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Body composition assessment of paddle and tennis adult male players

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Abstract

Introduction: **Racket sports require athletes to constantly improve and progress in their physical qualities in order to maintain competitive standards. This includes achieving and maintaining an optimal body composition. However, few studies have been published addressing this topic.**

Objective: **This study tries to provide a complete anthropometric profile, including somatotype and body composition, of paddle and tennis male adult players.**

Methods: **Anthropometric parameters including weight, height, skinfolds, girths and breadths were measured in 21 paddle and 26 tennis players, and the results were compared between the two groups as well as a control group, who did not play racket-based sports.**

Results: **No significant differences in any body composition variable were found comparing tennis vs paddle players, with both groups showing a meso-endomorphic somatotype. The athletes presented lower muscle mass, and therefore less mesomorphic component, compared to the control group.**

Conclusion: **Since body composition is a major determinant in racket sport performance, it is instrumental to control fat and muscle body mass by using adequate dietetic and nutritional tools as well as optimal training programs.**

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Key words: *Racket sports. Paddle. Tennis. Body composition. Somatotype.*

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ESTUDIO DE LA COMPOSICIÓN CORPORAL DE JUGADORES ADULTOS DE PÁDEL Y TENIS

Resumen

Introducción: **los deportistas que practican disciplinas deportivas de raqueta necesitan mejorar constantemente sus cualidades físicas con el fin de competir al máximo nivel. Por lo tanto, es necesario conseguir y mantener en dichos jugadores una óptima composición corporal, pero no obstante, existen pocos estudios publicados relacionados con esta temática.**

Objetivo: **el presente trabajo trata de ofrecer un perfil antropométrico completo, incluyendo el somatotipo y la composición corporal de jugadores varones adultos de pádel y tenis.**

Material y métodos: **se realizaron diversas medidas antropométricas, incluyendo peso corporal total, estatura, pliegues cutáneos, perímetros y diámetros, en 21 jugadores de pádel y 26 jugadores de tenis. Los resultados obtenidos de cada grupo de jugadores se compararon entre ellos y frente a un grupo control que no practicaba deportes de raqueta.**

Resultados: **no se encontraron diferencias significativas en cuanto a las variables de composición corporal analizadas entre los grupos de jugadores de pádel y tenis, mostrando ambos grupos un somatotipo meso-endomófico. Los jugadores presentaron una menor masa muscular, y por tanto un menor componente mesomórfico, cuando se compararon con el grupo control.**

Conclusión: **ya que la composición corporal es determinante en el rendimiento de los jugadores de deportes de raqueta, es imprescindible realizar un control de la grasa y masa muscular mediante herramientas dietético-nutricionales así como de programas de entrenamiento adecuados.**

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Palabras clave: *Deportes de raqueta. Pádel. Tenis. Composición corporal. Somatotipo.*

Abbreviations

BMI: body mass index or Quetelet index. Measure that links weight and height (weight (kg)·height (m)-2) and with a correlation with the body fat.

DXA: dual-energy X-ray absorptiometry. Technique used primarily to evaluate bone mineral density and based in the X-ray absorption by different tissues.

ISAK: International Society for the Advancement of Kinanthropometry. Organization that works on the standardization of anthropometric techniques and applications.

MRI: magnetic resonance imaging. Non invasive technique used in medicine based in magnetic fields and image treatment.

SAM: somatotype attitudinal mean. The average of the distance in three dimensions between the somatopoints from the mean somatopoint of a sample.

TEM: technical error of measurement. Represents the measurement quality and control dimension in anthropometry.

Introduction

Anthropometric measurements provide useful information concerning body composition parameters, making them a useful tool and a practical alternative to other costly methods based on image technology, in competitive sports. Competition at the highest level is in close correlation with specific phenotypic characteristics of the athletes, which are obtained in part by analyzing their anthropometric profile[1-4]. Current advances allow us to obtain reliable results in in terms of body composition through the use of magnetic resonance imaging (MRI) or dual-energy X-ray absorptiometry (DXA) techniques[5-6]. However, these techniques are not as portable or inexpensive as anthropometry, which can be used directly in the field. Therefore, anthropometry is a very fast method to obtain information of the athlete's nutritional and body composition, which can be reproduced and compared to other athletes of the sport discipline as well as track their own values throughout the season.

Paddle is a racket-based sport that is generally played in double matches on a 50 m^2 court for each player, surrounded by walls that can be used during the match. This allows a wide range of movements during paddle matches, although the physiological determinants remain to be analyzed in this particular discipline.

On the other hand, tennis is another racket-based sport where the player´s movements are performed in a 98 (single-match) or 130 m^2 (double-match) court. Therefore, many movements on court are based on short sprints of 2-10 s covering distances of 8-12 m[7-8]. The different types of surfaces (grass, clay, hard, etc.) and tennis balls force the athletes to adapt to different physiological requirements, and therefore, energetic demands[9]. Regarding metabolic energy expenditure during a tennis match, the players normally reach an average heart rate of 70-85% with respect to their maximum level, using both aerobic and anaerobic metabolic pathways to obtain energy[10-11]. Anaerobic pathways may entail 32% of the total energetic expenditure during the match, being 95% during the hit of the ball[12]. Blood lactate levels remain constant around 1.8-2.8 mmol·L-1[13-15], increasing to 8 mmol·L-1 in long and high intensity matches[16]. Regarding glycemia, blood glucose levels are maintained without alterations in matches that last between 90-180 min[13,17]. Since the match duration and the different neuromuscular intensity phases are very variable, energy recovery is influenced by many factors[18].

All the above mentioned parameters can be conditioned by a non-optimal body composition. In this context, fat mass excess may impair sports performance[19], thus many authors study the correlation of sports results, along with technical and tactical abilities, with body composition[20-22]. In addition, a high body fat level increases the possibility of developing injuries[23]. Therefore, racket sports should not be an exception to these premises, suggesting the importance of reaching an adequate somatotype through diet and training.

Several publications have studied the somatotype and anthropometric parameters in adolescent tennis players, however none have been thoroughly studied in adult athletes. Furthermore, there is no information concerning anthropometric characteristics of paddle players and the present study intends to fulfill this gap.

Objectives

The present work tries to provide a complete anthropometric profile, including somatotype and body composition, of paddle and tennis male adult players; offering an useful information about the average profile of each sport discipline and serving as tool to evaluate athletes of these disciplines.

Method

Participants

A total of 21 Caucasian adult male paddle players were recruited from a national university paddle championship in the modality of doubles. Twenty-six Caucasian adult male tennis players (4 professional and 22 university-level) participated in this study. The 4 professional tennis players were ranked in the ATP´s top 50. The remaining (n =22) tennis players were recruited from the national university tennis championship in the modality of singles, who were in the top 150 of the national ranking. Lastly, 25 Caucasian adult male athletes that did not practice racket-based sport disciplines were used as control group, chosen from the same university as the other candidates.

Participants were informed about the objective of the study and gave their written consent to participate. The study was in accordance with local legal requirements and the Helsinki Declaration for research on human beings, and approved by the Ethics Committee of University Miguel Hernandez (reference IB.ER.06.13). Anonymity was preserved for all participants.

Data collection

Anthropometric measurements were performed in the student tennis and paddle players on the first day of the championship before the matches. In the case of the professional tennis players, the measurements were performed during routine supervision sessions between ATP tournaments. The control group was measured throughout the school year. The restricted profile of ISAK I (International Society for the Advancement of Kinanthropometry) methodology was used by two ISAK accredited anthropometrists with an individual technical error of measurement (TEM) of 0.76% for skinfolds and 0.12% for the remaining parameters, both in the range of ISAK accreditation (<7.5% for skinfolds and <1.5% for the rest of measurements). Anthropometric parameters included weight in kg, height in m, eight skinfolds in mm (triceps, subscapular, biceps, suprailiac, supraspinal, abdominal, medial thigh and medial calf), four girths in cm (relaxed arm, flexed and tensed arm, waistline, hip, thigh and maximum calf) and three breadths in cm (femoral biepicondylar, humeral epicondylar and bistyloid of the wrist)[24]. Skinfolds, girths and breadths were measured with a caliper, flexible metallic tape and pachymeter, respectively (Holtain, Crymych, UK). A calibrated digital scale (Tanita, Tokyo, Japan) was used to obtain the weight.

Body composition analyses

Bone and muscle mass were obtained through Rocha's equation[25] and Lee´s formula[26], respectively. Fat mass was estimated using Siri's formula[27], obtaining the corporal density value through Withers' equation[28]. Residual mass was calculated from the difference between the total body weight minus the sum of the bone, muscle and fat masses.

Somatotype components were obtained from the analysis of different body compartments, including muscle mass for mesomorphy, fat mass for endomorphy and thinness and relative bone linearity for ectomorphy. Somatochart was obtained from these components[29]. The differences between each individual somatopoint with respect to the mean value was calculated using the somatotype attitudinal mean (SAM)[30].

Statistical analysis

SPSS Statistics V.20 package (Illinois, USA) was used to process the anthropometric data obtained from the volunteers. Standard descriptive statistics were presented as mean ± standard deviation (SD) and range. One-sample K-S test (Kolmogorov-Smirnov test) and Homoscedasticity Levene test were performed in order to assess if each variable fitted a normal distribution. Parametric and non-parametric tests for independent samples (T test and Mann-Whitney test) were used to compare the anthropometric data between paddle and tennis players. A two-way analysis of variance (ANOVA) was used to test the differences between paddle, tennis and control groups. Values with a $p<0.05$ were considered significant. A profile chart with norms, using percentiles (p values of 5, 10, 25, 50, 75, 90, 95) was constructed.

Results

Table I shows age and anthropometric characteristics of tennis, paddle and control groups monitored. The body mass index (BMI) ranged between 23.5-23.6 $kg \cdot m^{-2}$ and a distribution of muscle mass and fat percentage were 32.4-39.2 kg and 16.2-18.3% respectively in players of both sport disciplines. Therefore, no significant differences were detected between tennis and paddle players regarding the different anthropometric parameters. However, significant differences were detected in muscle mass, mesomorphic content and suprailiac skinfold value when compared to the control group.

However, when the data obtained from anthropometric measurements of both sports disciplines were calculated in percentiles following a normal distribution of frequencies, some tendencies were observed (tables II and III). At the 50th percentile, the tennis players presented a lower but not significant fat mass percentage than paddle players. These small differences were in accordance with the somatotype calculated at the 50th percentile, presenting higher mesomorphic and ectomorphic values in tennis than in paddle players.

The mean somatotype of tennis and paddle players was located in the meso-endomorphy area when the data were displayed in a somatochart (Fig. 1). However, and despite maintaining the mean somatotype in this area, paddle players tended to stay in the endomorphic component in a non-significant manner. Furthermore, SAM results were not significant.

Discussion

To our knowledge, this is the first report studying anthropometric parameters in adult paddle players. Regarding tennis players, previous studies have been published in adolescent tennis practitioners (under 18 years of age)[31,32] and in adults using DXA[33] but only to study body fat percentage. Therefore, this report is the first presenting complete anthropometric data of adult tennis players, including 4 individuals in the top 50 of the ATP ranking.

The main observation was that there were no significant differences when comparing anthropometric parameters in players from both sports. Skinfold values were similar between tennis and paddle players, indicating very similar body fat contents (tables I-III).

Table I
Descriptive anthropoemtric characteristics for adult tennis (n =26), paddle players (n =21), and university athletes (control) (n =25)

	Tennis			Paddle			Control			p Value
	mean		s	mean		s	mean		s	
Age (years)	23.0	±	3.7	23.1	±	3.6	21.0	±	1.9	0.008*
Body mass (Kg)	74.7	±	7.5	74.3	±	8.6	74.0	±	6.9	ns
Height (m)	1.8	±	0.1	1.8	±	0.1	1.8	±	0.1	ns
BMI ($kg \cdot m^{-2}$)	23.5	±	1.7	23.6	±	2.1	23.6	±	2.3	ns
Sum of 7 skinfold (mm)	92.3	±	28.6	104.3	±	34.8	87.3	±	28.1	ns
Subscapular skinfold (mm)	11.0	±	2.6	12.2	±	4.6	11.8	±	3.7	ns
Triceps skinfold (mm)	12.4	±	4.3	13.3	±	5.0	10.6	±	3.9	ns
Biceps skinfold (mm)	5.8	±	2.3	6.2	±	2.2	5.9	±	2.9	ns
Suprailiac skinfold (mm)	19.9	±	6.2	21.2	±	7.5	15.4	±	5.1	0.006**
Supraspinal skinfold (mm)	10.6	±	4.4	13.0	±	6.0	12.0	±	5.1	ns
Abdominal skinfold (mm)	18.1	±	8.0	20.5	±	9.0	16.1	±	6.1	ns
Thigh skinfold (mm)	14.5	±	5.4	17.8	±	6.6	15.5	±	6.8	ns
Calf skinfold (mm)	9.8	±	4.0	10.8	±	5.1	9.5	±	4.1	ns
Upper arm girth relaxed (cm)	30.8	±	2.5	30.9	±	2.5	31.4	±	2.5	ns
Upper arm girth flexed and tensed (cm)	32.7	±	2.3	32.9	±	2.4	33.4	±	2.6	ns
Thigh girth (cm)	52.4	±	3.2	52.2	±	3.6	54.0	±	3.8	ns
Calf girth (cm)	37.5	±	1.8	37.1	±	1.9	37.7	±	1.8	ns
Humeral breadth (cm)	7.2	±	0.4	7.1	±	0.3	7.0	±	0.5	ns
Wrist breadth (cm)	5.8	±	0.3	5.8	±	0.2	5.8	±	0.4	ns
Femoral breadth (cm)	10.0	±	0.6	9.8	±	0.4	9.9	±	0.5	ns
Endomorphy	3.3	±	1.0	3.7	±	1.2	3.3	±	1.2	ns
Mesomorphy	4.3	±	1.2	4.1	±	0.9	5.6	±	1.1	<0.001**
Ectomorphy	2.5	±	0.9	2.4	±	0.8	2.4	±	1.2	ns
SAM	1.6	±	7.9	1.6	±	7.1	1.7	±	8.7	ns
Muscle mass (kg) (Lee. 2000)	33.2	±	3.6	32.4	±	3.0	39.7	±	3.3	<0.001**
Fat mass (%) (Siri. 1961)	16.2	±	5.0	18.3	±	6.2	11.4	±	4.2	ns
Waist perimeter (cm)	80.6	±	4.6	80.3	±	4.3	80.1	±	3.9	ns
Hip perimeter (cm)	97.2	±	4.3	97.0	±	5.7	96.3	±	5.0	ns
Waist·Hip^{-1}	0.8	±	0.0	0.8	±	0.0	0.8	±	0.0	ns
Sum of 3 skinfold (mm)	34.0	±	10.2	38.6	±	13.7	34.4	±	11.5	ns
Sum of 6 skinfold (mm)	86.4	±	26.7	98.1	±	32.9	81.4	±	26.3	ns
Sum of 8 skinfold (mm)	102.0	±	31.5	115.0	±	38.5	96.7	±	30.4	ns

(mean+s), ns = not significant; * = Control vs Paddle; ** = Control vs Paddle and Tennis.

As a difference, tennis players tended to the ectomorphism in a non-significant manner than paddle players, coinciding with value distribution at the 50th percentile (tables II and III). This similarity in body composition for both sport disciplines could be due to the fact that many tennis players can leave tennis practice and start a new career in paddle or combine both disciplines. This is the case of the paddle players monitored in this study. The comparison with a control group, using volunteers of similar age than the athletes, indicated significant differences in the muscle component. This indicates an imbalance between lean mass and body

Table II
Anthropometric profile chart for the total adult tennis players (n =26)

Percentiles	*5*	*10*	*25*	*50*	*75*	*90*	*95*
Age (years)	18.4	19.0	19.8	22.5	27.0	28.3	29.7
Body mass (Kg)	63.3	64.7	68.1	74.6	81.4	84.0	88.3
Height (m)	1.7	1.7	1.7	1.8	1.8	1.9	1.9
BMI (kg·m^{-2})	20.7	21.3	22.5	23.0	24.7	25.4	27.8
Sum of 7 skinfold (mm)	51.3	56.0	62.7	90.5	117.4	135.0	139.3
Subscapular skinfold (mm)	6.8	7.7	9.2	10.8	12.4	14.9	16.7
Triceps skinfold (mm)	5.5	6.4	9.0	11.9	17.0	18.1	19.8
Biceps skinfold (mm)	3.1	3.3	4.1	5.4	7.6	9.3	11.2
Suprailiac skinfold (mm)	10.0	11.5	14.7	19.0	24.4	27.8	31.7
Supraspinal skinfold (mm))	5.1	5.3	6.2	10.4	13.4	16.6	20.1
Abdominal skinfold (mm)	7.4	9.0	11.4	16.3	26.0	29.7	32.6
Thigh skinfold (mm)	6.9	7.4	10.3	13.6	18.5	23.1	25.6
Calf skinfold (mm)	4.2	4.9	6.0	9.5	12.0	15.3	19.4
Upper arm girth relaxed (cm)	26.4	27.4	28.4	31.1	32.4	34.0	35.4
Upper arm girth flexed and tensed (cm)	28.7	29.7	31.0	33.0	34.0	35.2	38.1
Thigh girth (cm)	46.7	48.4	50.8	52.4	54.0	57.2	59.5
Calf girth (cm)	34.7	35.0	36.0	38.0	38.7	40.0	41.2
Humeral breadth (cm)	6.4	6.6	6.9	7.2	7.5	7.6	7.7
Wrist breadth (cm)	5.4	5.5	5.6	5.8	6.0	6.3	6.5
Femoral breadth (cm)	9.1	9.3	9.7	10.0	10.2	10.5	11.5
Endomorphy	1.5	1.7	2.4	3.5	4.0	4.4	5.2
Mesomorphy	1.9	2.2	3.6	4.5	4.9	5.9	6.1
Ectomorphy	0.5	1.3	1.9	2.6	3.1	3.7	3.9
Muscle mass (kg) (Lee, 2000)	27.2	29.3	31.0	32.8	35.0	37.6	42.7
Fat mass (Siri, 1961) (%)	9.0	9.9	11.0	15.8	20.6	23.8	24.5
Waist perimeter (cm)	71.8	75.0	76.0	80.3	84.9	87.0	88.4
Hip perimeter (cm)	88.7	90.0	93.9	98.3	100.4	101.7	104.5
Waist·Hip^{-1}	0.8	0.8	0.8	0.8	0.9	0.9	0.9
Sum of 3 skinfold (mm)	17.8	19.4	25.6	34.8	41.9	46.9	53.6
Sum of 6 skinfold (mm)	47.7	52.7	57.8	86.1	110.6	127.9	129.5
Sum of 8 skinfold (mm)	55.7	60.8	72.8	100.5	132.4	147.0	151.9

fat in tennis and paddle players, which may be due in part to a poor control in diet[34]. These athletes tend to travel frequently to compete in different tournaments around the world and one of the major difficulties is to control the intakes and manage adequate diet plans.

Compared to studies performed in adolescents[31,32], adult tennis players presented lower muscle mass percentages, around 44.6% (table I) vs 47%[32]. On the other hand, body fat percentage in adults was approximately 16.2% (table I), while adolescents presented values ranging 14.6-15.8%[31,32]. These differences determine the BMI values and somatotype of both types of players. The BMI of adolescent tennis players ranged 21.5–22.3 kg·m^{-2} [31,32], while in adults the values were approximately 23.5 kg·m^{-2} (table I). In this regard, endomorphic values in young players were lower than the mean value detected in adults: 2.4[32] and 3.3 (table I) respectively. The endomorphia values were also higher in adults (5.2, see percentile 95th in table II) compared to adolescents (4.3[32]). However the

Table III *Anthropometric profile chart for the total adult paddle players (n =21)*							
Percentiles	*5*	*10*	*25*	*50*	*75*	*90*	*95*
Age (years)	18.1	19.0	21.0	23.0	24.5	27.6	34.3
Body mass (Kg)	62.6	65.2	68.2	73.0	79.0	91.0	96.1
Height (m)	1.7	1.7	1.7	1.8	1.8	1.8	1.9
BMI ($kg \cdot m^{-2}$)	21.0	21.0	22.0	23.4	24.7	27.6	28.5
Sum of 7 skinfold (mm)	49.3	66.2	76.4	95.8	134.1	151.0	179.1
Subscapular skinfold (mm)	7.4	8.1	8.9	11.3	13.6	17.9	27.0
Triceps skinfold (mm)	5.4	6.7	9.0	13.8	16.5	20.0	25.2
Biceps skinfold (mm)	4.0	4.2	4.4	5.6	8.1	10.0	11.7
Suprailiac skinfold (mm)	9.9	11.5	14.6	19.3	29.3	32.9	33.4
Supraspinal skinfold (mm))	5.4	7.6	8.5	10.7	16.5	23.0	28.1
Abdominal skinfold (mm)	8.8	9.2	13.9	19.0	27.6	33.9	38.7
Thigh skinfold (mm)	6.7	8.8	13.3	16.2	24.4	25.6	30.5
Calf skinfold (mm)	4.2	5.6	6.7	9.2	13.0	20.7	21.3
Upper arm girth relaxed (cm)	25.3	28.0	29.3	31.1	32.3	34.6	36.2
Upper arm girth flexed and tensed (cm)	28.2	29.9	31.0	33.5	35.0	35.7	37.8
Thigh girth	46.8	48.1	49.0	52.0	55.1	56.9	60.0
Calf girth (cm)	33.1	34.1	35.8	36.9	38.9	39.4	40.0
Humeral breadth (cm)	6.3	6.7	7.0	7.2	7.4	7.5	7.8
Wrist breadth (cm)	5.1	5.5	5.7	5.8	5.9	6.2	6.2
Femoral breadth (cm)	9.0	9.4	9.6	9.8	10.2	10.2	10.6
Endomorphy	1.7	2.3	2.8	3.5	4.6	5.7	6.3
Mesomorphy	2.2	3.0	3.5	4.0	4.9	5.5	5.8
Ectomorphy	0.8	1.2	1.8	2.2	3.3	3.6	3.8
Muscle mass (kg) (Lee, 2000)	26.8	27.5	30.8	32.7	34.6	36.7	38.4
Fat mass (Siri, 1961) (%)	8.7	11.6	13.4	16.8	23.6	26.7	31.9
Waist perimeter (cm)	71.8	73.8	77.5	80.0	83.7	85.7	89.2
Hip perimeter (cm)	90.1	91.1	93.1	96.0	100.3	103.7	113.9
$Waist \cdot Hip^{-1}$	0.8	0.8	0.8	0.8	0.9	0.9	0.9
Sum of 3 skinfold (mm)	18.4	24.5	28.5	36.2	47.8	60.8	72.6
Sum of 6 skinfold (mm)	44.6	61.5	71.8	91.6	126.0	142.4	168.9
Sum of 8 skinfold (mm)	53.7	73.0	83.1	103.6	145.5	169.8	198.0

ectomorphic values were very similar in both populations (2.5, see table I), similar to that observed in previous studies[32]. Several factors could explain these anthropometric differences, including diet composition[31] together with an increase of hormonal levels and neuromuscular activation[35,36]. However, more studies are necessary to confront these questions and determine the role of diet in these observations.

Overall, this is the first report to study average tennis somatotype, located in the meso-endomorphic area. In a previous study using DXA assessment, the percentage of body fat in adult tennis players was calculated at approximately 10.3%[33], which is lower than the anthropometric measurements provided in this study (16.2%; table I). Indeed, DXA analysis is more accurate than kinanthropometry, since the formulas to develop equations from anthropometric measurements are not specific to sports disciplines. However, DXA is not a suitable technique for outdoor use. In addition, the population studied in the

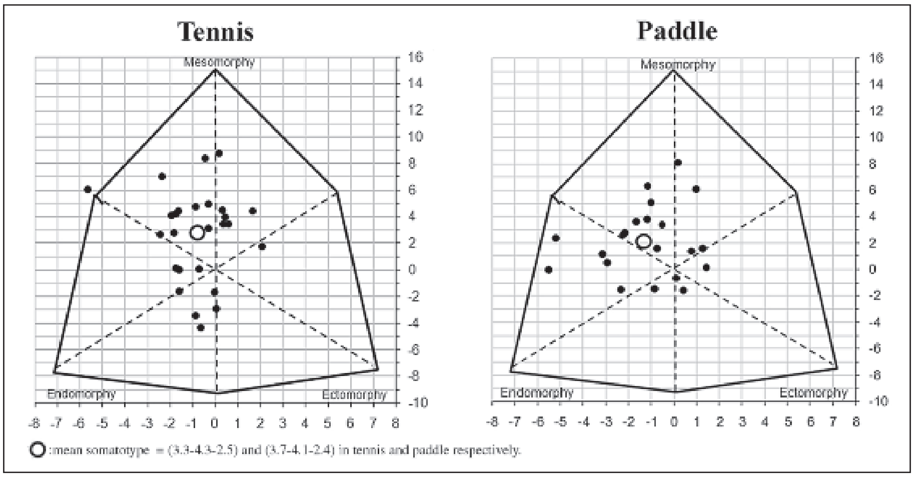

Fig. 1.—Somatotype distribution of adult tennis players (n=26) and adult paddle players (n=21).

previous work using DXA was not the same used in this study. In any study, it is necessary to take in account both methodology and data treatment so that data comparisons may be performed between studies. In this context, anthropometry presents a distinct advantage over other techniques, as it is regularly used in numerous studies from a wide range of sport disciplines. Furthermore, kinanthropometry is the most suitable and reliable method to control body composition changes over time in athletes.

Compared to other racket-based sports, tennis and paddle players presented higher height, weight and body fat percentages than adult badminton players: 1.7 ± 0.4 m, 64.8-67.5 ± 6.9-8.7 kg and 12.1 ± 3.4% respectively[37,38] and adult squash players: 1.7 ± 0.4m, 67.7 ± 6.9 kg and 7.4 ± 3.4% respectively[39].

Finally, it is possible to hypothesize the implication that these results may have on the training and diet management of tennis and paddle players. First of all, it is mandatory to establish if a relationship between body composition and daily diet exists. In fact, diet is an instrumental component, together with training, to modulate anthropometric parameters. However, diet is a source of regulatory molecules that help to control body homeostasis. In this respect, it has been described that excess protein and lipid intakes were observed in adolescent tennis players, which may present deficiencies in certain nutrients such as fiber, or micronutrients such as calcium, potassium, magnesium and folic acid[31]. Furthermore, racket sport players, and particularly tennis players, compete abroad during long periods of time, being exposed to a high risk of imbalanced diets, due to problems of food availability and suitable meals, changes in schedule and duration of matches. These issues could affect body composition and increase the risk of fat mass accumulation together with muscle mass decrease throughout time. In addition, performance in speed and capacity to respond would decrease when body fat accumulates, increasing the risk of developing injuries. A previous report indicated that 35-65% of the injuries occur in the lower limbs[40]. Part of the cause for these injuries may be due to excess weight, although additional studies must be performed to confirm this point. Therefore, the results presented in this study can be used as a standard reference for tennis professionals, including coaches, doctors and dietitians.

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