Research Article

Body composition, diet, activity, and physical fitness in university students

Composición corporal, alimentación, actividad y condición física en estudiantes universitarios

Composição corporal, alimentação, atividade e condição física em estudantes universitários

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ABSTRACT

The assessment of body composition in university athletes is a fundamental element for improving sports performance. The Body Fat Distribution Index (BDI) is an under-researched anthropometric indicator that may be useful for identifying body fat distribution when bioimpedance machines are unavailable in institutions. This study aims to assess the body composition of physically active and sedentary students through anthropometry (BDI) as an alternative to electrical bioimpedance and to examine its relationship with diet, physical activity, and physical condition. Sixty-six university students, healthy women and men over the age of 18, were included. Anthropometric measurements were applied to calculate the BDI and body fat, considering four skinfolds and two circumferences. Weight, total body fat percentage and fat by segments, muscle mass, and water content were evaluated with an eight-electrode bioimpedance machine. The measurements were taken at a single time point, and a comparison was made between both techniques and groups. Subsequently, an association was made between the BDI and some measured variables. The data were analyzed using SPSS Statistics 21.0, applying independent samples t-tests and Mann-Whitney U tests to identify differences between groups, and Spearman's test to measure variable correlations, using a significance level of 0.05. A strong positive correlation was found between BDI and bioimpedance as a method for determining body fat distribution. The most significant differences between physically active and sedentary students were identified in BDI, MET, endurance, and strength.

Keywords: Anthropometry; Health; Habits; Physical abilities.

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RESUMEN

La valoración de la composición corporal en deportistas universitarios es un elemento primordial para mejorar el rendimiento deportivo. El Índice de Distribución de Grasa Corporal (IDGC) es un indicador antropométrico poco investigado, pero que puede ser útil para identificar la distribución de la grasa corporal cuando no se dispone de máquinas de bioimpedancia en las instituciones. El presente estudio tiene como objetivo valorar la composición corporal de estudiantes activos e inactivos a través de la antropometría (IDGC) como una alternativa a la bioimpedancia eléctrica, así como su relación con la alimentación, la actividad física y la condición física. Se incluyeron 66 estudiantes universitarios, mujeres y hombres sanos, mayores de 18 años, a quienes se les realizaron mediciones antropométricas para el cálculo del IDGC y la grasa corporal, considerando cuatro pliegues cutáneos y dos circunferencias. Además, se evaluaron el peso, el porcentaje de grasa total y por segmentos, la masa muscular y el agua mediante una máquina de bioimpedancia de ocho electrodos. Las mediciones se realizaron en un solo momento y se compararon ambas técnicas y grupos. Posteriormente, se realizó una asociación entre el IDGC y algunas medidas variables. La información se analizó con SPSS Statistics 21.0, aplicando la prueba t para muestras independientes y la U de Mann-Whitney para identificar diferencias entre grupos, y la prueba de Spearman para medir la correlación de variables, utilizando un índice de significancia de 0.05. Se encontró una correlación positiva fuerte entre el IDGC y la bioimpedancia como método para determinar la distribución de la grasa corporal. Las diferencias más significativas entre estudiantes activos e inactivos se identificaron en el IDGC, el MET, la resistencia y la fuerza.

Palabras clave: Antropometría; Salud; Hábitos; Capacidades físicas.

RESUMO

A avaliação da composição corporal em atletas universitários é um elemento fundamental para a melhoria do desempenho esportivo. O Índice de Distribuição de Gordura Corporal (IDGC) é um indicador antropométrico pouco pesquisado, mas que pode ser útil para identificar a distribuição de gordura corporal quando não há máquinas de bioimpedância disponíveis nas instituições. Este estudo tem como objetivo avaliar a composição corporal de estudantes ativos e inativos por meio da antropometria (IDGC) como alternativa à bioimpedância elétrica e examinar sua relação com a dieta, a atividade física e a condição física. Sessenta e seis estudantes universitários, mulheres e homens saudáveis, maiores de 18 anos, foram incluídos. Medidas antropométricas foram aplicadas para calcular o IDGC e a gordura corporal, considerando quatro dobras cutâneas e duas circunferências. Peso, percentual de gordura total e por segmentos, massa muscular e conteúdo de água foram avaliados com um aparelho de bioimpedância de oito eletrodos. As medições foram realizadas em um único momento, e uma comparação foi feita entre as duas técnicas e os grupos. Posteriormente, foi feita uma associação entre o IDGC e algumas variáveis medidas. Os dados foram analisados no SPSS Statistics 21.0, aplicando testes t para amostras independentes e testes U de Mann-Whitney para identificar diferenças entre grupos, e o teste de Spearman para medir correlações de variáveis, com um nível de significância de 0,05. Foi encontrada uma forte correlação positiva entre o IDGC e a bioimpedância como método para determinar a distribuição de gordura corporal. As diferenças mais significativas entre estudantes ativos e inativos foram identificadas no IDGC, MET, resistência e força.

Palavras-chave: Antropometria; Saúde; Hábitos; Habilidades físicas.

INTRODUCTION

Poorly balanced diet and lack of regular physical activity in university students are the main factors that modify body composition (Alonso et al., 2014), which affects the sports performance of those who participate in sports teams. In this context, since body composition is a key determinant for improving sports performance (Reyes et al., 2020), it is necessary to consider the use of accessible and inexpensive techniques for its assessment.

There are various models, methods and techniques to estimate body composition, the choice of which will largely depend on their accessibility in terms of cost, time, space, precision, speed and reproducibility, especially when applied to large populations, smaller communities, clinical or research areas (Marrodán-Serrano et al., 2007). When accuracy and precision are required, three- or four-component models are often used through sophisticated, expensive and difficult-to-access methods, such as densitometry, dual-energy X-ray absorptiometry (DEXA) or hydrometry. On the other hand, in larger field studies with large populations and when resources and time are limited, the two-component model (fat mass and fat-free mass) is used, which can be determined using simpler tools and techniques, such as anthropometry and electrical bioimpedance (Aristizábal et al., 2007).

One of the anthropometric indicators for body composition that has been little studied in the sports population and in the general population is the Body Fat Distribution Index (BDI) (Chiquete et al., 2012). The most recent research on this marker uses basic measurements such as waist circumference, hip circumference and height for its calculation, in addition to using simple operations to obtain its results. Based on this data, it is possible to determine which part of the body the body fat is mostly distributed, locating it as a predominant distribution in the extremities or trunk, depending on the result (Chiquete et al., 2012). This formula was established by Chiquete et al. (2012): BDI = ([Waist circumference (WC) / height in meters] + [1 / height in meters]) / waist-hip ratio (WHR) in healthy adults. There is another formula applied to this indicator by Acuña et al. (2016), who, when implementing a nutritional program in a concentrating plant in Mexico, considered the measurement of two skinfolds (subscapular and tricipital) for its calculation and applied the following formula: BDI = Subscapular skinfold (SSF) / Tricipital skinfold (TSF) × 100. The parameters used for its interpretation were: results greater than 100 are classified as android obesity; values between 50 and 100 as normal; and values less than 50 as gynecoid obesity. However, the literature on BDI is scarce and there are few studies carried out to date, which shows the need to continue investigating this topic.

Regarding bioimpedance machines, Alvero-Cruz et al. (2011) point out that electrical bioimpedance is a simple, fast and non-invasive technique that allows estimating total body water (TBW) and, through assumptions based on tissue hydration constants, calculating fat-free mass (FFM) and, by derivation, fat mass (FM), using the simple two-component equation (FMM kg = total weight kg - FM kg). These machines have been developed to be used as tools for measuring body composition, since they can simplify the measurement even more than anthropometry. However, although they are not as expensive as other methods, they do represent a more significant expense than anthropometry, so these instruments are not always available in educational institutions due to lack of resources, making it necessary to resort to anthropometry as the most viable and economical option.

As evidence of the use of both methods, Arencibia et al. (2018) conducted a study in which they correlated body composition measured by plyometrics and electrical bioimpedance in nutrition students, finding that it is possible to use either method to measure body composition, as long as they are standardized. In anthropometry, certification guarantees that the measurements are reliable, and in bioimpedance, it ensures that the equipment is correctly calibrated. Along the same lines, Alomía-León et al. (2022) applied their research to Peruvian university students, determining, through the measurement of skinfolds (tricipital, suprailiac, subscapular, abdominal, front thigh and calf), body fat using the Yuhasz equation (1974), while for the assessment of body fat using the electrical bioimpedance method, the InBody 120 was used. The conclusions indicated that the correlation between both methods suggests that they are interchangeable and can be used interchangeably in this type of population to determine the percentage of body fat. Based on the evidence, the main hypothesis of the research considers that the BDI measured by anthropometry, compared to electrical bioimpedance, is a valid tool to detect changes in body composition in student athletes and non-athletes at the higher level.

Given the lack of research on this anthropometric index (BDI) and its relationship with variables such as eating habits, exercise and physical abilities in university students, both athletes and non-athletes, the need arose to carry out the present study. The objective was to assess body composition using the BDI and bioimpedance, and to analyze their relationship with diet, physical activity and physical condition in university students classified as active and inactive. Correlations were sought to determine whether this index can replace the use of more expensive equipment and whether it is an equally useful, simple and fast tool to assess body composition in active and inactive university populations.

METHODS

Participants

The design of the present research was descriptive, comparative, analytical and cross-sectional, and included a university population composed of student athletes and non-athletes, measuring the Body Fat Distribution Index (BDI) through two methods: anthropometry and electrical bioimpedance. The sample consisted of 66 participants, of which 31 were men (46.97%) and 35 women (53.03%), aged between 18 and 21 years (19.06 ± 0.9), all students of the Instituto Tecnológico Superior de Abasolo, in the city of Abasolo, Guanajuato, Mexico. A non-probabilistic convenience sampling was used, selecting participants through dissemination on social networks, internal printed calls placed in classrooms and by direct invitation to the first semester groups. The inclusion criteria were healthy men and women between the ages of 18 and 25, who were not under medical treatment and who were enrolled in the Technological Institute. All study participants were required to provide signed informed consent. Subjects who suffered from a non-communicable disease or were under medical treatment, who were diagnosed with a major health problem during the application of the tests, who did not provide informed consent and/or who did not complete at least 85% of the required measurements and surveys were excluded from the study.

The principles of the Declaration of Helsinki (World Medical Association [WMA], 2013) were followed in this research, and the approval of the Ethics Committee of the International Ibero-American University (minute No. CR-146) was obtained.

Materials and instruments

Anthropometric measurement

For skinfold measurements, a Slim Guide caliper with an accuracy of ±1 mm, 1 mm increments between each measurement, and an aperture of 80 mm, approved by the International Society for the Advancement of Kinanthropometry (ISAK), was used. For perimeter or circumference measurements, a Lufkin body tape measure (not validated), metal, with a width of 7 mm, a neutral zone of 10 cm before the 0 cm mark, and an extension of 2 meters in length, was used. For height measurements, a portable Avanutri 312 detachable stadiometer was used, with a measurement range of 20 to 210 cm, a base of 23.5 cm x 13.5 cm, and a large reading indicator for easy viewing. The stadiometer has a "T" shaped stabilizer that ensures the vertical and horizontal stability of the equipment. All measurements were based on the procedure established by ISAK for the restricted profile (Esparza et al., 2019).

Bioimpedance measurement

A Beurer BF 1000 bioimpedance machine (not validated) was used, with a maximum capacity of 200 kg and a cross-measurement of 8 stainless steel electrodes. The machine features a dot matrix display on an aluminum stand with blue illumination, a 10 mm thick glass weighing surface, and 5 activity grades. Measurements included weight, body fat and muscle mass by segments, visceral fat, water, bone mass, and basal metabolic rate (BMR). The measurement protocol was based on the manufacturer's instructions.

Identification of eating habits

The assessment of eating habits was carried out by applying a validated survey called "Food Group Consumption Frequency Questionnaire Based on an Exchange System" (Goni et al., 2016), which consists of 19 basic food groups of the diet.

Identification of exercise habits

The level of physical activity was determined using the short version of the validated IPAQ (International Physical Activity Questionnaire) (Cancela et al., 2019), which consists of 7 items on the frequency and intensity of physical activity performed in the last 7 days, as well as on walking time and sitting time on a workday.

Measurement of Physical Abilities

Aerobic capacity (endurance) was measured using the 1000-meter dash test; speed, through the 30-meter throw test; strength, with the 1-minute sit-up test; and flexibility, with the "sit and reach" test, which measures the flexibility of the lower back, hip extensors, knee flexor muscles, and gastrocnemius (Ramos et al., 2023).

Procedure

Measurements were conducted over a week, with subjects being placed in groups for the application of initial surveys, including the "Food Group Consumption Frequency Questionnaire" and the short version of the IPAQ questionnaire. Based on the information obtained through the IPAQ questionnaire, participants were classified as active (43=65.16%) or inactive (23=34.84%).

Subsequently, participants were called to perform the necessary anthropometric measurements in a small, closed classroom, between 8:00 a.m. and 12:00 p.m. The measurements were performed by the principal investigator of the study, an ISAK level 2 certified anthropometrist, following the standards established by ISAK (Esparza et al., 2019). The measurements performed included waist circumference, hip circumference, height in meters, and skinfolds (tricipital, subscapular, bicipital, supraspinal). With these measurements, the BDI was determined using the formula proposed by Chiquete (2012). The bioimpedance assessment was performed with an 8-electrode machine to determine weight in kilograms, percentage of body fat in general and by body segments, as well as muscle mass in percentage.

Finally, the physical capacity tests were applied on the soccer field of the Tecnológico university facilities, in a morning schedule (8:00 a.m. to 10:00 a.m.). Although there is evidence that the time of application of the physical capacity tests does not influence performance (Pazetti et al., 2024), it was preferred to carry out the tests at a time and environment more suitable for the participants. The tests were applied in the following order: 1000-meter test, 30-meter throw test, 1-minute sit-ups, and "sit and reach" test. All tests were applied by the researcher. For the interpretation of the results, the scales established in different studies were taken as a reference: 1000-meter test (Mazón et al., 2020); 30-meter throw (Quintasi et al., 2006); 1-minute sit-ups (Serrato, 2003); and "sit and reach" test (Poblete et al., 2013). With all the information obtained, the statistical analysis was carried out.

Data analysis

The normality of the study variables was verified with the Kolmogorov-Smirnov (K-S) test. A descriptive analysis of the following variables was performed: mean and standard deviation for age, anthropometric measurements, electrical bioimpedance assessment, body fat distribution index, waist circumference, hip circumference, and physical capacity test scores; simple frequencies for the IPAQ questionnaire variables and frequency of consumption by food groups; and percentages for the variables of university student athletes and non-athletes. To identify differences between the active and inactive groups in the BDI variable, the Mann-Whitney U test was applied; for kilocalories consumed per day, the T test for independent samples was used; for METs per week, the Mann-Whitney U test; for the results of the physical tests of endurance and speed, the Mann-Whitney U test; and for strength, the T test for independent samples. Spearman's correlation was used to measure the strength of the relationship between the anthropometrically measured BDI and that obtained by electrical bioimpedance, as well as between the value resulting from the calculation of the BDI and the percentage of body fat emitted by the bioimpedance machine. A level of statistical significance of 0.05 was considered for all tests, with a confidence interval of 95%. The scale used to interpret the Spearman correlation was: 0.10 = no correlation, 0.30 = weak correlation, 0.30 – 0.50 = moderate correlation, 0.50 – 1.00 = strong correlation. The analyses were performed using the statistical program SPSS Statistics 21.0.

RESULTS

The participant sample included college-level students who were enrolled at the institution and who met the inclusion criteria described. A total sample of 66 participants was obtained, who, according to the initial surveys, were classified as active and inactive, as shown in Table 1.

Table 1

Total	Active	Inactive
66(100%)	23(34.84%)	43(65.16%)

Table 2 presents the mean and standard deviation values of the anthropometric variables (skinfolds, circumferences, height, weight) and the bioimpedance variables (percentages of fat, muscle and water), as well as the results of the body fat distribution index (BDI) calculated using the formulas found in the literature.

Table 2.
Mean and SD values of all variables measured in the sample, divided by physical status

	Total	Active	Inactive
Age	19.06 ± 0.9	19.24 ±0.97	19.96 ± 0.84
P. Tricipital	14.98 ± 5.28	12.72 ± 4.61	16.19 ±5.23
P. Bicipital	8.04 ± 4.11	6.43 ± 3.57	8.90 ± 4.13
P. Supraespinatus	14.31 ± 7.21	11.13 ± 4.91	16.01 ± 7.65
P. subescapularis	14.92 ± 6.54	12.24 ± 4.68	16.35 ± 6.93
Height	1.65 ± 0.09	1.66 ± 0.08	1.64 ± 0.09
Waist circumference	80.66 ± 14.60	75.65 ± 8.03	83.34 ± 16.50
Hip circumference	98.75 ± 10.69	95.81 ± 6.53	100.32 ± 12.06
WHR	0.81 ± 0.07	0.79 ±0.05	0.82 ±0.07
Weight	67.65 ± 21.11	62.23 ± 10.33	70.55 ± 24.55
% Total fat	21.4 ± 7.7	19.90 ± 8.22	21.66 ± 7.32
% Muscle	43.05 ± 4.83	43.57 ± 5.14	42.77 ± 4.63
% Water	58.88 ± 7.53	60.43 ± 6.88	58.03 ± 7.73
% Right arm fat	20.66 ± 7.81	19.44 ± 7.49	21.33 ± 7.91
% Left arm fat	20.90 ± 7.95	19.18 ± 7.59	21.84 ± 7.99
% Right leg fat	22.95 ± 9.15	20.67 ± 10.31	24.20 ±8.18
% Left leg fat	22.91 ± 9.26	20.89 ± 10.41	24.02 ± 8.36
% Trunk fat	19.82 ± 8.77	19.37 ± 9.12	20.07 ± 8.56
BDI (Acuña y Ochoa)	101.46 ± 28.43	100.54 ± 27.83	101.95 ± 28.73
BDI (Chiquete)	49.53 ± 7.76	46.29 ± 4.87	51.26 ± 8.43

For the identification of the variables of the physical capacity tests, Table 3 is shown, which presents the average values found in the results of the tests of resistance, strength and speed, together with their standard deviation, differentiated by gender and classification as athletes and non-athletes. Regarding the flexibility capacity, the percentage of the classification in the three established ranges is presented (positive, neutral and negative).

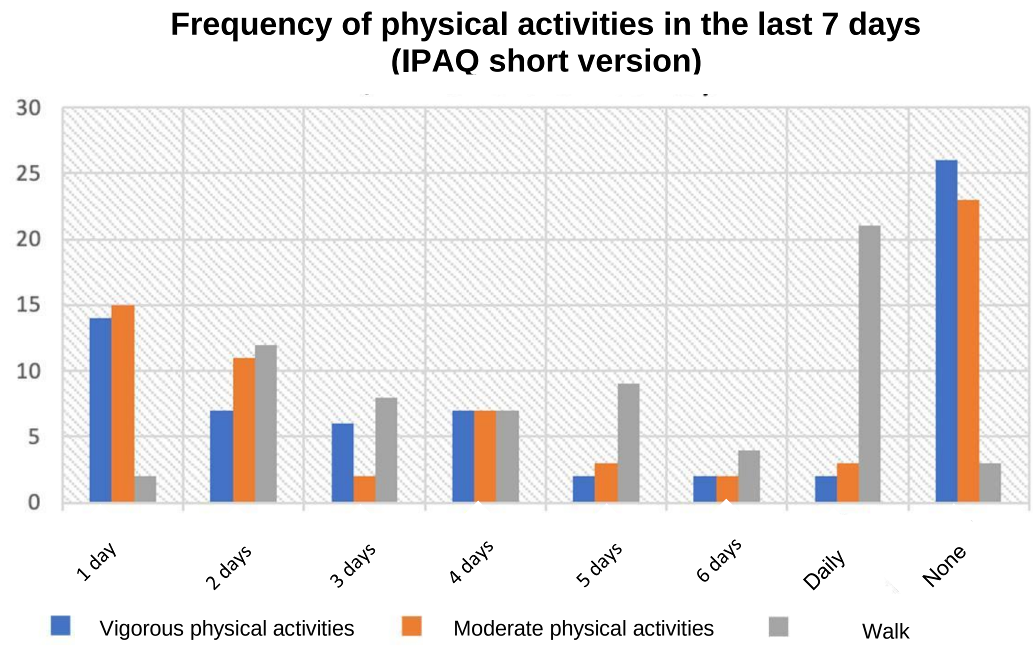
Table 3.
Mean, SD and percentage of physical capacity variables

	Total	Active	Inactive
Endurance capacity, 1000 m test (minute/seconds)	5.04 ± 0.99	4.55 ± 1.02	5.29 ± 0.86
Strength capacity, 1-minute sit-ups (total number of sit-ups)	22.27 ± 5.22	24.43 ± 4.92	21.12 ± 5.01
Speed capacity, 30 meters flat (seconds/hundredth of a second)	8.45 ± 2.04	8.41 ± 1.79	8.47 ± 2.16
Flexibility capacity, sit and reach test (centimeters +/-)	Good (6 cm or more) – 26 (39.4%)	13 (56.6%)	13 (31%)
	Average (0 to 5 cm) – 21 (31.8%)	5 (21.7%)	16 (38%)
	Poor (-1 cm or less) – 19 (28.8%)	5 (21.7%)	13 (31 %)

Regarding the nutritional variables measured in the participants, the most significant data showed that the average amount of calories consumed in a day was 1676.74 kcal; the average protein consumption was 74.97 g (20.11%), lipids 48.09 g (29.03%) and carbohydrates 179.50 g (48.15%).

Regarding the short version of the IPAQ questionnaire, Figure 1 is presented, which details the frequency with which the three activities (vigorous physical activities, moderate physical activities and walking) were practiced in the last 7 days. It is observed that a significant number of participants did not perform vigorous activities (26 participants) or moderate activities (23 participants), while the activity most frequently performed was walking daily (21 participants). The weekly average of METs in the sample was 1416.06.

Figure 1.
Physical Activity Frequency Chart (IPAQ short version)



Regarding the results of the inferential statistics, Table 4 describes the associated variables that could have had a significant effect on the results of the anthropometry. This table details the test applied to measure the correlation between the BDI and the percentage of fat measured by bioimpedance for the total sample, as well as its significance according to the range of interpretation taken as a reference. The most notable results of this correlation show that the BDI measured anthropometrically and the percentage of total fat measured through the bioimpedance machine present a strong positive correlation. In the same table, the results of the comparison between active and inactive students in the variables of BDI, calories consumed, MET, endurance capacity, strength and speed are described. Significant differences were identified in four variables: in the BDI, a significant difference was found between the average values of the group of active students (46.29) and inactive (51.26); For the variable of kilocalories consumed, no significant differences were found between the groups (active: 1501 kcal, inactive: 1494.84 kcal); in the variable MET, a significant difference was found (active: 2426.77, inactive: 1408.84); in the variable resistance, a significant difference was also found (active: 4.55 min, inactive: 5.20 min); the variable of strength showed significant differences (active: 24.43, inactive: 21.21); and in the variable of speed, no significant differences were found (active: 8.41 s, inactive: 8.48 s).

Table 4.
Correlation between main variables BDI vs bioimpedance

Variables	Normality	Type of analysis	Test	Result	Significance
BDI vs % total fat measured by BI (Total sample)	No	Correlation	Spearman	0.52	Strong positive

Table 5.
Intergroup differences between active vs. inactive students

Variables	Normality	Test	Mean/Median	Standard Deviation/Range	P
BDI	No	Mann Whitney U	Median 47.52	Range 44.59	0.01
Kilocalories consumed	Yes	Independent samples t test	Medan 1676.74	SD 306.72	0.2
MET	No	Mann Whitney U	Median 1412.50	Range 3290	0.005
Endurance	No	Mann Whitney U	Median 5.06	Range 3.48	0.025
Strength	Yes	Independent samples t test	Mean 22.8	SD 5.37	0.025

DISCUSSION

The main objective of this research was to evaluate the usefulness of the Body Fat Distribution Index (BDI) as an alternative to the use of tetrapolar bioimpedance for the assessment of body composition in active and inactive students, as well as to identify intergroup differences in the most representative variables related to fat distribution and body composition.

The usefulness of some anthropometric indicators, such as the BDI, has not been fully established in the literature (Chiquete et al., 2012; Acuña et al., 2016; Gorostiza et al., 2008; Fleta-Zagarozano et al., 1997; Poveda et al., 2019), and its application in the university population is scarce. Among the most notable results of the statistical analysis is the strong positive correlation between anthropometrically measured BDI and bioimpedance as methods for determining body fat distribution, as shown in Table 5. A similar study (Ortega et al., 2018) conducted with university women calculated the percentage of fat using different anthropometric formulas and compared it with a direct segmental measurement bioimpedance (BI) analyzer. Similarly, another study (Alomía-León et al., 2022) compared both methods in university students of both sexes, using the Yuhasz equation to determine the percentage of fat and the InBody 120 analyzer. Both studies suggest that, in this population, the use of one method or the other may be interchangeable, as long as certain indicators or formulas are used. However, a different study (Hincapie et al., 2023) that measured the correlation between body mass index (BMI) and the percentage of gross fat mass (GFM) obtained by bioimpedance concluded that there is no strong correlation between BMI and the percentage of GFM obtained by bioimpedance. This study indicates that BMI does not adequately differentiate obese or overweight people, while bioimpedance is considered an accurate marker for measuring body composition.

On the other hand, there is evidence suggesting that anthropometry is a more useful and sensitive method than bioimpedance for assessing body composition in the active population (Martínez & Urdampilleta, 2012). Based on the above, the BDI is a simple anthropometric indicator to calculate that can be considered a useful tool for assessing both active and inactive students.

In the analysis of the variables between active and inactive participants, significant differences were found in the BDI, where the active group presented lower values (46.29) compared to the inactive ones (51.26). A similar finding is reported in the literature (Leonardo-Mendonca et al., 2012), showing significant differences in fat mass and visceral fat between athletic and sedentary university students at the University of Valencia. Regarding the MET variable, the values were higher for the active ones (2426.77) compared to the inactive ones (1408.84). The research indicates that a significant part of the university population is inactive and has unhealthy health habits (Chales-Aoun et al., 2019). In relation to endurance capacity, active students recorded lower times in the test (4.55 minutes) compared to the inactive ones (5.20 minutes). A similar study (Siquier-Coll et al., 2018) conducted with young males aged 12 to 18 found that active participants have greater lung capacity and better recovery after exercise compared to sedentary participants. Finally, in terms of strength capacity, the active group performed a greater number of sit-ups (24.43) compared to the inactive group (21.21). No significant differences were found in the variables of kilocalories consumed and speed.

CONCLUSION

In the present investigation, a strong positive correlation was identified between the BDI and tetrapolar bioimpedance, suggesting the need to continue investigating this index, especially in larger and more diverse samples, and with greater control of the variables that affect the percentage of fat. Evidence is provided that the BDI could be a useful, practical and rapid tool for assessment in active and inactive university populations when tools such as bioimpedance are not available. It is expected that this tool will be as useful as other widely used indicators, such as BMI, which although has an important evidence base, shows deficiencies in identifying the distribution of body fat. It is essential to consider the most significant variables that mark the differences between the groups; in the present study, these variables were METs per week, endurance capacity and strength, which can bias the measurement of the main variable.

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