18 - COMPARATIVE ANALYSIS BETWEEN SKINFOLD THICKNESS AND BIOELETRIC IMPEDANCE FOR BODY FAT PERCENT MEASUREMENTS IN SOCCER PLAYERS

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INTRODUCTION

Professional soccer has had a worldwide growing, and in recent years there has been a growing interest in the biological sciences in further study in several areas of knowledge related to this activity (REILLY and WILLIAMS, 2003).

Body composition is an important aspect to the athletes fitness level in any sport, because extra fat can decrease athletic performance (MARQUES et al. 2000). Besides impair sports performance of an athlete, a high level of body fat is related to the incidence of chronic degenerative diseases such as diabetes and hypertension (DEMINICE and ROSA, 2009).

Knowledge of the body profile of athletes allows us to differentiate body components, improving knowledge of body shape physically active and athletic. Thus, it is possible to analyze and evaluate the changes caused by exercise, by diet, growth and aging (MURA and SILVA, 2007).

Hydrostatic weighing is a standard method for the accurate determination of the percentage of body fat, but its implementation requires trained personnel and collaboration of the individual, so its application is difficult especially in the elderly and children. Although this method can be considered a "gold standard" in body composition determination, it is impractical in places like gyms and offices, as well other techniques for the body composition determination are necessary (GIBSON, 1990).

Among the techniques for determining body composition, skinfolds thickness with the use of indices relating to body weight and height each have with its advantages and limitations (BRODIE, 1988). The advantages of using these anthropometric techniques are: anthropometric measures and body density relationship, low financial cost, ease of data collection, ease of finding an appropriate physical space and because it is a noninvasive method (PETROSKI, 2003).

A strong ally of anthropometry is bioelectrical impedance analysis (BAUMGARTNER et al., 1988). It is an inexpensive, portable and secure method by body composition estimation and fully applicable in field studies (LOBO et al., 1996). The BIA has great potential when used alone or in combination with anthropometry, but the use of the method is simplistic errors may occur in application and validity (ROSSI et al., 2001). Thus, the objective of this study was to make a comparative analysis of the body fat percentage values, obtained from skinfolds thickness and bioelectrical impedance-type bipolar and tetrapolar methods in soccer players.

METHODS

This study characterized as a cross-sectional according to Gil (1996). The procedures used in this study follow the Resolution 196/96, the National Health Council of Brazil, which deals with humans research procedures. To conduct this study were selected 22 players of Operário Ferroviário Sport Club from the Youth category in Ponta Grossa city, Paraná state.

Anthropometric evaluation

Anthropometric variables, weight and height, were measured according to the description of Gordon et al., (1991). To measure the height, we used a stadiometer with a measurement scale by 0.1 cm. The total body weight was measured using an electronic scale Tanita Model A-80, with precision of 100g.

The skinfolds thickness were measured as follows: triceps, subscapular, suprailiac and calf, as indications of Benedetti et al. (2003) using a skinfold caliper type Cescorf with 0.1 mm precision.

Relative body fat calculation (% BF) was employed to Siri equation (1961) {%BF = [495/body density(g/ml)] – 450}. The body density (Dens.) was calculated from the use of the regression model that uses the sum of the three skinfold thickness (PETROSKI, 1995). Dens. = 1,10726863-0,00081201*(ST TR + ST SE + ST SI + ST PM)+0,00000212*(ST TR + ST SE + ST SI + ST PM)2 - 0,00041761*(Idade).

Bioeletric impedance

Prior to the anthropometric and bioelectric impedance testing, the following recommendations were made to athletes: Avoid caffeine and alcohol 24 hours before the assessment; Not physical activity or heavy meal at least 4 hours before the evaluation.

Was used to evaluate a device tetrapolar bioelectric impedance, Maltron trend, model 906 (BIA), whose electrode placement followed the following guidelines: right foot, distal electrode at the base of the middle finger and the proximal between the medial and lateral malleolus; hand right, distal electrode at the base of the middle finger and the proximal electrode coinciding with the styloid process. We observed the distance between the electrodes above 5 cm and the individual in a supine position with foot and hand rights away from the trunk. These procedures were performed with the subject lying in supine position on a table, without carrying a clock or any other metal object. Before placing the electrodes on the skin of the subjects was done cleaning the contact points with alcohol swab. The subjects rested for five minutes before the assessment.

In contrast to evaluate the fat percentage of bioelectrical impedance bipolar method used an electronic scale Tanita model UM-80 (BIA). The subjects was instructed to correct foot placement on the platform base balance.

Statistical Analysis

Initially we used the Kolmogorov-Smirnov test, where it was observed normality of data, then parametric statistics were used. We applied the descriptive statistics, as mean and its standard deviation. The inferential statistics used was the test-T for independent samples and analysis of variance (ANOVA) randomized model, followed by post-hoc Tukey test for identification of differences between pairs of means if there is statistically significant. Data were considered statistically significant when the probability of null hypothesis is less than 0.05 ($p < 0.05$).

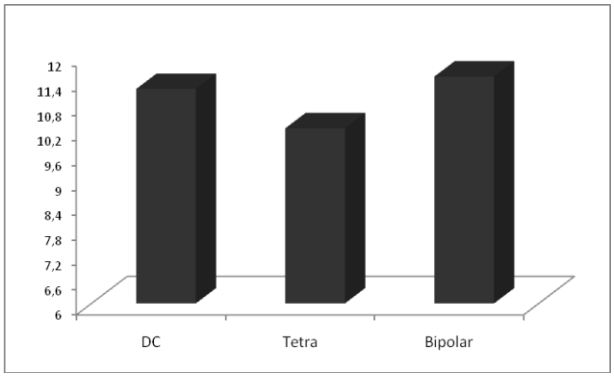
RESULTS AND DISCUSSION

Body composition is an important aspect to the physical fitness level. In a sport like professional football, it is thought

that a high rate of body fat can substantially decrease the player's performance during a match, which may consequently compromise the competition. In addition to lowering the performance can cause several injuries, concludes Reilly et al. (2000). It is extremely important to determine the athlete's physical profile, because there is a relationship between body shape and physical performance.

The concern with the body fat percentage in football is not just to the players, as in the scientific literature began to appear scientific papers describing the referee's morphological profile (Da SILVA e RODRIGUEZ-AÑEZ, 2003; Da SILVA e NASCIMENTO, 2005; Da SILVA e RODRIGUEZ-AÑEZ, 2008; Da SILVA e RECH, 2008).

In the present study it was observed that the body fat percentage average in each methodology was 10.2 ± 1.4% (BIA Tetrapolar), 11.5 ± 2.8% (BIA Bipolar), and 11.2 ± 2.3% (Skinfolds). Statistical analysis comparing the methods by ANOVA followed by post-hoc tests of Tukey showed no differences between the body fat percentages obtained with different methods (p = 01,618), despite the small variation as can be seen in Graph 1.



Graph 1. Comparison of the body fat percentage with the methods evaluated.

However, in a study by Roberts et al. (2001) report they have found statistically significant differences between the results for the body fat percentage mesured by four different models of handsets bioelectrical impedance. In addition, the results of all bioelectrical impedance devices, values were also statistically significant when equated to the values obtained by measuring skinfold thickness. The average body fat percentage obtained by bioelectrical impedance apparatus of the same brand and model of this study (Maltron, model 906) was 18.4 ± 6.3%, as obtained with the skinfolds thickness (Σ 3 ST) was of 12.0 ± 5.7. Results that opposed to our findings.

In another study that aimed to compare the body fat percentage obtained by the technique of bioelectrical impedance Bipolar "hand to hand", which is different from our "foot to foot" with the skinfold thickness technique, found no significant differences between the values of percentage fat, since the values were 13.26% to 12.48% BIA and to ST (PETREÇA, 2009). The same occurred in a survey conducted with 219 male professional athletes in pre season. Comparing BIA and skinfolds thickness, there was also no statistical difference between the means (OSTOJIC, 2006). However, in a study where the sample was composed of 20 athletes, when comparing two methods of bioelectrical impedance, tetrapolar and bipolar ("foot to foot") with the equation of Faulkner, found a significant difference in mean (ROSSI and TIRAPEGUI, 2001).

According Reilly and Duran (2003) the results found in the literature range from 6 to 12% for footballers, and this difference can be used by the various ways to measure body composition, but specifically for body fat percentage. Noting that this variable is extremely important to control the athletic ability level of the player.

Other searches that corroborate the values found in this study was developed by Burke et al. (2006), which shows that the fat mass percentage in footballers adults was 8.2 to 13%. Another study conducted at the Copa America in Uruguay, with a sample of 110 players, we obtained Body fat percentage values in averaged 10.6% ± 2.6% (RIENZI et al. 1998).

CONCLUSION

After analyzing the data it can be seen that there is no statistical difference between the methodologies used to measure the body fat percentage between youth category footballers. Thus, using any of the methodologies proposed here appears to be effective for determining the body fat percentage in youth athletes. Although the results are similar, there is no data to indicate a device over others because the results were equivalent to the BIA as to the %BF obtained with skinfolds thickness.

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COMPARATIVE ANALYSIS BETWEEN SKINFOLD THICKNESS AND BIOELETRIC IMPEDANCE FOR BODY FAT PERCENT MEASUREMENTS IN SOCCER PLAYERS

ABSTRACT

The estimate of body fat percentage (BF%) by bioelectrical impedance (BIA) and skinfold thickness (ST) has the advantage of simplicity of measurement. However, the reliability of both methods still have been criticized. The aim of this study was to make a comparative analysis between the methods for estimating the BF% through the techniques of bioelectrical impedance and skinfold thickness (ST). The sample consisted of 22 soccer players in the junior category of a professional soccer team, homogenized by gender (male) and age (18 and 20 years). For determination of BF% by bioelectrical impedance Tetrapolar was used the apparatus Maltron trend, model 906 and the electronic scale Bipolar Tanita model UM-80. For ST we used the equation Σ 4 ST (PETROSKI, 1995) then the equations of Siri (1961). After analyzing the data it was found that the BF% obtained by BIA Tetrapolar was 10.2±1.4%, 11.5±2.8% by bipolar and 11.2±2,3% by skinfold thickness. BIA measures did not differ significantly from each other (p = 0.0660), nor for BF% estimated by the ST (and ST Tetrapolar, p = 0.1048, and Bipolar ST, p = 0.7004). Despite the results, there is no data to indicate a device rather than others. The results of the BIA were similar as to the estimate of BF%.

KEYWORDS: Body fat, bioeletric impedance, skinfolds thickness

ANALYSE COMPARATIVE ENTRE LES MÉTHODES DE BIOIMPÉDANCE ET LES PLIS CUTANÉS POUR LES MESURES DU CENTILE DE GRAISSE DANS LES JOUEURS DE FOOTBALL

RÉSUMÉ

L'estimative du centile de graisse (le % G) par le bioimpédance (BIA) et par les plis cutané (DC) a comme l'avantage la simplicité de la mesure. Cependant, la fiabilité des deux méthodes subit toujours des critiques. L'objectif de cette étude était de faire une analyse comparative parmi les méthodes d'estimer le % G par les techniques bioimpédance et des plies cutané des plis(DC).L'échantillon a été constitué par 22 joueurs de football de la catégorie junior de football professionnelle, homogénéisé par le genre (masculin) et l'âge (18 et 20 ans).Pour la détermination du % de graisse pour le bioimpédance Tetrapolaire a été utilisé l appareille de la marque Maltron, le modèle 906 et pour le Bipolaire la balance électronique Tanita modèle UM-80. Pour les DC l'équation utilisée c' était. Σ 4 DC (PETROSKI 1995) suivi par les équations de Siri (1961).Après l'analyse des données il a été vérifié que le centile de graisse obtenue par le BIA Tetrapolaire était de 10,2 1,4 % ±, pour le Bipolaire de 11,5 2,8 % ± et pour les Plis Cutanés de 11,2 2,3 % ±. Les mesures du BIA'S n'ont pas différé significativement, parmi eux (p=00660), ni pour le % G estimé pour DC, (Tetrapolar et DC, p =0.1048, bipolaire et DC, p=07004). Malgré les résultats, il n'y a pas des données que permet d'indiquer un appareille au détriment de l'autre. Les résultats du BIA'S étaient égaux quant à l'estimative du % G.

MOTS CLÉS: Football, joueur, graisse corporelle, bioimpédance, plis cutanés

ANÁLISIS COMPARATIVO ENTRE LOS MÉTODOS DE BIOIMPEDANCIA Y PLIEGUES CUTÁNEOS PARA LA ESTIMACIÓN DE PERCENTAJE DE GRASA EN JUGADORES DE FÚTBOL

RESUMEN

La estimación del percentaje de grasa corporal (%G) por bioimpedancia (BIA) y el de pliegues cutáneos (PC) tiene la ventaja de la simplicidad en la medición. Sin embargo, la confiabilidad de ambos métodos aún son criticados. El objetivo de este estúdio fue el de realizar un análisis comparativo de los métodos para estimar el %G a través de las técnicas de bioimpedancia (BIA) y pliegues cutaneos. (PC). La muestra estuvo conformada por 22 jugadores de fútbol de categoria Junior de una equipo de fútbol profesional, homogeneizados por el género (varones) y edad (18 y 20 años). Para determinar el %G por bioimpedancia tetrapolar se utilizó un aparato marca Maltron, modelo 906 y una balanza electrónica bipolar Tanita Modelo A-80. Para la estimación del PC fue utilizada la ecuación de Σ 4 PC (PETROSKI, 1995) seguida de la ecuación de Siri (1961). Después de analizar los datos se encontró que el porcentaje de grasa obtenida por BIA Tetrapolar fue de 10,2 ± 1,4%, por bipolar 11,5 ± 2,8% y por pliegues cutáneos de 11,2 ± 2,3%. Las medidas BIA no difieren significativamente entre sí (p = 0,0660), ni para él %G estimado por el PC (Tetrapolar y PC, p = 0,1048, Bipolar y PC, p = 0,7004). A pesar de los resultados, no hay datos que permitan indicar un dispositivo sobre otro. Los resultados de la BIA son igualados en cuanto a la estimación de% G.

PALABRAS-CLAVE: Grasa corporal, bioimpedancia, pliegues cutáneas.

ANÁLISE COMPARATIVA ENTRE OS MÉTODOS DE BIOIMPEDANCIA E DOBRAS CUTÂNEAS PARA A MENSURAÇÃO DO PERCENTUAL DE GORDURA EM JOGADORES DE FUTEBOL

RESUMO

A estimativa do percentual de gordura (%G) pela bioimpedância (BIA) e pelas dobras cutâneas (DC) tem como vantagem a simplicidade da medida. Contudo, a confiabilidade de ambos os métodos ainda tem sofrido críticas. O objetivo deste estudo foi fazer uma análise comparativa entre os métodos para estimar o %G através das técnicas de bioimpedância e dobras cutâneas (DC). A amostra foi constituída por 22 jogadores de futebol da categoria junior de uma equipe de futebol profissional, homogeneizados pelo gênero (masculino) e idade (18 e 20 anos). Para a determinação da %G pela bioimpedância Tetrapolar se utilizou o aparelho marca Maltron, modelo 906 e para a Bipolar a balança eletrônica Tanita modelo UM-80. Para as DC foi utilizada a equação de Σ 4 DC (PETROSKI, 1995) seguida da equações de Siri (1961). Após análise dos dados verificou-se que o percentual de gordura obtido pela BIA Tetrapolar foi de 10,2±1,4%, pela bipolar de 11,5±2,8%, e pela Dobras Cutâneas de 11,2±2,3%. As medidas de BIA não diferiram significativamente, entre si (p=0,0660), nem para a %G estimado pela DC, (Tetrapolar e DC, p=0.1048, Bipolar e DC, p=0,7004). Apesar dos resultados, não há dados que permitam indicar um aparelho em detrimento de outros. Os resultados da BIA equivaleram-se quanto à estimativa do %G.

PALAVRAS-CHAVE: Gordura corporal, bioimpedância, dobras cutâneas.