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Low Levels of Physical Activity and its Associations with Mood State, Daytime Sleepiness and Food Consumption in University Students

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Abstract

Starting a university course leads to significant changes in the student's lifestyle and routine, with an impact on physical activity, mental health, sleeping habits and eating habits. The objective of the study was to verify the level of physical activity of young university students and its associations with mood, sleep quality and food consumption. This is a cross-sectional survey, carried out with university students studying Medicine at a Public Higher Education Institution. Anthropometric measurements, physical activity level (PAL) were assessed using the GT3x accelerometer (Actigraph), food consumption (24-hour inventory), and using the BECK and BRUMs / POMS questionnaires, health disorders were assessed. sleep and mood. Using SPSS software, comparative analysis was carried out with Student's t test for independent groups, Pearson correlation inferential analysis and binary logistic regression. Of the university students analyzed (n=75), 54.7% (n=41) were male and, when compared to women, they had a higher physical activity level (PAL). Approximately 1/3 of the entire study sample performed less than 300 minutes of moderate/vigorous physical activity. The dietary profile of university students was not satisfactory. For both sexes, the POMS Total Score (Profile of Mood States) was found to be associated with university students who perform less than 300 minutes of physical activity per week. Women are 65% more likely to present with Tension Scale (POMS) when they are less active, and in men, the odds ratio is approximately three times greater for presenting Confusion (BRUMS - Brunel Mood Scale). It is concluded that the majority of university students on the course studied were insufficiently physically active and presented some changes in mood, daytime drowsiness and unsatisfactory food consumption.

Keywords: Sedentary Behavior. Physical exercise. Food Consumption. State of Mood.

INTRODUCTION

Starting a university course leads to significant changes in the student's lifestyle and routine, in addition to promoting new social interactions. In this context, several authors have been evaluating the impact of this new phase on the practice of physical activity, mental health, sleeping habits and eating habits[1,2,3,4,5].

According to the World Health Organization (WHO), 47.3% of the Brazilian population over 18 years of age is considered insufficiently active[6]. Regular physical activity is responsible for promoting health and preventing diseases; however, physical inactivity is still observed among different populations[7].

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Studies have shown that sedentary behavior affects almost 65% of young university students after entering university[1,2]. Data in the literature have shown that low levels of physical activity contribute to the development of chronic diseases throughout life, which negatively affect the individual's physical and mental health, resulting in greater public health expenses[2]. Another relevant aspect observed when entering higher education is mental health, a large proportion of university students have some type of psychiatric disorder, with depression and anxiety being more common[8]. A multicenter study[3] carried out with 1350 medical students from 22 universities in Brazil, demonstrated that 41% of students presented depressive symptoms and 85.5% showed traces of anxiety.

Combined with these indices, significant changes in sleep patterns can be observed in this university population, in part due to high academic pressure, stress due to studying and other curricular activities, added to the daily tasks of life, which contribute to a decrease in the quantity/quality of sleep and greater indisposition for daytime activities[8,9].

Finally, another modifiable factor that affects young university students and that deserves special attention is the quality of their diet. Research carried out with university students showed that more than 65% of those interviewed reported changes in eating habits upon entering university[10], and the main barriers perceived by students to maintain healthy eating habits were the lack of time to prepare and eat meals, lack of of healthy options to purchase in canteens and shops close to the university, the high cost of healthy meals, exam period, stress, media appeal of unhealthy foods and the influence of social relationships[10,11,12].

Given the decrease in the level of physical activity among young people[6] particularly during the university period[1,2], as well as other evidence demonstrating changes in mood, sleep quality[8,9] and inadequate food consumption[10] during this period, highlights the need to monitor modifiable phenomena with aimed at ensuring a better quality of life for these young people in adulthood. Therefore, the objective of the present study was to verify the level of physical activity of young university students and its associations with mood, sleep quality and food consumption.

MATERIALS AND METHODS

This is a cross-sectional field research, of a descriptive nature, carried out with university students enrolled in the Medicine course at a Public Higher Education Institution, located in Curitiba, Brazil. The study is part of a larger research project entitled “Active behavior and risk factors of university students: follow-up study”, approved by the CEP/SD Research Ethics Committee (CAAE, 71645617.4.0000.0102). All participants signed the Free and Informed Consent Form (TCLE).

Data collection took place from February to December 2019 and the target population corresponded to all medical students, over 18 years old, regularly enrolled at the institution. Those individuals who did not adequately fill out the questionnaires and/or did not regularly use the accelerometer were excluded from the study.

To characterize the university students, information regarding age, sex and anthropometric characteristics was obtained. The anthropometric variables obtained were: skinfolds (biceps, triceps, subscapular, suprailiac, abdomen, thigh and medial calf), body mass (kg), waist circumference (cm) and standing height (cm), performed according to the ISAK protocol[13]. From measurements of body mass and standing height, the students' body mass indexes (BMI) were obtained.

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To assess the level of physical activity (PAL), brand accelerometers (Actigraph GT3X) were used, which measured the acceleration of body movement in three planes (anteroposterior, mediolateral and vertical). It is worth highlighting that these electronic devices allow the researcher to quantify the frequency, duration and intensity of the energy expenditure of physical activity and the individual's sedentary behavior depending on the characteristics of the acceleration, such as the oscillation pattern, the time interval and their magnitude[14,15]. The use of accelerometers for at least four days, including one on the weekend, was considered valid data. The day was considered valid when at least 10 hours of recording were recorded. Data were collected at a frequency of 30 Hz and analyzed in epochs of 60 s. At the same time, the subject was asked to record a diary of the activities carried out. If it was identified that these seven days did not correspond to a usual week, another time of using the device would be planned. The positioning of the device was fixed to an elastic strap, on the right side of the hip, in line with the iliac crest. The Actilife software, version 6.6.2, was used to initialize, download and analyze the accelerometry data, which were analyzed in 60-second Epoch[14]. While the accelerometer calibration algorithm determined the total energy expenditure in kcal, the metabolic equivalent (METs) and time, in percentage (%), for each intensity of physical activity: sedentary, light, moderate, vigorous and very vigorous[16]. To calculate the minutes spent on moderate and vigorous activities per week, the sum of all valid days was added and adjusted by the number of valid days and multiplied by seven, thus obtaining the individual weekly average. To classify the level of physical activity at different intensities, the cutoff point adopted was that proposed by Freedson *et al.*[23], counts between 1,952 and 5,724 are considered moderate activity, and counts above 5,725 are considered vigorous activities. As these were apparently healthy young adults, the cutoff point of 300min/week was used as a proposal to categorize PAL[6], with values below and above 300min being classified as little active and very active. When the subjects did not meet these evaluative criteria, the data were discarded.

The mood state of university students was assessed using the validated Profile of Mood States questionnaire (POMS)[17]. This instrument covers 65 items, which measure the six dimensions of mood, such as: tension - anxiety; depression - melancholy; anger - hostility; vigor - activity; fatigue - inertia and confusion – disorientation. The global mood scale was obtained by adding the five negative mood subscales (tension, depression, anger, fatigue and confusion) followed by subtracting the positive mood subscale (vigor). The Brunel Mood Scale (BRUMS)[18] was also used, an adapted and validated version of the POMS questionnaire[17], composed of 24 items that also aim to assess the mood domains: tension, depression, anger, vigor, fatigue and confusion. With the sum of the responses from each mood domain, which contains four items, a score was obtained that ranged from 0 to 16. The score results indicate that the higher the values, the greater the change in the mood state.

The Epworth sleepiness scale was also applied[19], with the aim of evaluating possible sleep disorders in students. The questionnaire was self-administered, in which an individual's propensity to fall asleep in eight different everyday situations was quantified, such as: chance of dozing off while sitting, reading or watching television. The participant assigned a score from zero to three points for each question: 0 (no chance of dozing off); 1 (slight chance of dozing off); 2 (moderate chance of dozing off) and 3 (high chance of dozing off). Since responses can reach a maximum score of 24, while the minimum score is 0 and a score of 10 is defined as the normal limit[19]. Cutoff points were used to determine the following classifications: scores < 10 nor-

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mal (sleepiness compatible with activity) and scores > 10 abnormal (chances of sleepiness).

The students' food consumption data were obtained from the Food Record (RA) for three non-consecutive days, which were evaluated and recorded the food consumed. In particular, the food consumption data had its intrapersonal variability adjusted by the Multiple Source Method (MSM), an online software developed by the Department of Epidemiology at the German Institute for Human Nutrition Postdam-Rehbrucke (DIfE), which, through a technique of statistical modeling, uses the 24-hour Food Intake Report (among other types of dietary surveys) to estimate habitual intake from repeated measurements of this instrument. Additionally, to minimize errors due to over- or under-reporting of intake, food records with energy values greater than 4,000 kcal or less than 500 kilocalories were excluded.

The conversion of household measurements into units of weight (g) and volume (mL) was carried out in accordance with the standards described in the "Table of Referenced Measurements for Food Consumed in Brazil" of the 2008-2009 Family Budget Survey[20]. Nutrient conversion was carried out using a spreadsheet in the Microsoft Excel® program (2016) using the Nutritional Composition Table of Foods Consumed in Brazil20 and the Brazilian Food Composition Table (TACO)[21]. The analysis of nutritional inadequacy of the diet regarding carbohydrate, protein and lipid values as a percentage of the total energy intake was carried out according to the acceptable distribution range of macronutrients (Acceptable Macronutrient Recommendations – AMDR)[22], which considers the following participation ranges acceptable for individuals over 19 years of age: 45 to 65% from carbohydrates, 10 to 35% from proteins and 20 to 35% from lipids.

To analyze the adequacy of the diet regarding the values of saturated, monounsaturated, polyunsaturated, trans and cholesterol fats, the dietary recommendations of the Guideline I on Fat Consumption and Cardiovascular Health of the Brazilian Society of Cardiology were used[23]. To assess the consumption of calcium, iron and vitamins A and C, the calculation of inadequacy of consumption was used based on the estimated average requirement (EAR)[24]. To assess sodium intake, the WHO recommendation for adults of < 2 g/day was used to reduce the risk of cardiovascular diseases[25]. For fiber consumption, the percentage of individuals below the Adequate Intake (AI) proposed by the IOM was calculated[26]. In addition to the quantitative analysis, a qualitative analysis was also made of the adequacy of food consumption by the number of portions for some food groups: fruits, vegetables, milk and sugar derivatives and sweets, for which the portions recommended by Philippi are considered[27]: 6 (six) portions for the group of rice, bread, pasta, potatoes and cassava, 3 (three) portions for the group of fruits, vegetables and milk and dairy products and 1 (one) portion for the group of sugars and sweets. To determine the portion size in grams, the consumption in grams/day of all food items that make up each food group is added.

For statistical analysis, the homogeneity and normality test (Shapiro Wilk) was initially used for quantitative variables and, subsequently, descriptive analysis of the data using measures of central tendency (mean and standard deviation). The first analyzes used the anthropometric profile, PAL, mood state, food consumption and daytime sleepiness to verify whether there was a difference between the sexes, using comparative analysis using the Student t test for independent groups. Subsequently, Pearson's inferential correlation analysis was used to verify the relationship between the longer time spent in sedentary behavior with food consumption and mood. Finally, based on previous analyzes categories were generated for the dependent variable

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(PAL), with subjects who practiced more than 300 minutes per week of Moderate to Vigorous Intensity Physical Activity (MVPA) being the reference in relation to those who performed less. Based on these categories, binary logistic regression analysis was performed, with the independent variables being all those used in the study, in an uncategorized way, with the exception of PAL. In this measure, confounding variables were not considered for the model. For the analyzes the software was used: SPSS for Windows, version 20.0. The present study considered a significance level of 5% ($p < 0.05$) for all analyzes.

RESULTS

Throughout 2019, 198 students entered the undergraduate Medicine course. During this period, 78 students agreed to participate in this research, with three participants being excluded because it did not contain all the data regarding the PAL and questionnaires. Of the university students evaluated, 54.7% (N=41) were male, had a mean age of 20.7 ± 2.1 years and had more time spent on energy expenditure by measuring the physical activity level (PAL).

The characterization of the sample stratified by sex with mean values and standard deviation of anthropometric variables and levels of physical activity are found in Table 1. In relation to the energy expenditure of every week with moderate and vigorous physical activity, (MVPA) the mean percentage was of just 2.8% for both sexes. In absolute terms, the average time spent per week at this exercise intensity was 256.65 ± 83.1min and 264.2 ± 107.3min for females and males, respectively, not differing significantly. Approximately 1/3 of the entire study sample performed less than 300min MVPA.

Table 1 - Anthropometric Characteristics and Physical Activity Levels of University Students Curitiba, PR - 2019.

	Female (N = 34)	Male (N = 41)	*P - value*
Age (years)	**20.5 ± 2.6**	**20.7 ± 2.1**	**0.758**
Anthropometry			
BM (kg)	69.06 ± 13.66	67.12 ± 14.27	0.587
Stature (cm)	170.47 ± 8.59	169.28 ± 10.68	0.619
BMI (kg/m²)	23.61 ± 3.41	23.19 ± 2.92	0.625
WC (cm)	78.66 ± 9.80	76.33 ± 8.43	0.341
BSF (cm)	8.49 ± 5.08	6.96 ± 3.40	0.208
TSF (cm)	14.70 ± 5.96	13.92 ± 4.88	0.598
SSSF (cm)	14.93 ± 5.62	12.56 ± 4.56	0.090
SISF (cm)	18.55 ± 8.23	15.78 ± 7.51	0.193
ASF (cm)	22.23 ± 8.70	18.26 ± 6.41	0.062
MTSF (cm)	24.37 ± 11.15	20.53 ± 8.45	0.159
MCSF (cm)	15.32 ± 8.21	13.95 ± 8.29	0.519
%BF (%)	19.06 ± 5.79	17.26 ± 6.96	0.259

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... continuation Table 01

	Female (N = 34)	Male (N = 41)	*P - value*
Age (years)	**20.5 ± 2.6**	**20.7 ± 2.1**	**0.758**
PAL			
METS (kcal/kg/h)	1.09 ± 0.03	1.16 ± 0.04*	0.006
Sedentary (min)	7042.03 ± 699.94	7234.29 ± 575.17	NS
% Sedentary	80.34 ± 2.73	80.82 ± 3.13	NS
Light (min)	1468.38 ± 268.79	1461.61 ± 296.74	NS
% Light	16.74 ± 2.75	16.25 ± 2.68	NS
Moderate (min)	244.15 ± 76.61	244.63 ± 94.26	NS
% Moderate	2.77 ± 0.78	2.70 ± 0.96	NS
Vigorous (min)	11.56 ± 15.98	17.51 ± 29.98	NS
% Vigorous	0.09 ± 0.13	0.35 ± 0.35	NS
Very Vigorous (min)	0.94 ± 2.47	2.05 ± 6.11	NS
% Very Vigorous	0.11 ± 0.29	0.22 ± 0.67	NS
Total MVPA (min)	256.65 ± 83.15	264.20 ± 107.30	NS

Source: research data, Curitiba, Paraná, Brasil, 2022.

Note: Student t test for independent groups; significance level: *p < 0.05. BM = body mass; BMI = body mass index; WC = waist circumference; BSF = biceps skinfold; TSF= triceps skinfold; DCSE = subscapular skinfold; SISF= suprailiac skinfold; ASF = abdominal skin fold; MTSF = middle thigh skinfold ; MCSF = medial calf skinfold; %BF = body fat percentage; PAL = physical activity level; METS = average metabolic equivalent of one week; Total FB = total time on Freedson Bouts; Total time SB = total time in Sedentary Bouts in one week; Sedentary = sedentary time in a week; Light = time in light activity in a week; Moderate = moderate activity time in one week; Vigorous = time in vigorous activity in a week; Very vigorous = time in very vigorous activity; % Sedentary = percentage of sedentary lifestyle in one week; % Light = percentage of light activity in one week; % Moderate = percentage of moderate activity in one week; % Vigorous = percentage of vigorous activity in a week; % Very Vigorous = percentage of very vigorous activity; Total MVPA = total time of moderate to vigorous physical activity in one week. NS = not significant.

The characteristics of the mood state and daytime sleepiness for both sexes are described in Table 2. Regarding the items presented, Anger was the only variable that differed significantly between the sexes, being 34% higher for females.

Table 2 - Comparison between female and male variables of mood state and daytime sleepiness. Curitiba, PR - 2019.

	Female (N = 34)	Male (N = 41)	*P - value*
POMS			
Sum score	47.54 ± 19.77	44.07 ± 15.85	NS
Tension	8.89 ± 4.07	7.83 ± 3.86	NS
Depression	4.77 ± 4.51	4.28 ± 4.84	NS
Hostility	3.22 ± 4.19	2.55 ± 2.97	NS
Vigor	8.23 ± 4.23	10.15 ± 4.35	NS
Fatigue	8.91 ± 5.54	7.78 ± 5.81	NS
Confusion	7.91 ± 3.32	6.85 ± 2.97	NS
Total disruption	33.71 ± 18.40	29.25 ± 15.29	NS
BRUMS			
Sum score	30.09 ± 14.32	25.25 ± 11.03	NS

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... continuation Table 02

	Female (N = 34)	Male (N = 41)	*P - value*
Tension	5.37 ± 2.63	4.65 ± 2.04	NS
Depression	3.71 ± 3.35	3.55 ± 3.05	NS
Anger	5.34 ± 3.41*	3.55 ± 2.73	0,014
Vigor	6.20 ± 2.28	5.45 ± 2.57	NS
Fatigue	3.43 ± 2.26	3.23 ± 1.79	NS
Confusion	5.20 ± 3.01	4.48 ± 2.30	NS
Sleep score	10.83 ± 5.31	10.30 ± 4.45	NS

Source: research data, Curitiba, Paraná, Brasil, 2022.

Note: Student t test; significance level: *p < 0.05. POMS = Profile Of Mood States, whose domains of the mood of the groups evaluated were: tension, depression, hostility, vigor, fatigue and confusion, given that the total disturbance and the sum score correspond to the result of the mood of the less active groups and very active. BRUMS = Brunel Mood Scale, whose mood state domains of the evaluated groups were: tension, depression, anger, vigor, fatigue and confusion, since the sum score corresponds to the result of the mood state of the little active and very active groups ; Sleep Score = classification of sleep between normal and abnormal for the little active and very active groups; BID score = Beck Inventory of Depression, classification of suggestive depressive symptoms in the low-active and very-active groups. NS = not significant.

Food consumption for both sexes is described in Table 3. Males had significantly higher energy consumption than female students, with higher intakes of proteins, lipids, and some micronutrients, especially sodium. It is also observed in both sexes a low consumption in terms of the amount of portions/day of the groups of fruits, vegetables, milk and derivatives, in which all students consumed less than 3 portions, and a high consumption of the number of portions of sugar and sweets, exceeding the recommended 1 portion/day.

Table 3 - Comparison of the values of macronutrients, micronutrients and portions of the food groups in median, variation values (minimum and maximum), of the usual diet of the students evaluated. Curitiba, PR - 2019.

	Female (N = 34)	Variation	Male (N = 41)	Variation	*P - value*
Macronutrients					
TEV (kcal)	1529.08	1095.53 – 2508.58	2088.4*	1023.12 - 2837.23	0.000
Carbohydrates (g)	192.84	130.53 – 347.10	238.41	100.99 -190.89	NS
Proteins (g)	79.12	50.39 – 101.02	101.57*	432.35 – 190.89	0.001
Lipids (g)	54.25	38.93 – 107.065	85.86 *	43.42 – 112.55	0.000
Saturated fat (g)	21.00	11.67 – 36.41	30.23*	11.02 – 42.32	0.001
Monounsaturated Fat	17.79	11.08 – 44.53	26.84*	13.03- 45.37	0.001
Polyunsaturated Fat	9.53	3.77 – 20.08	15.78*	7.58 – 22.81	0.001
Trans fats (g)	1.67	0.28 – 9.47	3.04	1.34 – 5.86	NS
Cholesterol (mg)	294.08	194.23 – 465.21	363.47	185.53 – 589.45	NS
Dietary Fibers (g)	14.20	6.21 – 28.94	19.42	9.42 – 41.89	NS
Micronutrients					
Calcium (mg)	533.85	200.48 – 1035	954.02*	326.22 – 1783.0	0.001
Iron (mg)	10.57	4.91 – 15.74	12.43*	6.45 – 25.18	0.007
Sodium (mg)	1442.67	445.12 – 3627.16	2115.31*	872.58 – 3916.67	0.007
Vitamin A (mcg)	423.88	69.21 – 2335.32	524.17	217.99 – 255.50	NS

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... continuation Table 03

	Female (N = 34)	Variation	Male (N = 41)	Variation	*P - value*
Vitamina C (mg)	56,62	16,50 – 200,74	41,76	3,61 – 229,47	NS
No. of Servings#					
Rice, bread, pasta, potatoes	3.63	2.87 – 6.07	5.08*	2.89 – 10.15	0.004
Vegetables and greens	0.79	0.00 – 2.65	1.61	0.00 – 4.92	NS
Fruits	1.32	0.00 – 3.24	0.63	0.00 – 2.57	NS
Milk, cheeses and dairy products	0.98	0.08 – 2.60	1.50	0.29 – 2.64	NS
Sugars and sweets	2.46	0.00 – 14.97	2.96	0.00 – 11.04	NS

Source: research data, Curitiba, Paraná, Brasil, 2022.

Note: TEV: total energy value. Data presented in Median and variation (minimum – maximum); significance level: *p < 0.05.

Based on the information on PAL measurements mentioned above, a correlation analysis was carried out between the percentage of time spent in sedentary behavior with mood and food consumption (Table 4). For food consumption, significant correlations were found only for females for the following variables: METs, Carbohydrates, Dietary Fiber, Sodium, Vitamins A and C and portions of sugars. Regarding mood, there was a significant correlation for females with vigor and daytime sleepiness. As for males, the perception of tension was positively correlated.

Table 4 - Correlation analysis ("r" value) between Food Consumption and Mood State variables with the percentage of time in Sedentary Behavior for men and women. Curitiba, PR - 2019.

		MET´S	CARBOHYDRATE	PROTEIN	LIPIDS	SATURATED FAT	TRANS FATS	DIETARY FIBER	Ca	Fe	Na	VIT. A	VIT. C	COLESTEROL	MONOUNSATURATED FA	POLYUNSATURATED AG	RICE PORTIONS	VEGETABLE PORTIONS	FRUIT PORTIONS	PORTIONS OF MILK	PORTIONS OF SUGAR
% TIME IN SEDENTARY BEHAVIOR	FEMALE	**-0.502***	**-0.482***	-0.90	-0.368	-0.387	-0.276	**-0.464***	-0.326	-0.351	**-0.420***	**-0.584****	**-0.451***	-0.038	-0.363	-0.71	-0.296	-0.166	0.247	0.500	**-0.499***
	MALE	-0.007	0.118	-0.87	0.036	-0.163	0.192	-0.123	-0.244	-0.124	-0.255	-0.259	-0.196	0.044	0.55	0.232	-0.289	-0.111	-0.405	-0.075	0.027

			POMS								BRUMS							SLEEP
			TENSION	DEPRESSION	HOSTILITY	VIGOR	FATIGUE	CONFUSION	DISTURBANCE	SUM SCORE	TENSION	DEPRESSION	ANGER	VIGOR	FATIGUE	CONFUSION	SUM SCORE	TOTAL SCORE
% SEDENTARY TIME	FEMALE		0.097	0.254	0.045	**-0.341***	0.133	0.129	0.160	0.086	0.027	0.171	0.234	0.061	-0.034	0.178	0.139	**0.340***
	MALE		0.393*	0.017	-0.024	0.155	0.095	0.094	0.144	0.189	0.056	0.105	0.109	0.245	0.302	-0.136	0.141	0.298

Source: research data, Curitiba, Paraná, Brasil, 2022.
Note: METS = average metabolic equivalent of one week; Ca = calcium; Fe = iron; Na = sodium; Vit A = Vitamin A; Vit C = Vitamin C; FA = fatty acid.

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Finally, considering the previous analyses, a binary logistic regression analysis was performed, considering the dependent variable as PAL, in which the reference was very active subjects (>300 min of PA per week). It showed odds ratios for university students to have 25% more adipose tissue in the thigh region (OR=1.256; CI=1.032 – 1.528) and 27% more fat percentage (OR=0.731; CI=0.570 – 0.939), when they do less than 300 minutes of physical activity per week. There was no association with other anthropometric variables.

Table 5 also demonstrates the association between the Mood State variables and lower levels of physical activity. For both sexes, it was possible to identify that the lower the PAL, the greater the odds ratio of students presenting higher Total POMS scores, being 8.8% for females and 19.9% for males. Females are approximately 35% more likely to perceive greater tension (POMS) when they perform less than 300 minutes of MVPA per week. For males, an odds ratio of 183% was observed in presenting a perception regarding Confusion (BRUMS) when also performing less than 300 minutes of MVPA per week. For the other study variables, no significant associations were found.

Table 5 - Association between the variables Mood State and Sleep Score with lower PALs for both sexes. Curitiba, PR - 2019.

	Female OR (CI)	*p-value*	Male OR (CI)	*p-value*
POMS				
Tension	0.656 (0.443-0.969)	0.034	1.267 (0.762-2.108)	NS
Depression/Melancholy	0.907 (0.200-4.121)	NS	1.147 (0.685-1.921)	NS
Hostility/Anger	0.504 (0.150-1.685)	NS	1.583 (0.478-5.242)	NS
Vigor/Activity	1.174 (.958-1.439)	NS	1.227 (0.776-1.941)	NS
Fatigue/Inertia	1.815 (0.811-4.065)	NS	1.334 (0.549-3.239)	NS
Confusion/Disorientation	0.614 (0.339-1.111)	NS	1.483 (0.956-2.298)	NS
POMS Total Score	1.088 (1.005-1.177)	0.036	0.811 (0.699-0.941)	0.006
BRUMS				
Tension	1.573 (0.890-2.781)	NS	1.567 (0.794-3.458)	NS
Depression	2.646 (0.317-22.098)	NS	1.654 (0.609-4.487)	NS
Anger	2.005 (0.791-5.781)	NS	2.853 (0.435-18.716)	NS
Vigor	1.979 (0.620-6.321)	NS	1.590 (0.550-4.594)	NS
Fatigue	1.665 (0.423-6.555)	NS	1.518 (0.709-3.253)	NS
Confusion	2.131 (0.643-7.066)	NS	2.830 (1.393-5.753)	0.004
BRUMS Total Score	0.913 (0.742-1.123)	NS	0.895 (0.663-1.207)	NS
Final Sleep Score	0.986 (0.722-1.344)	NS	0.909 (0.668-1.237)	NS

Source: research data, Curitiba, Paraná, Brasil, 2022.

Note: Legend: OR (odds-ratio), CI (confidence interval), NAF (physical activity level) NS = not significant.

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When analyzing the odds ratio of lower levels of PA influencing inadequate food consumption, it was found that for females, the consumption of dietary fiber is associated in 56% (OR=0.445; CI=0.203 – 0.974), sodium in 4% (OR=1.004; CI=1.001 – 1.009), vitamin A in 5% (OR=0.995; CI=0.990 – 0.999) and vitamin C in 43% (OR=1.043; CI=1.003 – 1.090). For males, no significant associations were observed.

DISCUSSION

The present study observed that university women are less active than university men, and that in both groups, less active participants were associated with mood. It was also verified an association and correlation between PAL and daytime sleepiness, mood and food consumption for females.

Regarding the inverse association between food consumption and PAL, the study by Nisar *et al.*[28], although it did not evaluate PAL, showed that the consumption of some foods has a significant association with sleep quality. The same study[28] also reiterates that this may be based on the tryptophan present in some foods that can promote sleep quality, as it is a precursor to neurotransmitters such as serotonin and melatonin. Still in relation to food consumption, the most prominent micronutrient in this research is sodium, whose consumption was above recommended in almost 40% of participants. According to the WHO Guideline for sodium consumption[25], daily consumption greater than 2000 mg for adults is correlated with increased blood pressure and risk of cardiovascular disease.

Another relevant point to be discussed in relation to the food consumption of young university students is the low consumption of fruits and vegetables (vegetables) found in both groups. According to data from VIGITEL[29], only 19.2% of young adults aged between 18 and 24 consume five or more daily servings of fruits and vegetables, with a greater predominance among women (29.6%) than among men (25.7%). Nogueira[30] evaluated the food consumption of 181 young Brazilian university students using a 24-hour recall and also identified a reduced intake in the food groups of fruits, vegetables and dairy products and a high intake of sugars and sweets[30]. These results corroborate the findings of the present study. It is noteworthy that these food groups (fruits and vegetables) are important sources of vitamins, minerals and fiber, which may justify the low level of these nutrients found in the quantitative analysis of food consumption by university students, demonstrating that their dietary profile does not is satisfactory and should be improved.

Guidelines that deal with Cardiovascular Health and Prevention of Cardiovascular Diseases[23], recommend the adoption of a dietary pattern with reduced amounts of total fat, saturated fat, trans fat, cholesterol, refined carbohydrates and sodium, in addition to emphasizing the importance of eating vegetables , vegetables and fruits and a rational distribution of vitamins and minerals. In this sense, based on the data collected, it can be noted that the students' dietary profile is not satisfactory and must be improved.

When observing the mental health of research participants, there was an inverse association between the chances of changes in mental health and low PAL in the present study, a result similar to that found in a meta-analysis study that concluded that athletes with high performance were just as likely to report depressive symptoms as non-athletes[31]. On the other hand, research carried out with university athletes demonstrated low depression scores[32], although the pre-

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sent study did not evaluate athletes. Research also highlights the benefits to mental health related to regular physical exercise[31,33,34]. Scientific findings have demonstrated that physical exercise in higher education provides a balance between academic commitments as well as several presumed benefits, including improved self-esteem, access to academic support and medical care, potentially protecting and/or mitigating negative effects on mental health[34]. These findings are in line with previous research that suggests that involvement in physical exercise is not a protective factor against the risk of depression and other mental health disorders[33-36].

Our results demonstrated that tension was the factor that was most associated with lower PAL as well as with the total POMS score, this same finding being verified with university students who were not athletes, and who did not participate in sports or team activities, had lower mental health scores[34-37]. Our findings may suggest a mental health benefit for these students, similar to that seen in participation in competitive sports, due to college students' general involvement in physical activity, team membership, and social interaction with other students[38,39]. The same results also state that engaging in any sport and physical activity, regardless of skill level and competition, contributes to overall well-being[39]. These findings are promising, as they contribute to the evidence that performing a significant amount of physical exercise can reinforce intervention efforts through this practice to reduce the growing mental health epidemic among university students, emphasizing the value of physical activities and initiatives that support university student engagement[39,40].

Among the limitations of the present study, as it involves questionnaires and the moment in which the person being evaluated is responding, there is a limitation in the momentary personal factors not controlled before collection that may have influenced the responses. Furthermore, it can be highlighted that the theme proposed for this age group may not be perceiving a certain condition when it comes to mental health, sleeping and eating habits.

CONCLUSION

Therefore, with this research, it is concluded that the majority of university students studying Medicine are insufficiently active and present some changes in mood, daytime drowsiness and unsatisfactory food consumption. This profile becomes worrying considering that these students are inserted in the training environment of health promoting agents and there is a significant association with levels of tension and general scores of depressive symptoms. Therefore, it becomes necessary to develop strategies and propose interventions based on the real needs of this target population with a view to promoting better lifestyle habits.

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