Trends in anthropometric and somatotype profiles of Brazilian female futsal players: a 20 year study

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Abstract

This study describes the anthropometric measurements and somatotype of the elite female futsal players from Brazil in 2021 and analyse the changes and trends over time in these physical characteristics. Data were collected from the 396 female futsal players, of whom; 169 players were assessed in 2021 then compared to those assessed in 2001 (n=112) and 2011 (n-115). Anthropometric measurements, including body weight, height, breadths, girths, and skinfolds were assessed. The somatotype was calculated and graphically represented. The changes between 2021 and the previous years were analysed using ANOVA and multiple linear regression. A jointpoint regression was performed to verify the annual percentage change. The comparison between 2021 data versus the other time points showed a higher age and lower fat content (2001: 22.7 ± 5.1 BF%; 2011: 22.2 ± 5.2 BF%; 2021: 19.0 ± 5.1 BF%). Players from 2021 had higher tensed arm and relaxed calf girths. All the positions, excluding pivots, significantly decreased their body fat units between 2021 and 2001 (goalkeeper: b=-4.49; defender: b=-2.78; winger: b=-4.48). Over the last 20 years, body fat reduced, and tensed arm and relaxed calf girths increased, suggesting an increase in fat-free mass content from the limbs.

Key Words: females in sport; somatotype; morphology; secular trend.

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Futsal is a game played by two teams of five athletes plus the nine substitute players. Differently to soccer, the game is played on an indoor court with a dimension of 20x40 meters and for two times 20-minute periods with time stopping at every dead ball. In addition, futsal involves high physiological demands. Aerobic and anaerobic metabolism are highly utilized during the matches.[1] Futsal players also perform more offensive and defensive actions compared to football,[2] promoting greater intermittency of actions. Metabolic systems and motor skills, necessary for a better performance, seems to be negatively impacted by body fat.[3] Athletes with mesomorph predominance characteristics have better technical actions and physiological responses.[3] In this sense, the specialization of the athlete and training must focus on physical factors,[1] since anthropometric characteristics and body composition are essential for excellence in athletic performance. [1] The specialization of the athletes over the years could reflect in changes on morphological profile and, subsequently, on recruitment for professional teams.[5,6] Also, many coaches tend to select their players by considering their morphological characteristics. Therefore, evaluating changes over time in anthropometric models is fundamental to clarify what are those for an "optimal" morphology.[7] Possibly due to specialization of the sport and more physical demands on training and during competition, female futsal players from 2011 showed a higher amount of muscle mass than players from 2001.[8] However, there is no information on whether there is a trend or the changes have stabilized. More than that, given the specific physical demands of each playing position,[9] morphological changes can occur in different ways for each position and need to be elucidated. Most of the research with futsal players included male samples,[1] leaving a gap in information for female players regarding their morphological profile and how it changed over time. As this information is scarce in the literature, especially for women, it is important to provide clarity for sport development.[1,8,10] Thus, the objective of this study was to describe the anthropometric measurements and the somatotype of the elite female futsal players from Brazil in 2021, analyzing the changes and the trends over time, i.e., vs. 2011 and 2001, in these physical characteristics. Certainly, this is the first study in the literature to assess this information.

Materials and Methods

Sample

For this longitudinal study, the sample was selected from the Women's Brazil Futsal Cup (Special division). All women were professional futsal players. The competition occurs each year in a different state of Brazil, and the players are from the whole country. The first year of data collection (2001) was performed in the Brazilian federal district. In 2011, data were collected in Santa Catarina, and in the last year (2021), the data collection occurred in Parana. Data were collected in 2001 (n= 112), 2011 (n= 115), and in 2021 (n=169) and consists of a total sample of 396 female futsal players. A comparison between 2001 and 2011 has been previously reported elsewhere.[8] Therefore, the current report only takes into account the comparisons between 2001 vs. 2021 and 2011 vs. 2021, and the trends during the years. The inclusion criteria consist solely in being registered in the tournament. No exclusion criteria were applied. This study was approved by the local ethics board (Process n. 039/2011) and complies with the declaration of Helsinki on human research. All players were informed of the procedures of the research and signed a consent form.

Anthropometric Measurements

Anthropometric variables were checked in duplicate if the difference was higher than 0.2 mm for skinfold and 0.5 cm for other variables, a third measurement was performed. More details of the protocol can be also seen in previous publications related to this longitudinal assessment.[8,11] Measurements were taken in a private room, and all data were assessed before the match. The same researcher conducted the measurements over the three data collections. Body mass was assessed by a 100 g precision anthropometric scale (Welmy™ São Paulo, Brazil) and height was measured by a 0.1 cm precision wall-mounted stadiometer. Tensed biceps girth (mid-upper-arm) and calf girth (cm) were measured using a

Table 1. *Sample characterization stratified by the years of data collection(n=396)*

		2001 (n=112)	*2011(n=115)*	*2021 (n=169)*
Age (years)		22.07 ± 5.43	21.98 ± 3.87	25.04 ± 4.83^{a,b}
Body mass (Kg)		58.37 ± 6.95	58.59 ± 7.56	60.33 ± 9.85
Height (cm)		161.80 ± 6.25	161.80 ± 6.54	160.89 ± 5.56
Skinfolds (mm)				
	Triceps	16.18 ± 4.61	16.20 ± 5.15	16.65 ± 5.65
	Subscapular	14.00 ± 4.83	13.00 ± 4.35	14.71 ± 5.84^{b}
	Supraspinale	19.12 ± 7.42	14.01 ± 5.04	14.86 ± 6.42^{a}
	Suprailiac	16.46 ± 6.99	16.60 ± 6.66	18.31 ± 8.21
	midthigh	22.51 ± 6.71	26.07 ± 8.49	27.79 ± 10.18^{a}
	Medial Calf	12.72 ± 4.46	13.00 ± 4.58	14.12 ± 7.09
Body Fat (%)		22.70 ± 5.10	22.18 ± 5.16	19.02 ± 5.09^{a,b}
Body Fat (kg)		13.47 ± 4.26	13.24 ± 4.59	11.84 ± 5.31^{a}
Bone Breadth (cm)				
	Humerus	6.09 ± 0.25	6.06 ± 0.31	5.56 ± 0.29^{a}
	Femur	8.82 ± 0.37	8.83 ± 0.46	8.64 ± 0.52^{a,b}
Girths (cm)				
	Tensed biceps	26.67 ± 2.08	27.43 ± 2.11	28.02 ± 3.03^{a}
	Calf	34.83 ± 2.70	35.31 ± 2.13	35.65 ± 2.80^{a}
Somatotype				
	Endomorph	4.95 ± 1.30	4.52 ± 1.14	4.79 ± 1.30
	Mesomorph	3.27 ± 0.98	4.14 ± 0.92	3.86 ± 1.13^{a}
	Ectomorph	2.06 ± 0.90	2.04 ± 0.97	1.71 ± 0.94^{a,b}

*Values: expressed in mean and standard deviation. a= significant difference for 2001; b= significant difference for 2011. *p<0.05.*

non-elastic tape to the nearest 0.1 cm (MabisTM Curitiba, Brazil). The biceps and calf girth measurements follow the procedures described by the International Standards for Anthropometric Assessment. Biepicondylar humerus and femur breadth were measured to the nearest 0.1 cm with a metal caliper (SometTM Curitiba, Brazil).

Body Fat Percentage

The body fat was calculated through skin folds measurements. Skinfolds were measured in six sites with a precision of 0.1 mm with a Cescorf caliper (CescorfTM Porto Alegre, Brazil). We used sum of three skinfold thicknesses (triceps + supra iliac + midthigh) to determine body density.[12] Subsequently, body fat percentage was estimated using Siri equation.[13]

Somatotype

The somatotype components (e.g., endomorphy, mesomorphy, and ectomorphy) were calculated according to the Heath and Carter Anthropometric Somatotyping Method.[14] For somatotype components the following anthropometric measurements were utilized: height; weight; triceps, subscapular, suprailiac and calf skinfold; humerus and femur bone breadth; tensed biceps and calf girth. For the somatochart, the three components must be converted into two coordinates (X, Y), and the following equations were utilized:[14]

X = ectomorphy – endomorphy

Y= 2x mesomorphy – (endomorphy + Ectomorphy)

The somatochart was designed in R-studio v.4.2.0.

Statistical Analysis

Data were presented in mean and standard deviation. Shapiro-Wilk tests were performed to assess data distribution. The comparison between the years of data collection was performed by the Analysis of Variance (ANOVA) with Bonferroni posthoc. For the comparison mean difference and confidence interval were presented. Linear regressions were conducted to verify the changes between 2001 and 2011 vs. 2021. Data were treated in panels, being each year of data collection represented by each panel. For the effect of analysis, dummy variables were created, and the group of 2001 was inserted as a reference when 2021 was related to it, and 2011 was set as reference for the analysis involving 2011 vs. 2021. Also, residual analysis was performed to verify the adequacy of regression. Secular trends for dependent variables were analyzed with the joint point regression.

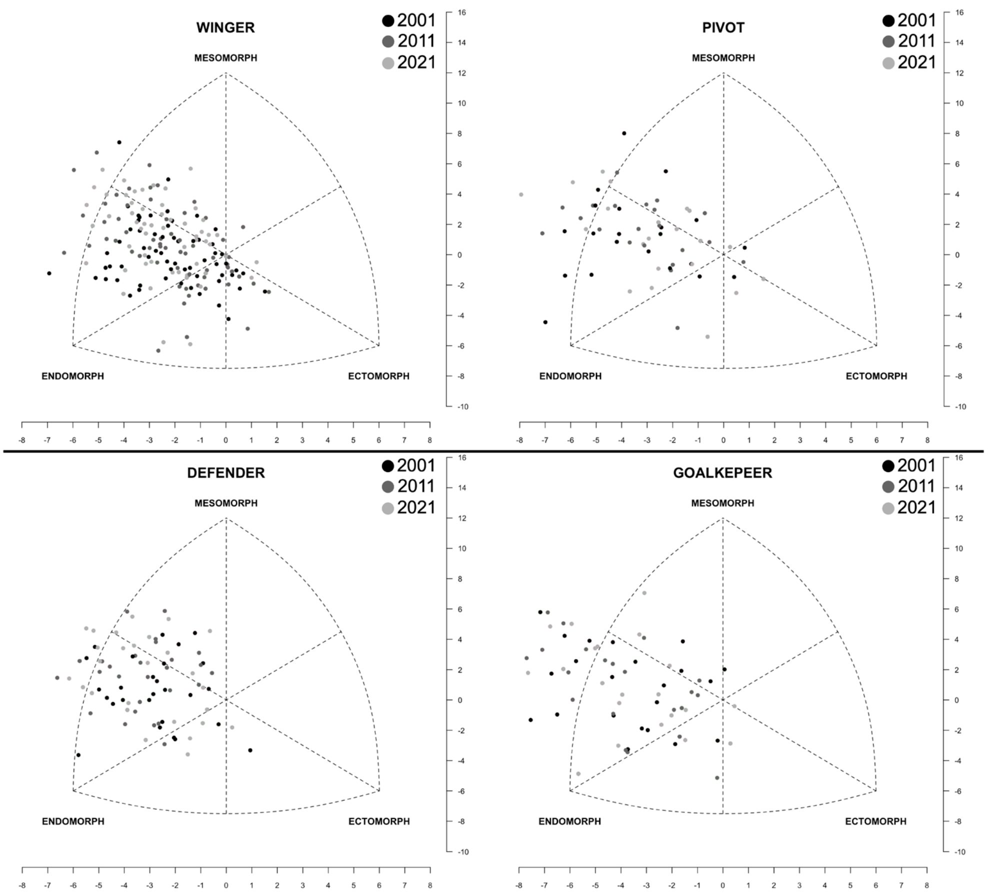

Fig 1. *Somatochart of the female futsal players stratified by positions and year of data collection.*

***Table 2**. Relationship between dependent variables and years of data collection 2001, and 2021.*

		2001 (n=112)	***2011(n=115)***	***2021 (n=169)***
Age (years)		22.07 ± 5.43	21.98 ± 3.87	25.04 ± 4.83[a,b]
Body mass (Kg)		58.37 ± 6.95	58.59 ± 7.56	60.33 ± 9.85
Height (cm)		161.80 ± 6.25	161.80 ± 6.54	160.89 ± 5.56
Skinfolds (mm)				
	Triceps	16.18 ± 4.61	16.20 ± 5.15	16.65 ± 5.65
	Subscapular	14.00 ± 4.83	13.00 ± 4.35	14.71 ± 5.84[b]
	Supraspinale	19.12 ± 7.42	14.01 ± 5.04	14.86 ± 6.42[a]
	Suprailiac	16.46 ± 6.99	16.60 ± 6.66	18.31 ± 8.21
	midthigh	22.51 ± 6.71	26.07 ± 8.49	27.79 ± 10.18[a]
	Medial Calf	12.72 ± 4.46	13.00 ± 4.58	14.12 ± 7.09
Body Fat (%)		22.70 ± 5.10	22.18 ± 5.16	19.02 ± 5.09 [a,b]
Body Fat (kg)		13.47 ± 4.26	13.24 ± 4.59	11.84 ± 5.31[a]
Bone Breadth (cm)				
	Humerus	6.09 ± 0.25	6.06 ± 0.31	5.56 ± 0.29[a]
	Femur	8.82 ± 0.37	8.83 ± 0.46	8.64 ± 0.52[a,b]
Girths (cm)				
	Tensed biceps	26.67 ± 2.08	27.43 ± 2.11	28.02 ± 3.03[a]
	Calf	34.83 ± 2.70	35.31 ± 2.13	35.65 ± 2.80[a]
Somatotype				
	Endomorph	4.95 ± 1.30	4.52 ± 1.14	4.79 ± 1.30
	Mesomorph	3.27 ± 0.98	4.14 ± 0.92	3.86 ± 1.13[a]
	Ectomorph	2.06 ± 0.90	2.04 ± 0.97	1.71 ± 0.94[a,b]

Values are expressed in beta and confidence interval; reference variable was presented in mean and standard deviation. Bold values for p<0.05.

Linear analyses were performed to verify the Annual Percent of Change (APC) over the 20 years involved in the analysis and confidence intervals were presented. The ANOVA and linear regression were performed in Statistical Package for Social Sciences (SPSS) version 26.0. The joint point regression was performed in Joint Point Software version 4.9.1. The significance was set at 5% for all the analyses.

Results

The characterization of the sample is present in Table 1. The data shows significant differences for age, athletes from 2021 are older than previously used plyers from 2011 (MD: 3.07 years; CI: 4.46 – 1.69) and 2001 (MD: 2.99 years; CI: 4.39 – 1.60). Also, the data highlighted the changes in body fat for 2021 athletes, presenting lower values of body fat when compared to 2011 (MD: -3.14 %BF; CI: -4.63 – -1.65) and 2001 (MD: -3.66 %BF; CI: -5.17 – -2.16). When analyzing the tensed biceps and calf griths, the 2021 athletes presented higher values of tensed biceps (MD: 1.35 cm; CI: 2.09 – 0.60) and calf (MD: 0.84 cm; CI: 1.61 – 0.08) in comparison to the previously used plyers from 2001. The somatotype is present in Table 1. The results demonstrate significant differences in the values for ectomorph profile when comparing the 2021 and 2001 (MD: -0.34; CI: -0.62 – 0.07). However, the predominant characteristic has been maintained, which is the meso-endomorph profile. Figure 1 displays the somatotype of different players' position stratified for the years of data collection (2001, 2011, 2021). Differences were found for the mesomorph biotype for the wingers, in which the 2001 athletes had lower values compared to 2021 (MD: -0.65; CI: -1.05 – -0.25). Analyzing the pivots characteristics, the values for ectomorph was significant lower for the 2021 athletes in comparison to the 2011 (MD: -0.72; CI: -1.43 - -0.01) and 2001 (MD: -0.75; CI: -1.47 - -0.04). Analyzing the somatochart of defender and goalkeeper, these categories did not present any differences between the years of data collection. Although pivot and wingers presented significant differences, all positions had the same classification over the years, which is a predominance of endomorph and secondly mesomorph, classified as meso-endomorph. The relationships between the years of data collection are presented in Table 2 and 3. The results

Table 3. *Relationship between dependent variables and years of data collection 2011, and 2021.*

		2011 (reference) (mean ± SD)	2021 (Beta and CI)
Age			
	GoalKepeer	22.45 ± 4.35	**3.39 (0.59 – 6.20)**
	Defender	22.28 ± 4.27	**3.78 (1.16 – 6.39)**
	Winger	21.92 ± 3.47	**2.19 (0.79 – 3.58)**
	Pivot	21.29 ± 3.93	**4.41 (1.58 – 7.24)**
Body Mass			
	GoalKepeer	63.78 ± 10.42	6.05 (-2.35 – 14.47)
	Defender	60.94 ± 5.93	-0.58 (-3.49 – 2.31)
	Winger	55.01 ± 5.17	1.33 (-0.64 – 3.31)
	Pivot	59.15 ± 7.15	3.55 (-0.82 – 7.94)
Height			
	GoalKepeer	163.59 ± 8.52	1.49 (-3.06 – 6.05)
	Defender	163.33 ± 5.58	-2.24 (-4.93 – 0.44)
	Winger	160.18 ± 6.33	-0.78 (-2.74 – 1.16)
	Pivot	162.01 ± 5.30	-1.31 (-4.20 – 1.56)
Body Fat (%)			
	GoalKepeer	25.64 ± 6.46	-3.95 (-7.95 – 0.04)
	Defender	22.91 ± 5.80	**-2.72 (-5.29 - -0.14)**
	Winger	20.53 ± 3.93	**-3.30 (-4.74 - -1.85)**
	Pivot	21.83 ± 3.77	-1.61 (-4.20 – 0.97)
Body Fat (kg)			
	GoalKepeer	16.75 ± 6.46	-0.69 (-5.49 – 4.09)
	Defender	14.13 ± 4.55	-1.84 (-3.85 – 0.16)
	Winger	11.41 ± 3.00	**-1.55 (-2.64 - -0.45)**
	Pivot	13.05 ± 3.38	-0.12 (-2.56 – 2.31)
Biceps girth (tensed) (cm)			
	GoalKepeer		
	Defender	29.65 ± 2.62	0.65 (-1.35 – 2.65)
	Winger	27.67 ± 1.66	0.34 (-0.73 – 1.41)
	Pivot	26.45 ± 1.56	0.70 (-0.11 – 1.52)
		27.33 ± 2.01	0.94 (-0.49 – 2.38)
Calf girth (cm)			
	GoalKepeer	36.33 ± 2.62	1.33 (-0.86 – 3.53)
	Defender	36.18 ± 1.66	0.36 (-1.48 – 0.74)
	Winger	34.30 ± 1.63	0.47 (-0.19 – 1.13)
	Pivot	35.62 ± 2.25	0.51 (-0.80 – 1.84)

Note: Values are expressed in beta and confidence interval; reference variable was presented in mean and standard deviation. Bold values for p<0.05.

of the regression showed an increase in the body mass for the pivots over the years, in which the players from 2021 have 5.30 (CI: 1.37 -9.23) more units in relation to the 2001 players. The analysis of body fat percentage demonstrates a decrease over the years. The goalkeeper, defender, and winger presented a negative beta for body fat when the relationship was performed. Also, the goalkeeper and pivot increase their biceps girth, and the pivot significantly increases their calf girth. The annual percentage of change (APC) is listed in Table 4. The results showed significant trends for body mass and body fat. The defender position has an APC significant for the body mass (APC: 0.2 kg; CI:0.2 – 0.3). The winger presents significant trends of decrease in body fat (APC: -1.2 %BF; CI: -1.6 - -0.8).

Discussion

The main purpose of this study was to describe the anthropometric measurements and somatotype of the elite female futsal players from Brazil in 2021 and

***Table 4**. Annual percent change (APC) for the period of 2001 – 2021 in according to players position obtained by jointpoint regressions.*

		2011 (reference) (mean ± SD)	2021 (Beta and CI)
Age			
	GoalKepeer	22.45 ± 4.35	**3.39 (0.59 – 6.20)**
	Defender	22.28 ± 4.27	**3.78 (1.16 – 6.39)**
	Winger	21.92 ± 3.47	**2.19 (0.79 – 3.58)**
	Pivot	21.29 ± 3.93	**4.41 (1.58 – 7.24)**
Body Mass			
	GoalKepeer	63.78 ± 10.42	6.05 (-2.35 – 14.47)
	Defender	60.94 ± 5.93	-0.58 (-3.49 – 2.31)
	Winger	55.01 ± 5.17	1.33 (-0.64 – 3.31)
	Pivot	59.15 ± 7.15	3.55 (-0.82 – 7.94)
Height			
	GoalKepeer	163.59 ± 8.52	1.49 (-3.06 – 6.05)
	Defender	163.33 ± 5.58	-2.24 (-4.93 – 0.44)
	Winger	160.18 ± 6.33	-0.78 (-2.74 – 1.16)
	Pivot	162.01 ± 5.30	-1.31 (-4.20 – 1.56)
Body Fat (%)			
	GoalKepeer	25.64 ± 6.46	-3.95 (-7.95 – 0.04)
	Defender	22.91 ± 5.80	**-2.72 (-5.29 - -0.14)**
	Winger	20.53 ± 3.93	**-3.30 (-4.74 - -1.85)**
	Pivot	21.83 ± 3.77	-1.61 (-4.20 – 0.97)
Body Fat (kg)			
	GoalKepeer	16.75 ± 6.46	-0.69 (-5.49 – 4.09)
	Defender	14.13 ± 4.55	-1.84 (-3.85 – 0.16)
	Winger	11.41 ± 3.00	**-1.55 (-2.64 - -0.45)**
	Pivot	13.05 ± 3.38	-0.12 (-2.56 – 2.31)
Biceps girth (tensed) (cm)			
	GoalKepeer		
	Defender	29.65 ± 2.62	0.65 (-1.35 – 2.65)
	Winger	27.67 ± 1.66	0.34 (-0.73 – 1.41)
	Pivot	26.45 ± 1.56	0.70 (-0.11 – 1.52)
		27.33 ± 2.01	0.94 (-0.49 – 2.38)
Calf girth (cm)			
	GoalKepeer	36.33 ± 2.62	1.33 (-0.86 – 3.53)
	Defender	36.18 ± 1.66	0.36 (-1.48 – 0.74)
	Winger	34.30 ± 1.63	0.47 (-0.19 – 1.13)
	Pivot	35.62 ± 2.25	0.51 (-0.80 – 1.84)

Note: CI: 95% Confidence Interval. Bold values for variable with p<0.05.

analyze the changes and trends over time (vs. 2011 and 2001) in these physical characteristics. The results demonstrated a decrease in body fat percentage in the last year of data collection (2021), and an increase in mesomorph profile from 2001 to 2021. Also, the ectomorph profile decreased over time. Moreover, wingers presented a linear tendency to decrease their fat over the years, around 1.2 kg each decade. Lastly, pivots increased body mass in relation to the 2001 athletes. The results of the present study showed maintenance of body mass over the years for the whole group. When making an analysis stratified by the player's position, the pivots increased their body mass and biceps and calf circumference, with no change to body fat. With regards to other positions (goalkeeper, defender, winger), all of them demonstrated a decrease in body fat. These results might be related to an increase in the player's muscle mass. Also, it is important to highlight that the decrease in body fat and increase in muscle mass can be related to a specialization of the sport once a competition with high-performance demand requires intensified training.[15] Although performance-related outcomes were not measured in the current study, physical performance improvements can be linked to changes in body composition, once adiposity and biotype are linked to agility, speed and maximum oxygen consumption.[16] Moreover, excess body fat can be related to the worst motor and technical skills during a match,[17] whereas low body fat promote better performance for athletes.[16,18] When analyzing the somatotype of athletes, the present study found a decrease in scores of ectomorphy over the years. On the other hand, a meso-endomorph profile became more predominant since the study has started. This result is particularly important for female futsal players and their coaching staff. When compared to female futsal players from other countries, the same characterization has been observed in female futsal players from Spain.[19,20] Mesomorph characteristics are associated with increased power and strength.[20,21] Moreover, an endomorph biotype related to a high-fat percentage can help females adapt to the energetic demands of the training routine.[20] Fat is essential for physiological and reproductive functions in females. Our team previously demonstrated that athletes with early age of menarche have higher adiposity when compared to their peers (normal and late).[11] However, if the predominance had changed to endo-mesomorph, some performance-related markers such as aerobic fitness and recovery capacity could have been increased.[22] Although these assumptions may seem logical, there is still the need for future investigations to clarify their practical implications.[11] For the winger athletes, changes from 2001 to 2021 should be highlighted. Although this increase is slight, it can show specialization of this position over the years. Improving the muscle mass of this position and consequently increasing the performance in accelerations and sprints; is necessary for better performance in futsal.[23] The secular trends of female futsal players showed a significant tendency to decrease 1.2% the body fat of wingers each decade. This result can be related to the specificity of the winger position since it is a position that demands high power, anaerobic capacities and repeated sprints.[1,8] Also, this result can be occasioned by training programs developed to improve the capacities utilized by the winger.[4] In the sample of the present study the athletes from 2021 have more time of futsal practice (2001: 5.7±3.4 years, 2011: 8.9±4.3 years, 2021: 13.3±5.6). This result demonstrates a significant evolution in the physical characteristics. Since this is the first study in the literature that shows the secular trends of female futsal players, it is challenging to compare these particular findings with the literature. Our study provides information about important morphological alterations/adaptations in the last 20 years with Brazilian elite futsal athletes. It is necessary to highlight that the practice of futsal for women was made official at the end of the 20th century, approximately 40 years ago. During this period, there were specific organic adaptations in the athletes that, unfortunately, were not completely recorded. The limit for these adaptations is unknown. However, there is still room for changes in body composition that the improvement in physical performance would impose. For example, the difference in maximum oxygen consumption (VO_2max), an important variable associated with body fat, in elite female futsal athletes is greater than 10% compared to male athletes. Studies with elite athletes revealed VO_2max values ranging from 62.9±5.3 ml.kg^{-1}min^{-1} [24] to 63.7±4.1 ml.kg^{-1}min^{-1} for men,[25] and 45.3±5.6 ml.kg^{-1} min^{-1} for women,[26] a difference of 18 ml.kg^{-1}min^{-1} (≈16%) between males and females. One important limitation of the current analysis is our lack of information on potential effect that the COVID-19 pandemic might have had in our analysis. The last data collection was conducted in 2021 when sports competitions returned after approximately two years of lockdown. Another limitation is related to the lack of physical performance assessment and the changes on environment conditions between the years. The longitudinal natural of the study is an important strength of our analysis. The update in our previous report with data collected in 2021 adds value to the field and provides useful information for coaches, trainers, and athletes. This study found that, over the last 20 years, body fat reduced, and tensed biceps and relaxed calf girths increased, suggesting an increase in fat-free mass content from the limbs. The practical application of this study is highlighted by the changes in morphology suffered, mainly, by the winger position. These changes are often caused by the demands of the match or training to which the athletes are exposed. Also, future studies should analyze the performance of female futsal player and how it changes over the years.

List of acronyms

ANOVA - analysis of variance
APC - annual percent of change
BF% - body fat percentage
Cm – centimeters
CI – 95% confidence interval
MD – mean difference
Kg – kilogram
VO2max - maximum oxygen consumption

Contributions of Authors

VW: Conception and design, methodology, data collection, analysis and interpretation of data, drafting the article, final approval; DD: Conception and design, drafting the article, final approval; DS: Analysis and interpretation of data, drafting the article, final approval; TC: Revising it critically, analysis of data, final approval; BP: Revising it critically, analysis of data, final approval; SA: Methodology, drafting the article, supervision, final approval; MQ: Conception and design, methodology, data collection, supervision, revising it critically, final approval. The data that support the findings of this study are available from the corresponding author All authors read and approved the final edited typescript.

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Conflict of Interest

The authors declare no competing interest.

Ethical Publication Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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