football clubs.

Indicator	Statistic	*p* value
Body mass	6.82	0.234
Stretch stature	2.89	0.715
BMI	18.42	0.002*
Muscle mass (kg)	4.74	0.448
Fat mass (kg)	10.18	0.07
Sum of six skinfolds	15.02	0.010*
IMO	4.94	0.422

Values represent p-values obtained from the Kruskal–Wallis test. Values marked with an asterisk (*) indicate statistically significant differences between at least two football clubs (p < 0.05).

Regarding body composition indicators related to fat, Team 1. Consistently registered the lowest median Fat Mass (15.3 kg) and the lowest median Sum of 6 Skinfolds (46.5 mm). Conversely, Team 6 exhibited the highest median Fat Mass (17.9 kg) and the highest median Sum of 6 Skinfolds (68.5 mm). The post hoc Dunn test confirmed that Team 6 displayed significantly greater values than Team 1 for fat-related indicators, as evidenced by the comparison between teams (Team 1 *vs*. Team 6: z = –3.20, r_rb = 0.50, p_holm = 0.020). The distribution of the Sum of 6 Skinfolds across the clubs is clearly illustrated in Figure 2.

The distribution of the Sum of 6 Skinfolds (in mm) for participants from six different clubs is illustrated using box plots. Within each box, the central line represents the median, while the lower and upper edges correspond to the first and third quartiles (Q1 and Q3), respectively. The whiskers extend to the minimum and maximum values within 1.5 times the interquartile range (IQR), and circles (o) denote outliers.

DISCUSSION

The primary objective of this study was to compare the anthropometric profile and body composition indicators of players from professional futsal teams competing in Argentina, in order to identify potential morphological differences among teams of similar competitive level. The findings revealed two central aspects. First, most of the anthropometric variables analyzed, including body mass, stretch stature, muscle mass, and fat mass, did not show significant differences among the evaluated teams, suggesting a high degree of physical homogeneity within the professional category studied. Second, despite this overall uniformity, significant differences were observed in BMI and the Sum of 6 Skinfolds between Team 1 and the teams Team 2 and Team 6, indicating noteworthy distinctions in adiposity levels.

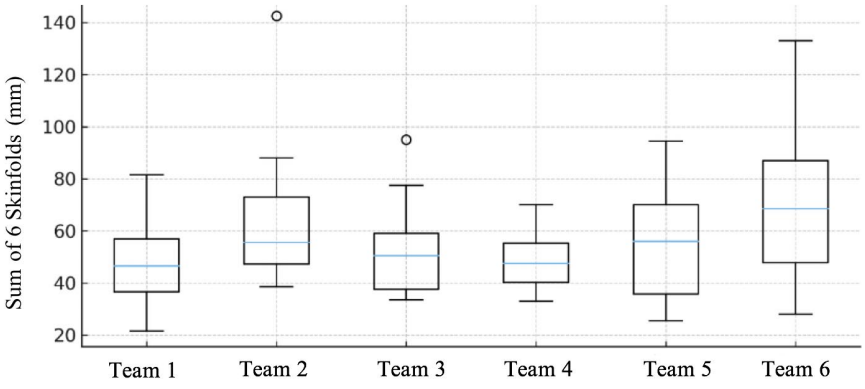

Fig. 2. Boxplot of the sum of 6 Skinfolds (mm) Across Clubs. * Indicates a statistically significant difference between Team 1 and Team 6 ($p < 0.05$).

In futsal, body composition has been assessed using various methodologies, including dual energy X-ray absorptiometry (DXA), bioelectrical impedance, and anthropometry, which complicates direct comparisons across studies due to methodological inconsistencies (Figueiredo Machado *et al*., 2023; Belo *et al*., 2024; Marques *et al*., 2024). In this context, Body Mass Index (BMI) emerges as a simple, standardized measure that enables comparisons among players at different competitive levels. In a recent study, Belo *et al*. (2024) reported no significant differences in body composition or BMI between elite and non-elite players (24.49 ± 1.86 *vs*. 25.19 ± 4.10 kg/m^2, $p = 0.711$), concluding that these variables are not discriminant factors between competitive tiers. These findings are consistent with our results, as the median BMI in our sample was 23.95 (22.58 to 25.81), reinforcing the notion of morphological homogeneity among professional futsal athletes. Similar evidence highlights that anthropometric characteristics in elite futsal tend to converge within a narrow range, possibly reflecting the sport's selective demands for a specific somatic profile (Stubbs-Gutierrez & Medina-Porqueres, 2021).

Additional support comes from Marques *et al*. (2024), who also found no significant differences in body composition across competitive levels. However, elite players demonstrated superior physical performance, particularly in lower-limb power and jumping ability, compared with their amateur counterparts. This reinforces the idea that, while morphological traits may be relatively homogeneous among players at the professional level, performance discriminants emerge from neuromuscular capabilities rather than from body size or mass indices alone. Taken together, these findings suggest that although body composition may fall within an optimal and relatively narrow range in competitive futsal, factors related to movement efficiency, force production, speed, and cardiorespiratory capacity constitute more relevant discriminants than BMI and other traditional anthropometric indicators, as they better reflect the physical demands and performance determinants of the sport (Marques *et al*., 2024; Belo *et al*., 2024; Rebelo *et al*., 2025).

Despite this anthropometric homogeneity, the specific differences identified in adiposity among clubs should not be overlooked. Repeated high-intensity efforts, rapid accelerations, abrupt changes of direction, and frequent deceleration phases characterize Futsal. In these contexts, excess non-functional mass, particularly fat mass, may compromise movement efficiency and increase the

physiological cost of locomotion (Matzenbacher *et al*., 2014). Therefore, the lower adiposity observed in Team 1 compared with Team 2 and Team 6 may reflect distinct training methodologies, nutritional strategies, or load management approaches that prioritize reductions in non-functional mass as a performance-enhancing strategy. This interpretation aligns with recent evidence indicating that, at the elite level, morphological traits tend to converge, with performance differentiation emerging primarily from neuromuscular and metabolic adaptations rather than from gross anthropometric measures (Marques *et al*., 2024; Rebelo *et al*., 2025).

Taken together, our findings support the hypothesis that competitive futsal operates within a constrained morphological window in which athletes present similar structural characteristics but may differ in adiposity-related variables (Sekulic *et al*., 2021). Such subtle differences, although not indicative of performance outcomes by themselves, may influence critical physical attributes relevant to futsal performance, such as acceleration, agility, and the capacity to sustain high-intensity intermittent actions. Future research should explore how these morphological nuances interact with functional markers, such as sprint performance, change-of-direction ability, and aerobic capacity, to determine whether the observed differences in adiposity translate into measurable competitive advantages. Moreover, incorporating longitudinal designs and broader samples would enhance understanding of the stability and predictive value of anthropometric traits in elite futsal environments.

CONCLUSIONS

The results of this study indicate that professional futsal players competing in the Argentine elite league share a remarkably homogeneous anthropometric profile, with no significant differences observed in most body size and composition indicators across clubs. However, the presence of significant differences in BMI and the Sum of Six Skinfolds, particularly involving Team 1 in comparison with Team 2 and Team 6, highlights adiposity as the only morphological variable capable of differentiating teams within the same competitive context. This finding suggests that, while elite futsal imposes relatively standardized structural demands that constrain players' morphology, subtle variations in fat-related components may still emerge, potentially reflecting divergent approaches to training, nutrition, or physical conditioning.

These results contribute to the growing body of evidence indicating that, at the elite level, anthropometry tends to cluster within a narrow performance window, reducing its discriminant value with respect to competitive hierarchy. Consequently, future research should emphasize integrating anthropometric markers with functional performance measures, such as sprint capacity, change-of-direction ability, and aerobic fitness, to determine whether differences in adiposity translate into measurable competitiveadvantages. Expanding the sample size and incorporating longitudinal tracking of players' physical characteristics would also enhance the generalizability of the current findings and provide a clearer understanding of the interaction between morphology, performance, and elite futsal demands.

GIMÉNEZ, M.; YÁÑEZ-SEPÚLVEDA, R.; BÁEZ-SAN MARTÍN, E.; CARVAJAL-VEITÍA, W.; GUZMÁN-MUÑOZ, E. & HERRERA-AMANTE, C. A. Perfil antropométrico de jugadores de fútbol sala: un estudio transversal, descriptivo y comparativo en seis clubes argentinos. *Int. J. Morphol., 44(3)*:1055-1061, 2026.

RESUMEN: La composición corporal óptima es un factor clave que influye en el rendimiento en deportes de élite, incluido el futsal, un deporte de equipo intermitente de alta intensidad con una creciente profesionalización global. Aunque el futsal argentino tiene una fuerte tradición, los datos de referencia antropométricos específicos de sus jugadores profesionales y las comparaciones entre clubes siguen siendo escasos. Este estudio tuvo como objetivo describir el perfil antropométrico y de composición corporal de jugadores profesionales en Argentina y evaluar la variabilidad morfológica entre clubes. Se realizó un estudio descriptivo y transversal con 126 jugadores profesionales de futsal masculinos de seis clubes durante las temporadas 2017–2019. Las medidas antropométricas fueron obtenidas por antropometristas certificados de Nivel 3 y 2 de ISAK, y la composición corporal se estimó utilizando el método de fraccionamiento de masas corporales en cinco componentes de Ross y Kerr. El perfil antropométrico general mostró una mediana de masa muscular del 48,2% [RIC: 46,1–50,1], masa de tejido adiposo del 22,1% [RIC: 20,0–24,2], una sumatoria de seis pliegues cutáneos de 54,0 mm [40,1–70,0] y un índice músculo-óseo de 4,12 [RIC: 3,86–4,43]. Cinco de las siete variables no mostraron diferencias significativas entre los clubes, lo que sugiere un perfil físico mayormente homogéneo. Sin embargo, se observaron diferencias significativas en el IMC ($p = 0,002$) y en la sumatoria de seis pliegues ($p = 0,010$). Los jugadores profesionales de futsal en Argentina exhiben un perfil antropométrico y de composición corporal relativamente homogéneo, con diferencias entre clubes reflejadas principalmente en los indicadores de adiposidad. Estos hallazgos proporcionan valores de referencia específicos del deporte para el futsal de élite y subrayan la necesidad de una mayor optimización de la composición corporal en ciertos equipos.

PALABRAS CLAVE: Antropometría; Composición corporal; Fútbol; Fútbol sala; Fútbol 5; Deportes de equipo; Ciencias de la nutrición deportiva.

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