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Article

Assessment of Body Mass Index, Body Composition, Physical Activity, and Dietary Preferences in University Students: A Pilot Study

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Abstract: (1) Background: Body composition analysis, particularly the assessment of the amount and distribution of body fat and muscle mass in young people, is of considerable clinical importance for the detection of nutritional disorders. (2) Methods: University students aged 19–25 years had their body composition measured using a bioimpedance (BIA) device InBody 370S. Furthermore, a questionnaire survey was performed using the questionnaires: factors that influence your choice of food (FCQ); food preference questionnaire for adolescents and adults (FPQ); the international physical activity questionnaire (IPAQ). (3) Results: Body mass index (BMI) values were within a normal range in 89.5% of men and 77.9% of women, while statistically significant differences between the sexes were confirmed for all body parameters ($p < 0.001$; $p = 0.025$). The waist-to-hip ratio (WHR) and percentage body fat (PBF) were abnormally high in 50.4% and 44.3% of women, respectively. High values of skeletal muscle mass (SMM), protein, minerals, and bone mineral content (BMC) were identified in 36.8% of men. A total of 88 students (66.7% of men and women) had a higher level of physical activity, i.e., achieved metabolic equivalent (MET) values of more than 3000 per week. (4) Conclusions: BMI does not always have explanatory power for assessing body weight, as it does not consider the percentage distribution of fat and non-fat body mass in the total body weight. Physical activity and a varied diet have a positive effect on achieving optimal body weight and are effective in preventing nutritional disorders (such as obesity and malnutrition) and associated health problems.

Keywords: body composition; bioimpedance; dietary preferences; obesity; exercise

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1. Introduction

Due to the increasing number of people suffering from overweight, obesity, metabolic syndrome, or malnutrition, the need for accurate and timely diagnosis of body composition is also increasing. The analysis of body composition, especially the assessment of the amount and distribution of body fat in young people, is of significant clinical importance for the detection of nutritional disorders. The assessment of nutritional status using the body mass index (BMI) is widely used primarily to quickly assess the risk and degree of obesity. However, BMI has significant limitations in distinguishing between fat and muscle mass [1–4].

Inappropriate eating habits and insufficient physical activity can be associated with the emergence of non-infectious diseases of mass occurrence. Many studies address the global problem of the declining amount of physical activity. This trend is associated, among other things, with the increasing prevalence of obesity in the population. Physical activity is crucial not only for a correct metabolic activity of the organism, but also (among other things) for the healthy development of bones and the good functionality of the muscular system. It, of course, also reduces the risk of obesity, stress, and anxiety [5–7].

Holidays can represent another factor for weight gain (not only) in young adults and students. A study from Spain that examined weight changes in 67 university students over the two-week Christmas break concluded that students experienced weight gain and BMI increase over this brief period [8]. In addition, the COVID-19 pandemic and lockdowns have affected the lifestyles of people around the globe. Systematic reviews show the impact of quarantine on inappropriate eating habits and lack of exercise, which can increase the risk of obesity and other diseases [9] even in students and young adults [10].

Energy volume, defined as the amount of energy provided per unit weight of food, is another factor contributing to body weight regulation. Eating large portions of food usually results in a higher energy intake. It is advisable to consume smaller portions of food and choose foods with a low energy content that contain more water, fiber, and quality protein. Foods with a higher fiber content affect the sensation of satiety and, therefore, can help maintain a healthy body weight. Inappropriate eating habits and poor quality of food are associated with nutritional disorders and the development of health problems. Eating foods that comply with nutritional recommendations provides adequate amounts of all macronutrients and micronutrients [5,11,12].

University students represent a population group of young women and men, who can be assumed to have different body compositions, which are influenced not only by physiological factors but also, as a rule, by different levels of physical activity and different dietary preferences among the sexes. Our research aimed to assess the body composition in university students. Body measurements were carried out using bioimpedance. The results were then compared with the students' level of physical activity, food preferences, and factors that influence their food choices.

2. Materials and Methods

Data collection for a pilot study took place from October 2020 to May 2021. Cooperation with the study participants included measuring body composition using bioimpedance analysis using the InBody 370S device and filling out standardized questionnaires to assess food intake and choices: the FCQ (36 questions, importance of intake) to identify food preferences; the FPQ to evaluate the popularity of individual foods (evaluation of 62 food types on a five-point Likert scale); and the long-form version of the IPAQ (5 domains of activities examined independently) to find out the level of physical activity. Given the length of the examination itself, we chose questionnaires that were previously reported to be simple and quick to complete by young respondents [13,14]. The questionnaires were processed in an electronic form and prepared in such a way to ensure that no sensitive data on the students were collected. A link to the electronic questionnaires was provided to all participants in the study cohort. Data from the electronic questionnaires were then exported for further statistical analysis.

The inclusion criteria were: students from the University of Ostrava (OU), age of 19–25 years, the absence of contraindications for measurement on the InBody 370S device (person with a pacemaker or pregnancy), compliance with the conditions of bioimpedance measurement and with completing questionnaires on physical activity and diet. The recruitment of students was promoted using leaflets, informative e-mails, word of mouth, and university media. Unfortunately, the recruitment was complicated by ongoing epidemiological measures due to the COVID-19 pandemic. Distance education, human movement restrictions, and numerous quarantines for students and researchers, resulted in lower student participation in our research.

The Ethics Committee of LF OU approved the research project. The informed consent, standardized questionnaires, and bioimpedance measurement instructions were submitted to the ethics committee for approval. All students who were interested in being included in the study were asked for their e-mail address, to which links to the electronic questionnaires were subsequently sent. Participants received all the information about the research project in advance, as well as the instructions they had to follow before the bioimpedance examination.

Before analysis, the measured data were divided by sex and exported to the Microsoft Office Excel 2017 program (MS Excel; Microsoft Corporation, Washington, DC, USA), in which the data were statistically processed, including the creation of tables and graphs. The basic descriptive statistics, non-parametric Wilcoxon test, and two-sample Welch's tests with correction for different sample ranges were used for statistical analyses performed in the NCSS 11 program (NCSS 11; Data Analysis & Graphics, Kaysville, UT, USA). A significance level of 5% was defined for testing.

3. Results

3.1. Results of BIA Measurements—Values of Measured Body Parameters by Sex

A total of 132 students participated in the study, of which 19 were men (14.4%) and 113 women (85.6%), respectively. The mean age of the women was 21.6 years (SD ± 1.46) and that of the men was 21.5 years (SD ± 1.02) years. No statistically significant difference in age was detected between the sexes ($p = 0.715$). As a part of the examination using the InBody device, all important values and indicators for assessing the nutritional status of the students were measured. The participants were classified into three sub-categories (below the lower limit, normal range, and above the upper limit). All limits were set individually according to the individual's initial parameters entered into the device at the beginning of the examination. Most students were within the normal range in all parameters. The lowest proportions of normal range values were detected for the body fat percentage (PBF; 48.7%) and waist-to-hip ratio (WHR; 49.6%) in women. These two indicators were most often above the norm in women (44.3% for PBF and 50.4% for WHR, respectively). From the physiological point of view, increased values of these indicators indicate an increased risk of the development of metabolic diseases associated with other complications. In men, more than 50% of the participants showed normal values in these parameters. The values of four indicators were above the normal limit (skeletal muscle mass (SMM), protein, minerals, and bone mineral content (BMC)) in 36.8% of the male participants; however, above-normal levels in these parameters are desirable. All body parameters significantly differed between men and women (Table 1).

Table 1. Results of BIA measurements—values of measured body composition parameters according to sex (* $p < 0.001$, Welch's test; ⁑ $p = 0.025$, Welch's test).

Body Composition	Men (N = 19)								Women (N = 113)							
	Mean ± SD	Median (Min; Max)	NR		>UL		<LL		Mean ± SD	Median (Min; Max)	NR		>UL		<LL	
			N	%	*N*	%	*N*	%			*N*	%	*N*	%	*N*	%
Age (years)	21.5 ± 1.02	21 (20; 24)							21.6 ± 1.46	21 (19; 25)						
Weight (kg)	77.7 ± 10.22	78.5 (53.5; 102.2)	17	89.5	2	10.5	0	0	62.6 ± 8.74	62.2 (44.9; 91.1)	90	79.7	18	15.9	5	4.4
BFM * (kg)	11.7 ± 4.80	9.9 (5.6; 24.9)	12	63.2	2	10.5	5	26.3	17.3 ± 6.42	16.2 (7.1; 47.7)	58	51.3	33	29.2	22	19.5
SMM * (kg)	37.7 ± 5.01	37.6 (26.4; 47.9)	12	63.2	7	36.8	0	0	24.9 ± 3.15	29.9 (17.2; 34.7)	80	70.8	5	4.4	28	24.8
FFM * (kg)	66.0 ± 8.22	66.2 (47.4; 83.6)	13	68.4	6	31.6	0	0	45.3 ± 5.26	45.4 (32.3; 61)	83	73.5	5	4.4	25	22.1
PBF * (%)	14.8 ± 5.01	13.7 (6.8; 27.7)	14	73.7	3	15.8	2	10.5	27.1 ± 6.84	26.4 (11.8; 52.3)	55	48.7	50	44.3	8	7.1
BMI ⁑ (kg/m^2)	23.7 ± 2.37	23.3 (20.1; 29.7)	17	89.5	2	10.5	0	0	22.3 ± 2.88	21.9 (16.3; 33.5)	88	77.9	17	15.0	8	7.1
WHR ⁑	0.84 ± 0.05	0.83 (0.75; 0.98)	14	73.7	2	10.5	3	15.8	0.87 ± 0.05	0.86 (0.77; 1.03)	56	49.6	57	50.4	0	0
Protein (kg) *	13.2 ± 1.67	13.2 (9.4; 16.6)	12	63.2	7	36.8	0	0	8.9 ± 1.04	8.9 (6.3; 12.2)	85	75.2	5	4.4	23	20.4
Minerals (kg) *	4.5 ± 0.60	4.6 (3.3; 5.9)	12	63.2	7	36.8	0	0	3.2 ± 0.39	3.2 (2.3; 4.5)	88	77.9	18	15.9	7	6.2
TBW * (L)	48.3 ± 5.99	48.4 (34.7; 61.1)	13	68.4	6	31.6	0	0	33.2 ± 3.84	32.2 (23.7; 44.8)	85	75.2	4	3.6	24	21.2
SLM * (kg)	62.3 ± 7.74	62.4 (44.7; 78.7)	13	68.4	6	31.6	0	0	42.7 ± 4.94	42.7 (30.5; 57.7)	84	74.3	4	3.5	25	22.1
BMC * (kg)	3.7 ± 0.49	3.8 (2.7; 4.87)	12	63.2	7	36.8	0	0	2.7 ± 0.33	2.7 (1.8; 3.73)	86	76.1	19	16.8	8	7.1

N—number; NR—normal range; UL—upper limit; LL—lower limit; BFM = body fat mass; SMM = skeletal muscle mass; FFM = fat free mass; PBF = percent; BMI = body mass index; WHR = waist–hip ratio; TBW = total body water; SLM = soft lean mass; BMC = bone mineral content.

3.2. Factors Influencing Food Choices—FCQ Questionnaire

The FCQ questionnaire classifies answers into 10 categories according to the factors influencing the food choices. The number of possible statements differs among categories and the resulting values are determined as the mean values of all statements within a single category. Answers are recorded from a total of 36 statements.

Evaluation of a standardized questionnaire determining the quality and preference of the diet was another aim of the study. Male students were, in particular, influenced by the effect of the food on health (3 ± 0.56) and by the sensory appeal of food (2.9 ± 0.63) in their food choices. On the contrary, quick (convenient) preparation of meals was the most important factor among the women (3.2 ± 0.52). Also, the sensory appeal of foods was significant (3.1 ± 0.54), similar to the men. The ethnic origin of the food (Table 2) was the least important factor for both sexes.

Table 3 shows the importance of the selected factors along with the category they belong to. Most men rated the taste of the food (53%) and its nutritious nature (47%) as very important, while the perspective of the political approval of the country of origin was unimportant for the majority of men (68%). On the contrary, the simplicity of food preparation (69%) and whether the food is packaged in an environmentally friendly way (43%) are very important for women. It is also interesting that, compared to the men, who rated the taste of food as the most important factor, women rated the taste of food as the least important factor (58%). For men, the categories of health (three items) and the sensory appeal category (two items) predominate in the eight most important items. In women, the mood and familiarity categories predominate (two items each).

Table 2. Factors influencing food choices—FCQ questionnaire (variables ordered by importance).

Food Choice Questionnaire	Men *N* = 19 Mean ± SD	Men *N* = 19 Median (Min; Max)	Food Choice Questionnaire	Women *N* = 113 Mean ± SD	Women *N* = 113 Median (Min; Max)
Health	3 ± 0.56	3 (2.0; 3.8)	Convenience	3.2 ± 0.52	3.2 (1.8; 4.0)
* Sensory Appeal	2.9 ± 0.63	3.3 (1.8; 4.0)	* Sensory Appeal	3.1 ± 0.54	3.3 (1.8; 4.0)
Convenience	2.9 ± 0.66	3.2 (1.4; 3.8)	Health	3.0 ± 0.59	3 (1.0; 4.0)
Mood	2.7 ± 0.46	2.8 (1.7; 3.5)	Price	2.8 ± 0.57	2.7 (1.3; 4.0)
Price	2.7 ± 0.48	2.7 (2.0; 3.3)	Mood	2.6 ± 0.61	2.5 (1.0; 4.0)
* Natural Content	2.5 ± 0.55	2.7 (1.7; 4.0)	* Natural Content	2.5 ± 0.68	2.3 (1.0; 4.0)
* Familiarity	2.2 ± 0.39	2.3 (1.7; 3.0)	* Familiarity	2.4 ± 0.59	2.3 (1.0; 3.7)
* Weight Control	2.1 ± 0.56	2.3 (1.0; 3.0)	* Weight Control	2.3 ± 0.67	2.3 (1.0; 4.0)
* Ethical Concern	1.9 ± 0.80	1.7 (1.0; 3.7)	* Ethical Concern	1.9 ± 0.67	1.7 (1.0; 4.0)

Food Choice Questionnaire Scoring Key: very important (4), moderately important (3), a little important (2), not important at all (1); N = number; SD—standard deviation; * the same rank for both sexes.

Table 3. Selected determinants influencing food choices and categories according to sex shown as absolute (N) and relative (%) frequencies of participants for whom the respective items were very important or, on the contrary, unimportant.

	Men: Items Affecting Food Choice	Men: Category	Total = 19 *N*	Total = 19 %	Women: Items Affecting Food Choice	Women: Category	Total = 113 *N*	Total = 113 %
Very important	tastes good	Sensory Appeal	10	53	can be cooked very simply	Convenience	78	69
	is nutritious	Health	9	47	is packaged in an environmentally friendly way	Ethical Concern	49	43
	easy to cook	Convenience	8	42	is good value for money	Price	47	42
	is good value for money	Price	8	42	looks nice	Sensory Appeal	46	41
	keeps me healthy	Health	8	42	helps me cope with stress	Mood	45	40
	makes me feel good	Mood	8	42	keeps me awake and alert	Mood	45	40
	smells nice	Sensory Appeal	7	37	is familiar to me	Familiarity	44	39
	is high in protein	Health	6	32	is like the food I ate when I was a child	Familiarity	43	38
Not important	comes from countries I approve of politically	Ethical Concern	13	68	tastes good	Sensory Appeal	66	58
	has the country of origin clearly marked	Ethical Concern	9	47	smells nice	Sensory Appeal	51	45
	is low in calories	Weight Control	7	37	is cheap	Price	43	38

3.3. Food Preferences—FPQ Questionnaire

The FPQ questionnaire investigated the popularity of foods, which is related to their preferences when included in students' diets. Based on the evaluation of the questionnaires according to the standardized methodology, the order of popularity of food groups was determined (Table 4), where fruit is the most popular food group for both sexes, with a score of 4.6 for both sexes (SD 0.45–0.48). Men had the least preference for snacks, starchy foods, and dairy products (all items 3.7; SD 0.55–0.77), while women had the least preference for meat and fish (3.6 ± 0.72). However, even though some foods were rated with fewer points, the popularity score was still high (with a mean above 3.6).

Table 4. Food preferences—FPQ questionnaire.

Food Groups—Preferences	Men		Food Groups—Preferences	Women	
	N = 19			N = 113	
	Mean ± SD	Median (Min; Max)		Mean ± SD	Median (Min; Max)
* Fruits	4.6 ± 0.48	4.7 (3.3; 5.0)	* Fruits	4.6 ± 0.45	4.9 (2.9; 5.0)
Meat and fish	3.8 ± 0.50	3.9 (2.5; 4.8)	Vegetables	4.0 ± 0.52	4.1 (2.6; 5.0)
Vegetables	3.8 ± 0.61	3.8 (2.1; 4.9)	Foods containing starch	3.8 ± 0.53	3.8 (2.3; 5.0)
Dairy product	3.7 ± 0.55	3.8 (2.5; 4.7)	Snacks	3.8 ± 0.67	3.8 (2.1; 5.0)
Foods containing starch	3.7 ± 0.77	3.8 (2.2; 5.0)	Dairy product	3.7 ± 0.50	3.8 (1.7; 4.8)
Snacks	3.7 ± 0.69	3.6 (2.7; 5.0)	Meat and fish	3.6 ± 0.72	3.7 (1.3; 4.8)

Food preference questionnaire for adolescents and adults Scoring key: I hate it (1), I do not like it very much (2), Average (3), I quite like it (4), I like it very much (5); N = number; SD—standard deviation; * the same order for both sexes.

3.4. Level of Physical Activity (IPQA) in the Group of Students

Physical activity, as one of the indicators of a healthy lifestyle and healthy habits among students, was another area investigated in this study. Physical activity was examined using the standardized IPAQ questionnaire. The results show that 88 students (66.7%) achieved a metabolic energy equivalent (MET) value of more than 3000 per week (a limit for the high level of physical activity). Of this number, men (79%) were more active than women (64.6%). Six students (4.5%) had a weekly total MET value of less than 600, which represents a low level of physical activity (Table 5). Interestingly, women with abnormally high WHR values were regularly engaged in physical activities, both moderate (40%) and high (58%). Only less than 2% of women with WHR indicators above the limit had a low level of physical activity. This is also very similar to the PBF indicator, where the majority of women with high PBF were engaged in moderate (48%) or high (48%) physical activity, while only 4% of women with PBF above the limit were engaged in low physical activity. The food preferences of these women did not differ from other women.

Table 5. Level of physical activity (IPQA) in the monitored group.

Sex	Category Physical Activities Total = 132	MET (Week)	*N*	Percentage of Respondents
Men N = 19	High	>3000	15	79.0%
	Medium	600–2999	2	10.5%
	Low	<600	2	10.5%
Women N = 113	High	>3000	73	64.6%
	Medium	600–2999	36	31.9%
	Low	<600	4	3.5%

N = number.

4. Discussion

Although most of the body composition values in students in our study were within reference values, there were different results between genders. In this study, statistically significant differences between the sexes were confirmed in all body parameters ($p < 0.001$; $p = 0.025$). A more detailed analysis of the results confirmed, similar to the results by McArdle [15] and Kotnik [16], that BMI is not an accurate index for determining the nutritional status and risk of nutritional disorders in humans as it does not account for the physiological differences in body composition between the sexes. BMI can be calculated using a formula that divides body weight (kg) by body height (m^2). Although it is widely used, it has limitations that can bias body weight assessment. It does not consider the percentage distribution of fat-free body mass (FFM), which includes active muscle mass (SLM), skeletal muscle mass (SMM), bone mineral content (BMC), and body fat mass (BFM). At the same time, differences in the representation of total body water (TBW) in the organism are not considered. From the results of the measurements of our students (both men and women), it is evident that even people with a normal BMI value (mean 23.7 ± 2.37 in men and 22.3 ± 2.88 in women in our study group) may have abnormally high values of BFM and PBF. Conversely, a BMI above the norm does not always mean being overweight, as its high values can be influenced, for example, by a higher percentage of SMM. In 89.5% of the men and 77.9% of the women in our study group, BMI was within the normal range, with FFM being within the normal range in 68.4% of men and 73.5% of women, respectively. In 22.1% of women, FFM was below the normal range. Only 63.2% of the men and 51.3% of the women had BFM within the normal range, while 29.2% of the women had a BFM above and 19.5% below the normal range. PBF was normal in 73.7% of the men and only 48.7% of the women. A total of 44.3% of the women had a higher PBF. The SMM of 63.2% of the women and 70.8% of the men was within the normal range, while 24.8% of the women had an SMM below the normal range. As far as TBW is concerned, 21.2% of the women had a TBW below the normal range, while in 31.6% of the men and 3.6% of the women, TBW was higher than normal. Therefore, the result of the body mass index should be presented judiciously. The amount of body fat and skeletal muscle tissue affects a person's metabolism as well as the physical and health condition. An increase in body fat increases the risk of developing cardiovascular, metabolic, and other diseases [17].

The amount and proportion of body adipose tissue increases with increasing age and the proportion of muscle tissue decreases. This process is also sex-dependent, with women generally having more body fat and less muscle mass compared to men. Body fat content should be between 10–25% of body weight in men and 15–30% in women [16,18]. In our study, the average PBF was $14.8 \pm 5.01\%$ in men and $27.1 \pm 6.84\%$ in women. Physiological differences in body composition in men and women were confirmed, similar to the study by Davar [19], whose conclusions say that the percentage of essential fat in women is physiologically higher due to the demands of pregnancy and other hormonal functions. A below-normal fat percentage is associated with malnutrition, while above-norm values can lead to diseases associated with obesity.

It should be considered that approximately half of the body fat is stored in the subcutaneous tissue, with another part stored in the visceral area. Abdominal obesity is, therefore, considered the riskiest factor associated with health complications [20]. People at risk who tend to store visceral fat are typically people with a sedentary lifestyle, individuals who are under long-term stress, and/or those with an improper diet. Davar [19] refers to a visceral type of obesity with normal body weight as metabolic obesity. Metabolic risk should be diagnosed using a complex palette of methods including indices other than just BMI. Examples include waist circumference (WC), the waist-to-height ratio index (WHtR), and the waist-to-hip ratio index (WHR) [21–23]. Our bioimpedance measurements of the students included WHR results. The WHO sets the cut-off values for WHR at ≥ 0.90 for men and ≥ 0.85 for women [24]. The average WHR values found in our study were 0.84 ± 0.05 in the men and 0.87 ± 0.05 in the women. Only 49.6% of the women had a normal WHR, with all the rest being abnormally high (50.4%). The results were better for the men, with 73.7% having a normal WHR index, 10.5% abnormally high, and 15.8% abnormally low, respectively. The lifelong right diet and sufficient physical activity affect the body composition and nutritional status of the organism. It is the skeletal muscle mass that can be most transformed by exercise and diet [25]. A higher representation of skeletal muscle tissue is desirable and it would not be appropriate to focus on its loss to achieve a normal BMI value in relation to height. The main function of muscle tissue, in general, is the creation of an entire organism's movement (skeletal muscles, but also internal organs) and the creation of pressure and tension. In women, muscle mass is about 32% of body weight, while in men, it is around 36%. However, muscle mass can reach up to 45% or more, with strength athletes achieving the highest proportion [26]. In our study group, skeletal muscle mass averaged at 48.5% in the men and 39.8% in the women. The higher average proportion of skeletal muscle mass corresponds to the observed level of physical activity in our men, who achieved a higher percentage of high levels of physical activity compared to the women (men 79%, women 64.6%); 10.5% men and 31.9% women achieved an average level of physical activity. High physical activity levels included intense activity for at least 3 days per week of any combination of walking, less strenuous or intense activity achieving a physical activity score of at least 3000 MET minutes/week. MET stands for the aerobic capacity of an organism in relation to its energy status. The MET value is defined as the volume of oxygen (O_2) consumed relative to a person's weight under basal conditions. One MET is equal to 3.5 mL O_2/kg.min or 1 kcal/kg.h [27,28]. The criteria for moderate physical activity level were as follows: (a) 3 or more days of intense activity of at least 20 min per session weekly or (b) 5 or more days of less intense activity and/or walking of at least 30 min per day or (c) 5 or more days of any combination of walking, less intense or intense activity achieving a total physical activity score of at least 600 MET minutes/week. Our results are consistent with the results of a large questionnaire survey on the extent of weekly physical activity of the Czech population in 2005–2009, which showed that men had more than 6000 MET min/week and women more than 5000 MET min/week [29]. Our results are not entirely consistent with those of the study by Dikmen et al. [30], where the authors reported that only 18% of university students (510 students, 80% women and 20% men) who filled in the IPAQ had sufficient physical activity (6% women and 12% men; the fact that men that are physically more active than women was confirmed also in our study). In the discussion, the authors then referred to studies with results similar to theirs. They also stated that they did not confirm a relationship between the level of physical activity and BMI and, therefore, concluded that physical activity is important in the prevention of weight gain, but ineffective in body weight reduction. In agreement with us, they also drew attention to the importance of other factors, such as eating habits. However, given the results of body composition of the university students included in our study, we believe that physical activity may not have a significant effect on changes in BMI, but it does play a significant role in changes in body composition, especially reflected in changes in skeletal muscle mass and body fat percentage. This finding is consistent with another study [31], which confirms that sufficient physical activity and increasing lean body mass help to increase physical fitness in the population. The study by Chwalczynska et al. [32] also demonstrated a relationship between physical activity and changes in body composition. It surveyed the impact of changes in body weight and body composition compared with changes in daily physical activity during periods of COVID-19-associated restrictions. The participants of their study were recruited from medical and sports university students and the results revealed that the forms of physical activity changed during restrictions from strength and group activities to endurance (running and cycling) and individual activity. Students showed a statistically significant increase in body fat regardless of their sex.

Diet plays an important role in the body composition. According to our research, students have a varied diet, they expressed a preference for all food groups on their menu, which significantly contributes to a good nutritional status. Fruit was the most popular food group for both the women and men, but meat and fish were ranked second by the men and last by the women. Lean meat, fish, semi-skimmed milk, and dairy products are important sources of complete proteins. According to our results, men have a more regular intake of quality proteins, which are important, among other things, for building muscle mass. Women are more influenced by the comfort (speed and simplicity) of preparation when choosing food. For men in our study group, the choice of their food was most influenced by its effect on their health. Bone mineral content (BMC), total mineral content in other parts of the body, protein content, and total water content (TBW) are important indicators of nutritional status that can be detected by bioimpedance. High levels of protein (nitrogen) in the cells indicate a good level of muscle mass [33,34]. We identified statistically significant differences between the sexes in these indicators. A total of 36.8% of the men in whom we found higher values of SMM had above-normal values of proteins, minerals, and BMC. As mentioned above, men prefer to eat food with high-quality protein content. Such unequivocal results were not found for the women. Of the women, 4.4% had above-normal SMM values and the same proportion had high protein values. On the contrary, 20.4% of the women had lower values of proteins, while 24.8% of the women had below-normal SMM.

The presented study may contribute to the implementation of preventive body composition measurements in medical check-ups. The bioimpedance analysis can reveal the proportion of body fat and lean muscle mass in the body, allowing a deeper insight into overall health and potential risks associated with obesity. Body composition analysis enables personalized interventions for obesity prevention and management. Armed with precise data, healthcare providers can tailor nutrition and exercise recommendations to promote fat loss while preserving lean muscle mass. This individualized approach enhances the effectiveness of lifestyle interventions, making them more sustainable in the long term.

Limitations

The study was limited by the epidemiological situation caused by COVID-19 during recruitment and data collection. (i) During this period, the possibility of involving a higher number of students was limited as online education was taking place. Students were not physically present at the faculty during the week and had to attend only for the measurements. Moreover, many participants canceled their appointments due to being quarantined or ill. (ii) It was also necessary to adhere to the anti-epidemic measures. During the measurements, special conditions had to be observed: no more than two persons in the consulting room at a time, social distancing, disinfection of the instruments after each measurement, and regular ventilation of the room after the examinations. In addition, no more than 10 people were allowed to gather in the waiting room before the examination. Since the measurements were, in line with the methodology of this study, only performed in the morning, we were not able to examine more than 4–6 people per day and due to the time frame of the grant project, the number of days to complete the measurements was limited and could not be increased. (iii) Lastly, the restrictions associated with the COVID-19 pandemic (closed sports and fitness centers, etc.) also might have had an impact on respondents' physical activity level at this time period. (iv) We consider the imbalanced sex distribution of the participants (women $N = 113$, men $N = 19$) to be another limitation of this study. However, this difference is due to the fact that the study group consisted of students of the Faculty of Medicine at the University of Ostrava, where female students predominate.

5. Conclusions

As a result of an inappropriate lifestyle, the prevalence of non-infectious diseases of mass occurrence is increasing. Physical activity and appropriate eating habits demonstrably belong to important factors of a healthy lifestyle (e.g., enough high-quality protein in the diet together with regular physical activity increases the amount of skeletal muscle mass at the expense of body fat mass). Women who have a physiologically higher risk of storing body fat should consume enough high-quality protein foods. Young people can reduce the risk of health complications that arise as a result of nutritional disorders by changing their lifestyles. BMI is not always an appropriate value for assessing body weight, as it does not consider the proportional distribution of fat and non-fat body mass in the total body weight. Body fat and skeletal muscle mass values outside the normal range were found even among students with a normal BMI. We confirmed the differences in body composition between men and women. The students ate a varied diet. They also included snacks in their menu, which, if consumed in excess, can be carriers of high energy intake, but they primarily preferred fruits and vegetables and did not avoid sources of complete protein, starch, and fiber. In addition, the students in our study group engaged in sufficient physical activity. Physical activity and a high-quality and varied diet have a positive effect on reasonable body weight and are effective prevention against nutritional disorders (such as obesity or malnutrition) and other health complications related to these disorders. This pilot study will be further extended with the results of ongoing metabolic measurements by indirect calorimetry.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Faculty of Medicine of the University of Ostrava.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The study materials and the details of all analyses can be available by contacting the supervisor of the research (KP).

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