28 - CORRELATION BETWEEN BODY ADIPOSITY INDEX, BODY MASS INDEX AND ESTIMATED BODY FAT BY SKINFOLD THICKNESS IN DIFFERENT AGE GROUPS

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INTRODUCTION

Obesity is now classified as a problem of global concern, and Brazil do not turn left out of this situation. Statistical surveys conducted by the Brazilian Institute of Geography and Statistics (IBGE) published in 2010 show a ascendancy in the percentage of the population overweight or obese in Brazil.

The evaluation of the individual, in turn, becomes of paramount importance, so they can have the data of body composition and especially the percentage of body fat. According Glaner (2005) quantification of body fat with minimal error is essential, causing researchers to develop and validate different types of techniques for measuring it, such as: hydrostatic weighing, anthropometry, bioelectrical impedance, Dual-energy X-ray absorptiometry, plethysmography, among others.

The methods for determining overweight and obesity vary across studies, and Body Mass Index (BMI) is still being used in screening for adiposity in some groups (Monteiro et al., 2000). Given the widespread use of BMI, Anjos (1992) affirms the importance of correlating the values found in BMI with other measures.

In order to determine the percentage of body fat, a technique widely used in clinics, gyms and also by researchers is the measurement through the skin folds, which in turn have relatively low cost, and provide high reliability and correlate very well with more sophisticated techniques (FERNANDES FILHO, 1999).

In the search for tools with a better cost benefit, Bergman et al. (2011) present a new index, the Body Adiposity Index (BAI), which is able to estimate the percentage of body fat using an equation using only measures of hip circumference and height. The purpose of BAI is to replace the Body Mass Index (BMI) because BMI for certain groups do not have efficiency ratings as body fat (Glaner, 2005).

Sulino et al. (2011) show the correlation between Body Adiposity Index (BAI) and BMI, finding a high correlation, which enables the use of BAI for the diagnosis of body fat.

Thus, the purpose of this study was to correlate the Body Adiposity Index, Body Mass Index and body fat estimated by skinfold measurements in different age groups in order to identify the feasibility of using BAI in different age groups.

METHODOLOGY

The sample selected for this study consisted of 96 individuals classified as sedentary adults (48 females with body mass of 66.74 ± 11.38 kg and height of 161.51 ± 5.74 cm, and 48 male with body mass of 82.73 ± 12.04 kg and height of 174.16 ± 7.19 cm, as shown in Table 1), aged between 20 and 60 years, divided by age group (20 to 30 years, 31 and 40 years, 41 to 50 years, 51-60 years), and 24 individuals per age group (12 males and 12 females).

TABLE 1 – Sample characteristics.

Variable	Men	Women
Age (years)	40,08±11,24	39,98±11,79
Body mass (kg)	82,73±12,04	66,74±11,38
Height (cm)	174,16±7,19	161,51±5,74
%Fat Skinfold	26,33±4,95	32,61±5,02
%Fat BAI	25,87±4,24	32,11±4,58

To determine the activity level of each individual was used the questionnaire IPAQ short version (CELAFISCS, 2007).

To estimate the percentage of body fat through skinfold measurement was used a Cescorf scientific caliper and Jackson and Pollock 3-fold protocol (1978), as described by Tritschler (2003).

For the weight and height measurement was used a Filizola scale.

To estimate the percentage of fat through the Body Adiposity Index was used the equation proposed by Bergman et al. (2011).

The Body Mass Index was calculated from the ratio of body weight by height squared.

Data were analyzed using the normality test Kolmogorov-Smirnov test and is classified as normal distribution, and descriptive statistics (mean and standard deviation) and correlation factor (r) with significance level (p) set at 0.05 , using the software IBM SPSS Statistics version 19.

RESULTS AND DISCUSSION

For the analysis of data from this study, we adopted as reference to estimate body fat by skinfold thickness, which is a method widely used and accepted scientifically. Upon such reference, the correlation was made between BAI and BMI and skinfold thickness for different age groups for both males and females.

According to the data presented (Tables 1 and 2), the Body Adiposity Index showed a strong correlation ($r > 0.70$, $p < 0.01$) to estimate body fat percentage through skinfold measurements, for both males (Table 2) and for females (Table 3).

Analysing the Body Mass Index (BMI), we can see that it also showed a strong correlation ($r > 0.70$, $p < 0.01$) with both the Body Adiposity Index (BAI) and to estimate body fat by skinfold (SK).

According to Garn et al. (1986), there are basically three limitations to the use of BMI: low correlation with height, low correlation with fat-free mass (especially in men) and low correlation with body proportionality (related to leg length and trunk). These limitations compromise the use of BMI as an indicator of adiposity.

Therefore, it is important to note that the sample was composed of individuals classified as sedentary, with a higher

percentage of body fat and consequently a lower percentage of lean body mass, which features a better applicability of BMI.

TABLE 2 - Correlations between Body Adiposity Index, body fat percentage estimated by skinfolds and Body Mass Index for males (n = 48).

		Correlation		
Age group	N	BAI x BMI	BAI x SK	SK x BMI
20 – 30	12	0,923*	0,898*	0,890*
31 – 40	12	0,819*	0,962*	0,841*
41 – 50	12	0,948*	0,954*	0,900*
51 – 60	12	0,936*	0,884*	0,859*

* significant for p < 0,01

TABLE 3 - Correlations between Body Adiposity Index, body fat percentage estimated by skinfolds and Body Mass Index for females (n = 48).

		Correlations		
Age group	N	BAI x BMI	BAI x SK	SK x BMI
20 – 30	12	0,770*	0,922*	0,797*
31 – 40	12	0,916*	0,929*	0,906*
41 – 50	12	0,940*	0,852*	0,854*
51 – 60	12	0,824*	0,854*	0,888*

* significant for p < 0,01

As can be seen in Table 3 and Figure 2, when comparing the BAI with BMI in relation to skin folds on the sample of females in the age groups 41-50 years and 51-60 years, BMI showed a closer correlation with folds compared to the BAI.

According Matsudo et al. (2000), with the aging process changes occur mainly in height, weight and body composition, causing a decrease in stature, a process that appears to occur more rapidly in women than in men, mainly due to higher prevalence of osteoporosis after menopause.

With these structural changes, BMI also changes, according to data from the U.S. population, men reach their maximum BMI between 45 and 49 years, while women reach this peak only between 60 and 70 years (MATSUDO et al., 2000).

Thus, the stronger correlation between BMI and SK for females in the age groups 41-50 years and 51-60 years (Table 3) may be due to structural features related to weight and body composition found in this range group, in which BMI better fits.

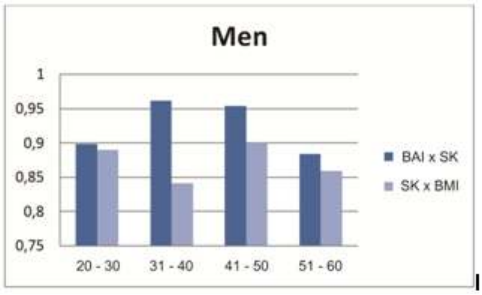

FIGURE 1 - Correlation between the BAI and estimated body fat by skinfold thickness compared with the correlation between BMI and skinfold thickness (males, n = 48).

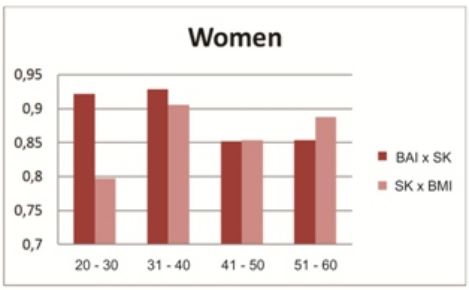

FIGURE 2 - Correlation between the BAI and estimated body fat by skinfold thickness compared with the correlation between BMI and skinfold thickness (females, n = 48).

CONCLUSION

Corroborating with the study of Sulino et al. (2011), this study confirms the feasibility of Body Adiposity Index as a good option for estimating body fat percentage, so presenting a practical and low cost, and presented a strong correlation between BMI and SK in all age groups analyzed.

Although the known limitations regarding the use of BMI as an indicator of adiposity, this study showed a good correlation between BMI and the BAI, mainly due to the characteristics of the sample. These results could be presented differently depending on whether the sample was composed of individuals with the lowest percentage of fat and a higher percentage of lean mass, as is the case with athletes of various sports.

Thus, we conclude that more studies are needed to verify the applicability of BAI in samples with different characteristics, such as children, adolescents and athletes.

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CORRELATION BETWEEN BODY ADIPOSITY INDEX, BODY MASS INDEX AND ESTIMATED BODY FAT BY SKINFOLD THICKNESS IN DIFFERENT AGE GROUPS

ABSTRACT

Obesity is a known public health problem. The evaluation of the individual is paramount, so you can diagnose obesity and overweight, and BMI and skinfold measurement are widely used in clinics, academies and scientific studies. Bergman et al. (2011) present the Body Adiposity Index (BAI), in order to estimate the percentage of body fat, using only the measurements of hip circumference and height. This index is presented also as an alternative method to the Body Mass Index (BMI) in the identification of obesity. Sulino et al. (2011) show the correlation between BMI and the BAI, finding a high correlation between the two methods, which enables the use of BAI as a tool for the diagnosis of body fat. Thus, this study shows a correlation between the IAC, BMI and skinfold method in order to identify the feasibility of using BAI in different age groups. The study included 96 individuals classified as sedentary, 48 females with body mass 66.74 ± 11.38 kg and height of 161.51 ± 5.74 cm, and 48 males with body mass of 82.73 ± 12.04 kg and height of 174.16 ± 7.19 cm, aged between 20 and 60 years old, divided by age groups. As a result, we identified a high correlation between BAI and skinfolds at all ages, both men and women, while for women aged 41 to 60 years, BMI has shown a higher correlation, possibly due to a better applicability of BMI in this age group. From the results presented, we can conclude that, for the sample, the BAI is presented as a viable alternative for the diagnosis of body fat.

KEYWORDS: correlation, body fat, physical assessment.

CORRELATION ENTRE L'ADIPOSITE INDICE CORPOREL, L'INDICE DE MASSE CORPORELLE ET LA GRAISSE CORPORELLE ESTIMEE PAR L'EPAISSEUR DES PLIS CUTANES DIFFERENTS GROUPES D'AGE

RÉSUMÉ

L'obésité est un problème de santé publique. L'évaluation de l'individu est primordiale, donc vous pouvez diagnostiquer l'obésité et le surpoids des mesures, et de l'IMC et les plis cutanés largement utilisés dans les cliniques, les académies et les études scientifiques. Bergman et al. (2011) présentent l'indice de l'adiposité corporelle (IAC), afin d'estimer, dans la pratique, le pourcentage de graisse du corps, en utilisant uniquement les mesures de la circonférence de la hanche et de la hauteur. Cet indice est présentée aussi comme une méthode alternative à l'indice de masse corporelle (IMC) à l'identification de l'obésité. Sulino et al. (2011) montrent la corrélation entre l'IMC et le IAC, trouver une corrélation élevée entre les deux méthodes, ce qui permet l'utilisation de la IAC comme un outil pour le diagnostic de la graisse corporelle. Ainsi, cette étude montre une corrélation entre la IAC, l'IMC et la méthode des plis cutanés afin d'identifier la faisabilité d'utiliser la IAC dans les différents groupes d'âge. L'étude a inclus 96 personnes classées comme sédentaires, les femelles 48 à 66,74 masse corporelle ± 11.38 kg et une hauteur de 161,51 ± 5,74 cm, et 48 hommes avec de masse corporelle de 82,73 ± 12.04 kg et une hauteur de 174,16 ± 7,19 cm, âgés entre 20 et 60 , divisé par l'âge. En conséquence, nous avons identifié une forte corrélation entre la BAI et les plis cutanés à tous les âges, hommes et femmes, tandis que pour les femmes âgées de 41 à 60 ans, l'IMC a montré une corrélation plus élevée, probablement due à une meilleure applicabilité de l'IMC dans ce groupe d'âge . A partir des résultats présentés, nous pouvons conclure que pour l'échantillon, la IAC est présenté comme une alternative viable pour le diagnostic de la graisse corporelle.

MOTS-CLÉS: corrélation, graisse corporelle, l'évaluation physique.

CORRELACIÓN ENTRE EL ÍNDICE DE ADIPOSIDAD CORPORAL, ÍNDICE DE MASA CORPORAL Y LA GRASA CORPORAL ESTIMADA POR EL ESPESOR DEL PLIEGUE CUTÁNEO EN DIFERENTES GRUPOS DE EDAD

RESUMEN

La obesidad es problema de salud pública. La evaluación de la persona es lo más importante, por lo que puede diagnosticar la obesidad y las mediciones de sobrepeso, y el IMC y del pliegue cutáneo ampliamente utilizado en las clínicas, academias y estudios científicos. Bergman et al. (2011) presentan el Índice de Adiposidad Corporal (IAC), a fin de calcular el porcentaje de grasa corporal, utilizando solamente las mediciones de la circunferencia de la cadera y la altura. Este índice se presenta también como un método alternativo para el Índice de Masa Corporal (IMC) en la identificación de la obesidad. Sulino et al. (2011) muestran la correlación entre el IMC y el IAC, encontrando una alta correlación entre los dos métodos, que permite el uso de IAC como una herramienta para el diagnóstico de la grasa corporal. Por lo tanto, este estudio muestra una correlación entre el IAC, el IMC y el método de los pliegues cutáneos con el fin de determinar la viabilidad de la utilización de IAC en diferentes grupos de edad. El estudio incluyó a 96 individuos clasificados como sedentarias,48 mujeres con masa corporal 66.74 ± 11.38 kg y la altura de 161.51 ± 5.74 cm, y 48 hombres con masa corporal de 82,73 ± 12,04 kg y la altura de 174.16 ± 7.19 cm, con edades comprendidas entre 20 y 60, divididos por edad. Como resultado, se identificó una alta correlación entre IAC y pliegues de la piel en todas las edades, mientras que para las mujeres de 41 a 60 años, el IMC ha demostrado una correlación más alta, posiblemente debido a una mejor aplicación en este grupo de edad. De los resultados presentados, podemos concluir que para la muestra, el IAC se presenta como una alternativa viable para el diagnóstico de la grasa corporal.

PALABRAS CLAVE: correlación, grasa corporal, evaluación física.

CORRELAÇÃO ENTRE O ÍNDICE DE ADIPOSIDADE CORPORAL, ÍNDICE DE MASSA CORPORAL E ESTIMATIVA DE ADIPOSIDADE CORPORAL POR MEIO DE DOBRAS CUTÂNEAS EM DIFERENTES FAIXAS ETÁRIAS

RESUMO

A obesidade é um conhecido problema de saúde pública. A avaliação do indivíduo é de suma importância, para que se possa diagnosticar a obesidade e sobrepeso, sendo o IMC e medidas de dobras cutâneas amplamente utilizadas em clínicas, academias e estudos científicos. Bergman et al. (2011) apresentam o Índice de Adiposidade Corporal (IAC), com a finalidade de estimar o percentual de gordura corporal, utilizando-se apenas medidas da circunferência do quadril e estatura. Este índice apresenta-se, ainda, como um método alternativo ao Índice de Massa Corporal (IMC) na identificação da obesidade. Sulino et al. (2011) apresentam a correlação entre o IAC e o IMC, encontrando uma alta correlação entre os dois métodos, o que viabiliza a utilização do IAC como ferramenta para diagnóstico da adiposidade corporal. Dessa forma, o presente estudo apresenta uma correlação entre o IAC, IMC e dobras cutâneas, de forma a identificar a viabilidade de utilização do IAC em diferentes faixas etárias. Participaram deste estudo 96 indivíduos classificados como sedentários, sendo 48 do sexo feminino com massa corporal de 66,74±11,38 kg e estatura de 161,51±5,74 cm, e 48 do sexo masculino com massa corporal de 82,73±12,04 kg e estatura de 174,16±7,19 cm, com idade entre 20 e 60 anos, divididos por faixa etária. Como resultado, identificou-se uma alta correlação entre o IAC e dobras cutâneas em todas as faixas etárias, tanto para homens quanto para mulheres, embora para as mulheres na faixa etária de 41 a 60 anos o IMC tenha apresentado uma correlação mais alta, possivelmente devido a uma melhor aplicabilidade do IMC em tal faixa etária. Mediante os resultados apresentados, podemos concluir que, para a amostra estudada, o IAC se apresenta como uma alternativa viável para o diagnóstico da adiposidade corporal.

PALAVRAS CHAVE: correlação, gordura corporal, avaliação física.