BODY COMPOSITION AND SOMATOTYPE OF ELITE 10 KILOMETERS
RACE WALKING ATHLETES


SUMMARY

The somatotype of athletes has been determined for many sports. However, there are few reports on race walkers and even fewer on female athletes. The aim of this study was to describe the body composition and somatotype of young elite 10km race walkers. Twenty females aged 17.2 ±1.14 and 10 males aged 19.45 ±4.30, who competed in the XVII Pan American Race Walking Cup, were evaluated. Their weight, height, body mass index (BMI) and percentage of body fat (%BF) were recorded. The Heath-Carter method was used to determine the somatotype. In male, the mean values for BMI (20.58 ±0.35), %BF (7.64 ±1.55) and somatotype (2.34 ±0.89; 3.33 ±0.92; 3.39 ±0.66) are reported. For female, the mean values for BMI (20.67 ±0.55), %BF (13.94 ±3.66) and somatotype (3.11 ±1.26; 3.04 ±1.08; 2.93 ±1.24) were also determined. Males presented a significantly lower %BF. In addition, females had a significantly greater endomorphic component than males. Performance was better in males than in females (47min 53s vs 52min 34s). It is concluded that there are significant differences by sex in the body composition and somatotype of these young elite Pan American athletes. The characteristics of elite race walkers by sex provide relevant information that can be assistive to coaches or sport science professionals during the training of these athletes.

INTRODUCTION

Race walking is historically one of the first-foot racing specialties practiced, although it is poorly known among different disciplines of athletics. It is very popular in some countries, such as Spain, Italy, China, Japan, Mexico, Guatemala, and Russia, where there is a tradition of race walkers. The emergence of world-class athletes has increased its popularity in countries, such as Kenya and Ethiopia, which have outstanding performers in this discipline (Carter et al., 2008; Vernillo et al., 2013).

Race walking differs from other athletic sports of displacement because in its execution there is no ‘flight’ phase; i.e., the race walker must at no time lose contact with the ground during the race. This forces the performers to develop a technique that differs with respect to the usual running technique, with several important differences. Race walking is an Olympic specialty with usual track distances of 10, 20 and 50 km, being thus considered as a middle- or long-distance event (Vernillo et al., 2012; Hanley, 2015). Most authors identify knee joint and lower limb kinematics during the race cycle as the primary indicators for expressing better athletic achievements (Donà et al., 2015; Hanley et al., 2013).

Athletic performance is influenced by several factors. Body composition has shown to be one of the most determinants of them, due to the importance that anthropometric characteristics have on a specific sport, as do arm span or muscle groups in ball players and swimmers (Carter and Heath, 2005; Arrese and Ostáriz, 2006; Högström et al., 2012; Buško et al., 2017). Consequently, competitors in different disciplines present different physiques, and athletes from different categories and genders might have different body composition profiles. It is therefore relevant to determine the ideal body composition and morphological characteristics of each sport, in order to establish a reference point for future athletes and coaches (Carter and Heath, 2005).

Some researchers have used the Heath-Carter method to classify individual athletes according to three essential elements, namely, endomorphy (relative adiposity), mesomorphy (the tendency for relative musculoskeletal development) and ectomorphy (the tendency to relative linearity), which results in the somatotype or biotype of the subject. This is an anthropometric method that has important relevance in the classification of athletes and non-athletes (Carter and Heath, 2005; Díaz and Espinoza-Navarro, 2012; Högström et al., 2012; Lizana et al., 2015).

Understanding the somatic traits of a specific discipline that may differentiate relevant qualities for establishing an association between body dimensions and the best dynamic performance is a challenge for kinaanthropometrists and sport science researchers (Landers et al., 2000; Kandel et al., 2014) Therefore, the objective of the present study

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COMPOSITION CORPOREAL Y SOMATOTIPO DE ATLETAS MARCHISTAS DE ÉLITE DE 10km


RESUMO

El somatotipo de los atletas en muchos deportes ha sido determinado. Sin embargo, hay pocos informes sobre la marcha olímpica y menos aún sobre las mujeres que lo practican. El objetivo de este estudio fue describir la composición corporal y el somatotipo de caminantes jóvenes de elite de 10km. Se evaluó a 20 mujeres de 17,2 ±1,14 años de edad y a 10 varones de 19,45 ±4,30 años, quienes compitieron en la XVII Copa Panamericana de Marcha Olímpica. Se registró peso, altura, índice de masa corporal (IMC) y porcentaje de grasa corporal (%MG), y se utilizó el método Heath-Carter para determinar el somatotipo. En hombres se obtuvieron valores medios para IMC de 20,58 ±0,35%; para %BF de 7,64 ±1,55 y un somatotipo de 2,34 ±0,89; 3,33 ±0,92; 3,39 ±0,6). Para las mujeres, se determinaron los valores medios para IMC (20,87 ±0,55), %MG (13,94 ±3,66) y somatotipo (3,11 ±1,26; 3,04 ±1,08; 2,93 ±1,24). Los varones presentaron un %BF significativamente menor. Además, las mujeres poseen un componente endomórfico significativamente mayor que en los varones. El rendimiento de la prueba fue mejor en hombres que en mujeres (47min 53s vs 52min 34s). Se concluye que existen diferencias significativas por sexo en la composición corporal y el somatotipo de estos atletas jóvenes de elite panamericanos. Las características de los marchistas de elite por sexo proporcionan una información relevante que ayuda a entrenadores o profesionales de las ciencias del deporte durante el entrenamiento de estos atletas.

COMPOSIÇÃO CORPORAL E SOMATOTIPO DE ATLETAS CAMPINHANTES DE ÉLITE DE 10km


RESUMEN

O somatotipo dos atletas em muitos esportes tem sido determinado. No entanto, há poucos relatos sobre a marcha atlética e ainda menos sobre as mulheres que a praticam. O objetivo deste estudo foi descrever a composição corporal e o somatotipo de caminhantes jovens de elite de 10km. Avaliou-se 20 mulheres de 17,2 ±1,14 anos de idade e 10 homens de 19,45 ±4,30 anos, quem competiram na XVII Copa Panamericana de Marcha Atlética. Registrou-se peso, altura, índice de massa corporal (IMC) e porcentagem de gordura corporal (%BF), e se utilizou o método Heath-Carter para determinar o somatotipo. Em homens se obtiveram valores médios para IMC de 20,87 ±0,35%; para %BF de 7,64 ±1,55 e um somatotipo de 2,34 ±0,89; 3,33 ±0,92; 3,39 ±0,6). Para as mulheres, se determinaram os valores médios para IMC (20,57 ±0,55), %MG (13,94 ±3,66) e somatotipo (3,11 ±1,26; 3,04 ±1,08; 2,93 ±1,24). Os homens apresentaram %BF significativamente menor. Além disso, as mulheres possuem um componente endomórfico significativamente maior que os homens. O rendimento da prova foi melhor em homens que em mulheres (47min 53s vs 52min 34s). Conclui-se que existem diferenças significativas por sexo na composição corporal e o somatotipo destes atletas jovens de elite panamericanos. As características dos marchadores de elite por sexo proporcionam uma informação relevante que ajuda a treinadores ou profissionais das ciências do deporte durante o treinamento de estes atletas.
Table I contains the characteristics of the study sample. Males had a significantly greater weight and height than females. The skinfolds of the triceps, front thigh and medial calf were significantly lower in males than females. In general, it is observed that females present greater measurements in their skinfolds. The femoral diameter was greater in males. The time of execution of the race (10km) was significantly shorter (p<0.05) in males (47min 53s) than in females (52min 34s).

Table II shows the body composition and somatotype of the race walkers. The percentage of body fat, the sum of six skinfolds and endomorphy were significantly greater in females as compared to males (p<0.05). There were no differences by gender in body mass index.

Table III shows the distribution of the somatotype categories according to those proposed by Carter and Heath (2005). Females showed a large dispersion, predominating the mesomorphic endomorph (15%), balanced mesomorphic (15%) and ectomorphic endomorph (15%) categories, while in males, the ectomorphic mesomorph category was predominant (50%).

Figure 1 is the somatograph of the male athletes. A distribution of somatotypes centered between the mesomorphic and ectomorphic components is reported with a mean somatotype of 2.3-3.3-3.4.

Discussion

Biotype using the Heath-Carter anthropometric somatotype is one of the most widely used methods for the selection of gifted and talented people for sports (Lentini et al., 2004; Almagià et al., 2009; Sterkowicz-Przybycien and Gualdi-Russo, 2018). When the anthropometric study is performed amongst elite competitors, this provides valuable data on the structural requirements necessary in the different disciplines, since there are somatic characteristics that are selective in the world of sport. Likewise, other authors point to the concept of morphological prototype related to the performance of athletes from the point of view of kinanthropometric techniques and establish an ideal figure possible through the optimization of body vari-
The search for athletes with the right characteristics to compete successfully at top levels is increasingly difficult. Anthropometry and somatotype seem to be the most influential physical characteristics. Based on these methods, several authors determined the importance of adiposity levels in sports performance (Legaz and Eston, 2005; Arrese and Ostáriz, 2006); however, different disciplines also have their own morphological requirements, such as long arms for rowing, greater endomorphy for throwing sports, or greater ectomorphy for long-distance running (Kerr, 1995). These morphological parameters are largely hereditary (Baker, 2001; Norton and Olds, 2001; Calò and Vona, 2008).

When analyzing anthropometric characteristics and somatotypes in our study sample according to gender (Tables I and II), it is observed that male have a significantly higher weight and height and a significantly lower %BF compared to female. The respective somatotypes show a uniform pattern, with predominantly ecto-mesomorphic nature in males compared to a more dispersed distribution in females, where the endomorphic component being predominant (Table II, Figures 1 and 2). Lentini et al. (2004) in a study of high-performance Argentinean athletes, determined a predominantly mesomorphic somatotype in males and a medium, mesomorph-endomorph biotype in females, reaffirming a sexual dimorphism between athletes and different athletic disciplines. Ein et al. (2007) described the somatotype of young race track Malaysian athletes of both sexes, finding a meso-ectomorphic somatotype in males and a large ectomorphic component in females, which differs from our results. Martínez-Sanz et al. (2011) established international referential somatotypes in which, specifically for Olympic male race walkers, a predominantly mesomorphic somatotype and low endomorphy were observed; however, they did not report the length of the race nor the values for female race walkers. A study performed on male Kenyan elite marathon athletes showed that this population presents a somatotype of 1.53-1.61-3.86, with a dominant ectomorphic component (Vernillo et al., 2013), an aspect that is consistent with the male junior athletes of our sample because the two highest components presented by them were mesomorphic and ectomorphic. A high ectomorphic component and a smaller mesomorphic component of male athletes in our study may be related to long-distance running tests and lower muscular effort, which influences energy expenditure (Morgan and Daniels, 1994). However, for female athletes in this category, there is no dominant component (average somatotype), which may be because, in this junior category, the biotype of the female race walker remains undefined. In addition, the high dispersion of somatopoints may also be related to the wide range of ages of female athletes in our sample, with a difference of four years between the youngest and oldest participants, as opposed to males, amongst which there was a difference of only two years.

Rodríguez et al. (2014) reported anthropometric characteristics of high performance
Chilean athletes, determining an average somatotype of 2.0-4.0-3.8 for mid distance male runners, with dominant components of mesomorphy and ectomorphy, similar to our results. The endomorphic component was also the lowest of the three, similar to the findings of the present study. In females, a somatotype of 2.9 ± 3.0 was observed, with no major differences between the components of the somatotype, which is also similar to our study. Additional studies are required in male and female Olympic race walkers and athletes of greater distances, such as 20km and 50km, due to the scarcity of existing reports.

Another frequently mentioned component of sports practice is the percentage of body fat due to its relation with performance (Kandel et al., 2014). Table I shows a lower %BF in males than females. Arrese and Ostáriz (2006) found a strong relationship between the thickness of the thigh and leg skinfolds and the time of execution of a distance running test. They observed a high relation when comparing the skinfolds of the front thigh and medial calf. Bale et al. (1986), when comparing skinfolds and percentage of body fat mass in 10km male runners, found that the elite group had a body fat mass percentage of 8.0 ±0.5 vs average athletes with a fat mass percentage of 12.1 ±1.5. Our study group reveals a similar percentage of body fat mass in males, 7.64 ±1.55, while in our female study population it was 13.94 ±3.66, similar to that observed in the average male athlete.

Knechtle et al. (2010a, b) associated and correlated the best personal execution times of running tests with the endomorphic component between males and females and found better performances in athletes with a lower endomorphy and, consequently, lower body fat, as observed in Table II of our study, where males show significantly lower body fat values than females and lower adipose components such as endomorphy and Z6 skinfolds, which may influence the sports performance of females.

A challenge for the kinanthropometrists and the scholars in sports sciences is the understanding of the somatic traits that differentiate relevant aspects, in order to establish the association between a body dimension and the best dynamic performance. The analysis of the functional components of the Olympic race walking practice is relevant, given its special technique involving the ankle, knee and hip joints, where the pace and cadence length must be coordinated, which involves a great control of the skeletal neuro-muscular system (Preatoni et al., 2010). Henley and Bissas (2013) determined that knee flexors undergo heavy wear during the oscillation phase of the race, which may increase the risk of injury to ischemic muscles.

This study aimed to provide additional information regarding the discipline of Olympic race walking in male and female junior athletes of the 10km running test, information that remains scarce in the literature, so as to serve future research in the determination of sports talents in this discipline.

The anatomical conditions according to the different age groups, gender, origin and environment, evidently generate dissimilar sports performance responses, for which more rigorous comparative analyzes are necessary in order to be useful for coaches and sport science professionals (Pavei et al., 2014).

Conclusions

There are significant differences by gender in the body composition and somatotype of these young elite Pan American race walking athletes, with significantly lower skinfolds in males. Females have significantly more body fat mass than males (13.94 ±3.66% vs 7.64 ±1.55%), which is an aspect that could influence their sports performance. Further studies are required in this regard. The time used to finish the race was significantly lower in males than females.

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