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Original

Morphological characteristics of visually impaired tennis practitioners

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ABSTRACT

Objective: To evaluate somatotype and body composition of a population of sound-tennis players.
Method: The research included a descriptive, cross-sectional design, with a quantitative focus. The sample consists of 13 male sound-tennis players: eight Spanish and five from other countries that were recruited in an international tournament in May 2017. The Spanish population started the practice of this discipline two years before the data collection, while the other group was more experienced with 4-6 years of sports practice. Anthropometric characteristics and body composition of both populations were determined by the protocols described by the International Society for the Advancement of Kinanthropometry.
Results: All the participants presented an endomorphic mesomorph somatotype. No significant differences were detected regarding fat and muscle masses when comparing Spanish vs others. Spanish players displayed significantly higher values of biceps and medial calf skinfolds, but also lower bone mass and height.
Conclusions: All participants were slightly overweight. The Spanish para-athletes tend to accumulate fat in the upper and lower limbs that could affect their tennis performance. These indicators should be taken into account when planning diet, training and season goals.
Keywords: Blind; Body composition; Visual impairment;Somatotype; Tennis.

Características morfológicas de practicantes de tenis con discapacidad visual

RESUMEN

Objetivo: Caracterizar el somatotipo y la composición corporal de un grupo de tenistas con discapacidad visual.
Método: La investigación contempló un diseño descriptivo, transversal, con un enfoque cuantitativo. La muestra estaba compuesta por 13 jugadores masculinos de tenis: ocho españoles y cinco extranjeros, reclutados en un campeonato internacional en mayo de 2017. La población española comenzó la práctica de esta disciplina dos años antes del momento de la toma de datos, mientras que el grupo de deportistas de otros países tenía un historial de práctica de 4-6 años. Las características antropométricas y la composición corporal de ambas poblaciones fueron determinadas siguiendo los protocolos de la Sociedad Internacional para el Avance de la Cineantropometría.
Resultados: Los deportistas presentaron un somatotipo mesomorfo endomórfico. No se observaron diferencias en las masas grasa y muscular al comparar españoles vs extranjeros. No obstante, los jugadores españoles presentaron valores significativamente mayores en los pliegues del bíceps y medial de la pierna, así como valores más bajos de masa ósea y altura.
Conclusiones: Todos los participantes del presente estudio presentaron un sobrepeso límite. Sin embargo, los deportistas españoles tendían a acumular más grasa en las extremidades superiores e inferiores, lo que podría condicionar su rendimiento. Estos indicadores deberían tenerse en cuenta a la hora de planificar la dieta, el entrenamiento y los objetivos de temporada.
Palabras clave: Ceguera; Composición corporal; Discapacidad visual; Somatotipo; Tenis.

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Características morfológicas de praticantes de tênis com deficiência visual

RESUMO

Objetivo: Caracterizar o somatótipo e a composição corporal de um grupo de tenistas com deficiência visual.
Método: A pesquisa contemplou um delineamento descritivo, transversal, com abordagem quantitativa. A amostra foi composta por 13 tenistas do sexo masculino: oito espanhóis e cinco estrangeiros, recrutados em um campeonato internacional em maio de 2017. A população espanhola iniciou a prática dessa disciplina dois anos antes da época da coleta de dados, enquanto a O grupo de atletas de outros países tinha um histórico de prática de 4-6 anos. As características antropométricas e a composição corporal de ambas as populações foram determinadas seguindo os protocolos da Sociedade Internacional para o Avanço da Cineantropometria.
Resultados: Os atletas apresentaram um somatótipo endomórfico de mesomorfia. Não foram observadas diferenças na massa gorda e muscular ao comparar espanhóis x estrangeiros. No entanto, jogadores espanhóis apresentaram valores significativamente mais altos nas dobras bíceps e mediais da perna, além de menores valores de massa e altura óssea.
Conclusões: Todos os participantes deste estudo apresentaram um limite de excesso de peso. No entanto, os atletas espanhóis tendiam a acumular mais gordura nas extremidades superior e inferior, o que poderia condicionar seu desempenho. Esses indicadores devem ser levados em consideração ao planejar dieta, treinamento e metas sazonais.
Palavras-chave: Cegueira; Composição corporal; Deficiência visual; Somatótipo; Tênis.

Introduction

According to the World Health Organization (WHO), around 285 million people suffer from some type of visual disability, in which the 0.7% (39 million) is completely blind. This disability has a strong prevalence in developing countries, due mainly to ageing and the strong incidence of chronic diseases.[1] In Spain, around 979200 people suffer from some type of visual impairment, corresponding to a prevalence of 2.14%.[2-3] Sports practice has positive benefits, since it reinforces functional independence, favours competition and the social integration of this population.[4] A study by Jaarsma et al.[5] analyzed the barriers to and facilitators for sports participation by people with visual impairments, concluding that health professionals should try to decrease barriers (e.g., problems with transport, lack of information, and lack of sports peers/buddies) before the start of sports programs. Therefore, the emphasis of a sports program should also be on the positive aspects of sports, such as fun, increasing health, and social contacts, to improve sports participation in people with visual impairments.[5]

Sound-tennis is a specific sport for people with visual impairments, adapting the ball (i.e. a soft sound ball), the court (lines in relief), the racquet (the maximum sizes are established according to the amount of visual loss) and the rules for the game (the ball can bounce until three times). The International Blind Sports Association (IBSA) actually classifies practitioners with visual impairments in three categories:[6] i) B1, with a visual acuity lower than LogMAR 2.6; ii) B2, with a visual acuity ranging from LogMAR 1.5 to 2.6 (inclusive) and/or visual field constricted to a diameter of fewer than 10 degrees; and iii) B3, with a visual acuity ranging from LogMAR 1.4 to 1.0 (inclusive) and/or visual field constricted to a diameter of fewer than 40 degrees.

Recent studies have demonstrated the lower levels of lifestyle physical activity and higher levels of sedentary time in adolescents and adults with visual impairment than those with normal vision[7] and it has been associated with locomotor dysfunctions.[8] Although active people present significant differences regarding body fat mass as well as muscle mass when compared to sedentary subjects,[9] the presence of the visual impairment or practising a para-sport that requires specific supports would underlie the anthropometric scores of this population. Due to the recent implantation of sound-tennis in Europe, no anthropometric data are available for this group of para-athletes. To the best authors´ knowledge, this is the first anthropometric study performed in sound-tennis players. Therefore, the aim of this study was to evaluate the somatotype and the body composition in order to establish the adequacy and reference scores of these parameters in sound-tennis players.

Method

Subject

Thirteen players with visual impairments participated in the study. Eight (three B1 and five B2) were recruited from the Sound Tennis Foundation (Valencia, Spain), with two years of previous experience. Five players from other countries (Italy, Mexico and the UK; three B1 and two B3) were also recruited during the First International Blind Tennis Tournament celebrated in May 2017 held in Alicante (Spain) and they had a longer training experience (4-to-6 years). Players from both groups trained an average of 3h/week. All participants were Caucasians. Table 1 shows the descriptive data of the participants.

All participants were verbally informed about the aims of the study, signing informed consent and participating on a voluntary basis. Participants did not practice other sports, did not suffer from any pathology nor were under medical treatment, were not following any specific diet nor display muscle-skeletal alterations that could impair their sport activity. The study followed the principles of the Helsinki Declaration for studies with human beings and was approved by the Ethics Committee of the University of Valencia.

Procedures

Anthropometric evaluations were performed according to the methodology described by the International Society for the Advancement of Kineanthropometry[10] by a level 2 anthropometrist. Stretch stature was determined with a stadiometer with a sensibility of 0.1 cm. Body mass was measured with a homologated digital scale Tanita (Tokyo, Japan) with a sensibility of 0.1 kg. Skinfold calliper Holtain (UK) was used to determine eight skinfolds: triceps, subscapular, biceps, iliac crest, supraspinal, abdominal, front thigh and medial calf, with a sensibility of 0.2 mm. Girths were measured with a metallic inextensible tape (Cescrof, Brazil) with a precision of 1 mm: relaxed arm, flexed and tensed arm, waist, gluteal (hip), mid-thigh and calf. Humerus, bi-styloid and femur breadths were taken with a small bone calliper with a precision of 1 mm (Cescrof, Brazil).

All the measurements were taken twice (or three times if the difference between the first two measures was greater than 5% for skinfolds and 1% for the rest of measurements) and the mean values were used for data analysis. The technical error of measurement scores was less than 5% for skinfolds and less than 1% for the remaining variables.

Fat percentage was calculated using the Durnin and Womersley formula.[11] Muscle mass was calculated according to Lee's equation[12] and the bone mass from Rocha's equation.[13] Residual weight was calculated from the difference between body weight and the addition of fat, muscle and bone compartments.[14] Somatotype was calculated according to Carter and Heath[15] methodology.

Body mass index (BMI) was used to classify overweight and obesity according to WHO.[16] The risk to suffer obesity-related pathologies was evaluated from indicators such as hip-waist ratio, waist perimeter and waist/height index. The cutting point of >1 for hip/waist ratio in men used in this study was proposed by the Spanish Society for the Study of Obesity.[17] Waist girth is used to validate the content of abdominal fat and thereby the cardiovascular risk. Lastly, the waist/height ratio did not present cutting points established by any institution. However, the majority of the studies indicate that the risk associated to different pathologies increase when the values of this index are equal to or more than 0.55, so this was the cutting point considered in the present study.

Statistical analysis

Descriptive statistics presents data as means ± standard deviations. Since the sample was small, one-sample K-S test (Kolmogorov-Smirnov test) was performed in order to assess if each sample fits a normal distribution. The K-S test determined the appropriateness of using parametric techniques for data analysis and a Student's t-test for independent variables was used to detect significant differences between Spanish and the rest of the participants. To calculate the effect size of between-groups differences, Hedges' g index was used.[18] This index is based on Cohen's d index,[19] but it provides an effect size estimation reducing the bias caused by small samples (n < 20). Interpretation of Hedge's g was above 0.8, between 0.5 and 0.8, between 0.2 and 0.5, and lower than 0.2 were considered large, moderate, small, and trivial, respectively. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, v.22.0 for Windows). Statistical significance was set at p<0.05.

Results

Anthropometric variables (skinfolds, girths and breadths) of the study participants are shown in Table 1. No significant differences were observed when comparing participants according to their visual acuity (B1 vs B2/B3). Therefore, we decided to compare body composition according to the years of experience, considering the Spanish players as the group with less experience. There were significant differences and large effects sizes for the age and the stretch stature, with lower scores for both variables in the group with less experience (i.e. Spanish players). Significant differences were also observed for skinfold means in biceps and medial calf sites and large effect sizes for the subscapular, iliac crest and front thigh sites. For all these measurements, the group with less experience presented higher skinfolds scores. In the line, regarding girths, only the mid-thigh exhibits a large effect size when comparing both groups. And concerning breadths, only the measurement for the femur exhibits a large effect size but with higher scores for the group with higher experience.

Body composition (fat, muscle, bone and residual masses) was assessed from the anthropometric parameters (Table 2) (Figure 1). Regarding body composition, the only significant difference and large effect size was a lower mean value of bone mass for the Spanish players. Regarding somatotype, data indicate a predominant endomorphic mesomorph somatotype for the whole population as well as for both populations studied separately. However, a significant difference and a large effect size were obtained for the ectomorphic somatotype (i.e. higher score in the group with more experience) and large effect size for the endomorphic somatotype (i.e. higher score in the group with less experience). With regard to the somatotype attitudinal mean (SAM), as a measure of the average dispersion of individual somatotypes from the group mean, indicated a lower homogeneity structure (i.e. moderate effect size) in the Spanish players (1.9 ± 1.1) than in the rest of participants (1.2 ± 0.7). Finally, Table 2 also shows the results of different anthropometric indicators related to the health status of the participants. Although no significant differences were obtained between groups, the Spanish players exhibit higher scores (i.e. large effect sizes) for the BMI, hip/waist and waist/height ratios compared with the remaining participants of this study.

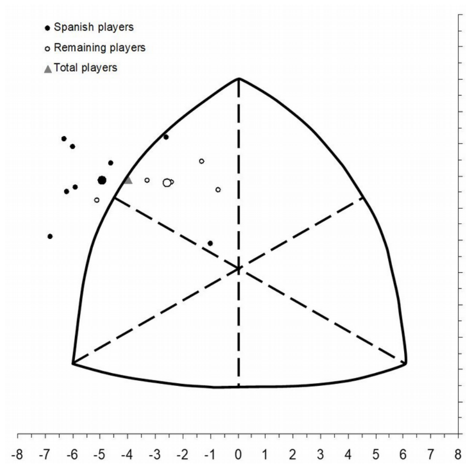

Figure 1. Individual and mean somatopoints of bind tennis players participating in the study. Large points show the mean profile for each group.

Discussion

To the best author's knowledge, this is the first anthropometric and health status report conducted in sound-tennis practitioners. Previous studies performed in able-bodied male adult tennis players,[20-22] as well as studies on blind practitioners from other sport disciplines,[21-22] were considered as reference scores for comparison.

In this context, body mass (see Table 1) was similar to the values observed in other studies conducted with regular tennis players.[22] However, the stature values (Table 1) obtained in the whole sample as well as in each one of the studied subgroups differed from the values observed in regular tennis players: 182.9 ± 5.2 cm.[21] These differences were determinant for BMI values as well as for somatotype, also considering that the group with higher experience in this para-sport exhibited a mean stature of 10 cm higher compared to the group with less experience.

In general, the sound-tennis practitioners presented an endomorphic mesomorph morphotype for the whole sample as well as for the different subgroups of this study (Figure 1), but with a prevalence of the ectomorphic and the endomorphic morphotypes in the groups with higher and fewer experiences, respectively. The values presented in Table 2 indicate a decompensated somatotype when comparing with able-bodied tennis players, being 3.3-4.3-2.5.[20] However, the somatotype of the participants in this study was very similar to that observed in studies in visually impaired athletes of other sports disciplines, such as athletics, alpinism, cycling, goalball, judo and swimming, being 4.0-5.2-2.3.[23]

Table 1. Age, weight, stretch stature and anthropometric characteristics (skinfolds, girths and breadths) of the whole population and the two subgroups (Spanish and rest) of blind tennis players participating in the study (see text for more details).

	Overall (n=13)		Spanish players (n=8) 2 years of experience		Rest of players (n=5) 4-6 years of experience		t	*p*	d_g	
	Mean + SD	Range	Mean + SD	Range	Mean + SD	Range				
Age (years)	38.3 ± 10.3	19 – 53	33.2 ± 9.4	19 – 53	46.3 ± 5.3	39 – 53	-2.81	0.017	-1.49	*ǂ
Body mass (kg)	79.9 ± 11.9	62.2 – 99.8	80.5 ± 11.3	62.2 – 99.8	78.8 ± 12.9	67.3 – 98.4	0.24	0.815	0.13	
Stretch stature (cm)	169.1 ± 7.1	161 - 185	166.3 ± 4.2	161 ± 172	176.5 ± 6.1	171 – 190	-3.49	0.005	-1.90	*ǂ
Skinfolds (mm)										
Triceps	14.3 ± 4.4	7.4 – 19.2	15.0 ± 4.2	8.2 – 19.2	13.1 ± 4.4	7.4 – 18.2	0.77	0.459	0.41	
Subscapular	19.7 ± 6.3	11.2 – 29.6	22.2 ± 5.2	11.2 – 29.6	15.7 ± 5.6	11.4 – 25.2	2.06	0.064	1.13	ǂ
Biceps	8.9 ± 4.1	4.4 – 19.8	10.6 ± 4.1	6.2 – 19.8	6.1 ± 1.4	4.4 – 7.8	2.22	0.049	1.24	*ǂ
Iliac crest	22.7 ± 4.8	12.2 – 28.6	24.2 ± 3.4	17.2 – 28.6	20.3 ± 5.8	12.2 – 25.2	1.50	0.163	0.82	ǂ
Supraspinal	16.6 ± 7.4	7.8 – 27.4	17.7 ± 7.1	8.8 – 27.4	14.9 ± 7.6	7.8 – 25.6	0.64	0.534	0.34	
Abdominal	24.8 ± 6.2	16.0 – 31.6	25.0 ± 5.1	16.0 – 31.6	24.5 ± 7.9	11.8 – 31.4	0.13	0.898	0.07	
Front thigh	23.3 ± 7.9	6.4 – 34.0	26.0 ± 6.2	15.2 – 34.0	18.9 ± 8.6	6.4 – 25.4	1.69	0.119	0.92	ǂ
Medial calf	14.3 ± 5.9	3.4 – 22.4	17.2 ± 4.3	9.8 – 22.4	9.6 ± 4.9	3.4 – 16.6	2.86	0.015	1.56	*
Girths (cm)										
Relaxed arm	31.6 ± 2.4	27.5 – 33.5	32.0 ± 2.7	27.5 – 33.5	30.9 ± 1.5	28.7 – 32.5	0.78	0.454	0.44	
Flexed-tensed arm	32.9 ± 2.5	27.5 – 38.0	33.2 ± 2.8	27.5 – 38.0	32.4 ± 1.5	30.2 – 33.9	0.52	0.614	0.31	
Waist	91.9 ± 9.4	77.5 – 103.8	93.8 ± 9.6	77.5 – 103.8	88.9 ± 7.8	82.4 – 101.3	0.91	0.380	0.51	
Gluteal (hip)	100.6 ± 7.9	86.4 – 113.3	100.5 ± 8.0	86.4 – 112.6	100.6 ± 7.8	94.2 – 113.3	-0.01	0.990	-0.01	
Mid-thigh	55.1 ± 4.9	50.0 – 66.5	56.9 ± 4.3	50.4 – 66.5	52.1 ± 3.9	50.0 – 59.0	1.94	0.078	1.07	ǂ
Calf	39.3 ± 2.7	36.5 – 45.6	39.0 ± 2.8	36.5 – 45.6	39.8 ± 2.4	38.2 – 44.0	-0.49	0.634	-0.27	
Breadths (cm)										
Humerus	6.9 ± 0.7	5.3 – 7.8	6.7 ± 0.7	5.3 – 7.5	7.2 ± 0.5	6.6 – 7.8	-1.35	0.205	-0.73	
Bi-styloid	5.5 ± 0.2	5.1 – 5.8	5.5 ± 0.2	5.1 – 5.7	5.6 ± 0.2	5.4 – 5.8	-1.13	0.283	-0.47	
Femur	9.6 ± 0.6	8.6 – 10.6	9.3 ± 0.6	8.6 – 10.6	10.0 ± 0.4	9.6 – 10.3	-2.10	0.060	-1.21	ǂ

(*) Significant differences and large effect sizes (ǂ) comparing Spanish (less experienced) to the rest of players. Abbreviations used: SD, standard deviation.

Table 2. Body composition, somatotype and body indexes of the whole population and subgroups (Spanish and rest) of blind tennis players participating in the study (see text for more details).

	Overall players (n=13)		Spanish players (n=8) 2 years of experience		Rest of players (n=5) 4-6 vears of experience		t	*p*	d_g	
	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range				
Body composition										
Fat mass (%)	28.1 ± 5.3	17.3 – 34.7	28.5 ± 5.6	17.3 – 34.7	27.6 ± 5.3	19.7 – 33.2	0.91	0.380	0.15	
Muscle mass (%)	37.2 ± 4.1	30.6 – 42.2	36.1 ± 4.2	30.6 – 42.0	38.9 ± 3.7	34.1 – 42.2	-1.22	0.246	-0.65	
Bone mass (%)	13.9 ± 1.9	11.2 – 16.7	13.3 ± 1.7	11.8 – 16.1	15.4 ± 1.5	13.0 – 16.7	2.57	0.026	-1.20	*ǂ
Residual mass (%)	20.8 ± 6.0	9.7 – 29.5	22.4 ± 5.6	11.0 – 29.5	18.1 ± 6.2	9.7 – 25.6	0.79	0.446	0.69	
Somatotype										
Endomorphy	5.0 ± 1.4	2.7 – 6.9	5.5 ± 1.4	3.0 – 6.9	4.2 ± 1.3	2.7 – 6.0	1.65	0.127	0.89	ǂ
Mesomorphy	5.9 ± 1.3	3.4 – 9.0	6.1 ± 1.7	3.4 – 9.0	5.7 ± 0.2	5.5 – 5.9	0.49	0.631	0.27	
Ectomorphy	0.9 ± 0.9	0.1 – 2.6	0.5 ± 0.8	0.1 – 2.0	1.6 ± 0.6	0.9 – 2.6	-2.75	0.019	-1.40	*ǂ
SAM	1.6 ± 1.0	0.3 – 3.9	1.9 ± 1.1	0.6 – 3.9	1.2 ± 0.7	0.3 – 1.9	1.29	0.223	0.68	
Body indexes										
BMI (kg/m^2)	27.7 ± 3.9	22.5 – 34.9	29.3 ± 4.0	23.7 – 34.9	25.2 ± 2.4	22.5 – 28.7	2.04	0.067	1.09	ǂ
Hip/Waist ratio	0.9 ± 0.05	0.8 – 1.0	0.93 ± 0.05	0.8 – 1.0	0.88 ± 0.03	0.8 – 0.9	1.94	0.078	1.16	ǂ
Waist/Height ratio	0.5 ± 0.06	0.5 – 0.6	0.56 ± 0.06	0.5 – 0.6	0.50 ± 0.03	0.5 – 0.6	1.97	0.075	1.09	ǂ

(*) Significant differences and large effect sizes (ǂ) comparing Spanish (less experienced) to the rest of players. Abbreviations used: BMI, body mass index; SAM, somatotype attitudinal mean; SD, standard deviation.

On the other hand, body composition is very influenced by the formula used for assessment, particularly for the fat mass. According to the formula of Durnin and Womersley,[11] the fat mass values obtained (see Table 2) for the Spanish individuals and the others were higher than applying the Faulkner´s formula, used in other studies. Using this formula, the Spanish players displayed a fat mass of 18%, being 16% for the other participants. However, both values are far from the 12.3% of fat mass obtained for blind subjects practising other para-sport disciplines.[23] Regarding muscle mass, the Spanish and the other players presented 36% and 39%, respectively. These figures are below the mean value of 44.4% obtained for able-bodied tennis players,[20] below the 46.6% mean value observed in blind athletes practising other sport disciplines[23] (using Matiegka´s strategy), and below the 42.7% mean value observed in goalball paralympic athletes.[24]

Proper planning of sports practice allows reaching an adequate BMI, correlating with a healthy metabolic profile and a low risk to suffer joint injuries.[25] This statement is extensive as well to Paralympic practitioners. In this context, we evaluated the BMI of the participants in this study. As a result, the majority of the athletes in the overweight category (see Table 2) were close to type 1 obesity in the case of the Spanish group and slightly overweight for the remaining participants.[16] This differs from able-bodied tennis players, who generally have a BMI below 23.6 kg m^{-2}.[20] Our results match with those observed by Torralba et al.[23] in blind athletes practising other sport disciplines. However, this result is not extended to other para-sport disciplines practised by blind athletes. In the study of Valdés Badilla et al.[24], blind practitioners of goalball presented a BMI of 26.05 kg m^{-2}, higher than in our study. This result is plausible because goalball is a sport where para-athletes mainly play in a small area (i.e. team area) with reduced movement possibilities.

Since BMI in sports practitioners does not distinguish fat mass from muscle mass, we can infer that the data obtained in the present study may correspond mainly to the high-fat mass component in these subjects. In addition, BMI does not provide information regarding body fat distribution. In this sense, the subjects with normal body weight or slightly overweight may present a fat distribution that may put them at risk of suffering certain pathologies.[26] In the present study, the more experienced group presented less fat accumulation in the arms and legs, compared to the Spanish group ($p < 0.05$ in biceps and medial calf skinfolds; $d > 0.8$ in subscapular, iliac crest and front thigh). For all these reasons, the information provided by the BMI has to be taken into account, as well as additional parameters. Accordingly, a recent study by Romanov et al.[27] with goalball players demonstrated a relationship of the waist and hip scores with the ranking achievement of the teams, indicating the importance of the body fat distribution in the defining of the morphological profile of those para-athletes.

Regarding the hip/waist ratio, only the Spanish group surpassed the limit value of 0.93. The score in able-bodied tennis players was 0.8,[20] but 0.96 for goalball players.[24] Regarding the waist circumference, the mean value in the Spanish group was 93.8 cm vs 88.9 cm for the other group. The American Diabetes Association has established a limit of 94 cm for males, where higher values correlate with an increased risk of cardiovascular disease.[28] When taken the sample of this study as a whole, the studied population did not reach this value, although the Spanish subgroup was very close to this limit. Comparing to other sport disciplines, the mean waist circumference value was 90.0 cm for goalball players[24] and 80.5 cm in able-bodied tennis players.[20] Finally, the waist/height index has been presented in certain studies as a good predictor for type-2 diabetes and cardiovascular risk, completing the information provided by the waist circumference. The cut-off point of 0.55 indicates that it is recommended to avoid an abdominal waist circumference higher than half of the individual´s height.[29] The value of this index in the Spanish group was 0.56 vs 0.50 for the rest of the participants. Although this index is not presented in other studies, the data to figure out are provided and goalball players display an index of 0.53[24] and 0.44 for able-bodied tennis players.[20]

Altogether, these data suggest that the training time could be a key factor to improve the anthropometric parameters related to health, having obtained better body indexes related with health status for those with more playing experience in sound-tennis. In this context, able-bodied tennis players as well as blind athletes from other para-sport disciplines and Paralympic athletes, invest a higher number of training hours than the 3 h declared by the individuals participating in the present study.[24] A second factor to consider could be the age. The able-bodied tennis players present a mean age of 23 years vs the 33 years of the Spanish group and the 46 years for the rest of the participants. However, goalball players presented a mean age of 42 years, while displaying better anthropometric parameters. The third key parameter influencing anthropometric indexes could be the diet and sedentary lifestyle, but unfortunately, these parameters were not registered in the present study. Nevertheless, we cannot discard the possibility that disability by itself could favour a sedentary lifestyle that could correlate with an unbalanced intake and a reduced physical activity.[5] This situation may give rise to an anthropometric profile with a major susceptibility of suffering certain pathologies.

The main limitation of the study is the low sample number, which must be increased in order to validate the presented results. Nevertheless, the most immediate change is to increase the training time and revise the nutrition patterns of sound-tennis players with the goal of improving their health anthropometric parameters.

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