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Time using a computer as a discriminator of obesity, sedentarism and cardiovascular risk factors in university students

Tempo utilizando computador como discriminador de obesidade, sedentarismo e fatores de risco cardiovascular em universitários

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ABSTRACT

Introduction: University students are at greater risk of adopting a sedentary behavior due to their routine, with a large amount of time being dedicated to classes and studying in front of a computer. This situation has become a matter of concern, because sedentary behavior has been associated with adverse health outcomes such as mortality and chronic non-communicable diseases.

Objective: To analyze the time spent using the computer as a discriminator of obesity, sedentary lifestyle and cardiovascular risk factors in University students.

Method: This was a cross-sectional study with 2,275 students from courses in the health area of a public institution in Goiás. Data were obtained by applying a questionnaire consisting of sociodemographic, course-related, behavioral and health variables. The outcome variable was time using the computer (TC). The discriminatory power and the cutoff points of time using the computer for the outcomes of interest were identified using the Receiver Operating Characteristic (ROC) curves with 95%CI.

Result: The mean time spent using the computer for studying, working, or leisure was 3.90 hours/day for women and 3.82 hours/day for men. The area under the ROC curve between TC and sedentary lifestyle was 0.54 (95%CI 0.51-0.58) for women and 0.56 (95%CI 0.50 – 0.63) for men. As for systemic arterial hypertension (SAH) it was 0.57 (95%CI 0.50 – 0.64) for women. The best cutoff points related to these conditions were 3.5 and 4.5 hours, respectively.

Conclusion: The TC showed good predictive capacity to discriminate a sedentary lifestyle and SAH among University students. It is suggested that the reduction of TC and its replacement by active activities can contribute to improving the health profile and quality of life of students.

Keywords: Sedentary Behavior; Lifestyle; Student Health.

RESUMO

Introdução: *Os universitários apresentam maior risco de adotar o comportamento sedentário em virtude da própria rotina, a qual requer muito tempo dedicado às aulas e a utilização frequente do computador para os estudos. Essa situação tem se tornado preocupante porque o comportamento sedentário tem sido associado a desfechos adversos em saúde, como mortalidade e doenças crônicas não transmissíveis.*

Objetivo: *Este estudo teve como objetivo analisar o tempo despendido com o uso do computador como discriminador da obesidade, do sedentarismo e de fatores de risco cardiovascular em universitários.*

Método: *Trata-se de estudo transversal realizado com 2.275 acadêmicos de cursos da área da saúde de uma fundação pública do estado de Goiás. Os dados foram obtidos por meio da aplicação de um questionário composto por variáveis sociodemográficas, relativas ao curso e a aspectos comportamentais e de saúde. A variável de desfecho foi o tempo utilizando o computador (TC). Identificaram-se o poder discriminatório e os pontos de corte do TC para os desfechos de interesse por meio das curvas Receiver Operating Characteristic (ROC) com IC95%.*

Resultado: *O tempo médio usando o computador para estudos, trabalho ou lazer foi de 3,90 horas/dia para mulheres e 3,82 horas/dia para homens. A área sob a curva ROC entre o TC e o sedentarismo foi de 0,54 (IC95% 0,51-0,58) para mulheres e 0,56 (IC95% 0,50-0,63) para homens. Já para a hipertensão arterial sistêmica (HAS), foi de 0,57 (IC95% 0,50-0,64) para mulheres. Os melhores pontos de corte relacionados a essas condições foram 3,5 e 4,5 horas, respectivamente.*

Conclusão: *O TC apresentou boa capacidade preditiva para discriminar o sedentarismo e a HAS entre universitários. Sugere-se que a diminuição do TC e sua substituição por atividades ativas possam contribuir para a melhoria do perfil de saúde e a qualidade de vida dos acadêmicos.*

Palavras-chave: *Comportamento Sedentário; Estilo de Vida; Saúde do Estudante.*

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INTRODUCTION

Sedentary behavior (SB) has been investigated in different contexts due to its negative relationship with health. When considered excessive, it is associated with outcomes such as mortality, cardiovascular disease (CVD), type 2 diabetes and metabolic syndrome[1]. Long periods spent in sedentary activities are associated with increases in the risk of obesity and less time spent on physical activity[2,3].

University students constitute a group at greater risk of adopting SB because of their routine, with a large amount of time spent in classes and studying in front of a computer[4]. Studies on SB, show great variability regarding their measurement methods, as well as different cutoff points used to classify individuals with higher or lower levels of SB and the types of behavior assessed. However, a systematic review whose objective was to summarize the evidence on SB levels in university students indicated that time of computer use showed a significantly higher prevalence in relation to other screen time modalities[5].

The life changes that started with university admission has been related to a decrease in the practice of physical activity (PA) and an increase in SB[6,7]. Moreover, it is known that a considerable proportion of university students have higher levels of SB compared to the general adult population[5].

Among the events that are harmful to health, chronic non-communicable diseases (NCDs) play a prominent role, as their occurrence has increased, constituting the group of diseases with the greatest magnitude worldwide and the main cause of death in adults, especially in low- and middle-income countries[8].

The main risk factors for chronic NCDs are systemic arterial hypertension (SAH), diabetes mellitus (DM), dyslipidemia, inadequate eating habits, sedentary lifestyle, smoking and obesity[9,10]. Many of these factors are likely to arise or be aggravated during the undergraduate school period, because starting a university course can imply a change in lifestyle, with the adoption of unhealthy habits[9].

Recent data from the National Health Survey showed that approximately 96 million Brazilians over 18 years of age were overweight, corresponding to 60.3% of the population. Additionally, 39.2% had SAH and 15.9% had diabetes[11].

Establishing the quantitative relationship between time using the computer and certain conditions such as obesity, sedentary lifestyle and cardiovascular risk factors can contribute to the implementation of measures that discourage these behaviors and encourage university students to adopt more active practices, thus preventing the aforementioned diseases.

Therefore, the aim of this study was to analyze the time spent using the computer as a discriminator of obesity, sedentary lifestyle and cardiovascular risk factors in university students.

METHODS

A cross-sectional, school-based study was carried out in a census-type sample of university students linked to a municipal public institution located in the state of Goiás, Brazil, in 2018.

Students of both genders aged 18 years or over were included, and those who had some type of physical disability and those aged 60 years or older were excluded. To calculate the sample size, an estimated prevalence of 50% was considered, taking into account the inclusion of different health-related information and a 3% error. A total of 10% were added considering possible losses or refusals and 15% to control for confounding factors. Therefore, the need to include 953 individuals was estimated.

The study population consisted of all undergraduate students from the institution's health courses (Physical Education, Nursing, Pharmacy, Physiotherapy, Medicine and Dentistry), distributed in three campuses (Aparecida de Goiânia, Goianésia and Rio Verde), in a total of 2,658 students.

To carry out the data collection, a printed, pre-tested, standardized and self-applicable questionnaire was used, consisting of sociodemographic, course-related, behavioral and health variables.

Time using the computer (TC) was evaluated through a question about the time spent, in hours and minutes, on a normal day of the week, using the computer for working, studying or leisure. The TC in minutes were transformed into hours.

The demographic variables included gender (female; male); age (18-19 years; 20-24 years; 25-29 years; 30 years or older), self-reported skin color/ethnicity (white; brown; black; others) and marital status (with a partner; without a partner). The socioeconomic variable corresponded to the economic classification of the Brazilian Association of Research Companies (ABEP, *Associação Brasileira de Empresas de Pesquisa*), whose scores were organized into categories (A; B; C/D/E). The ABEP classification was established based on the possession and quantity of some consumer goods, the head of the family's level of education, and access to certain public services[12].

The variables related to student characteristics comprised the course (Medicine; others) and semester (1st to 6th; 7th to 12th). The lifestyle habits considered were smoking status (non-smoker; ex-smoker; current smoker); use of illicit drugs on the last 30 days (use; non-use); alcohol consumption (use; non-use) and the practice of physical activity (PA), collected through the International Physical Activity Questionnaire (IPAQ)[13] and categorized into: Sedentary (does not perform any physical activity for at least 10 continuous minutes during

the week); Insufficiently Active (practices physical activity for at least 10 continuous minutes per week, but not enough to be classified as active); Active (complies with the following recommendations: a) vigorous physical activity – ≥ 3 days/week and ≥ 20 minutes/session; b) moderate or walking – ≥ 5 days/week and ≥30 minutes/session; c) any added activity: ≥ 5 days/week and ≥ 150 min/week) and Very Active (complies with the following recommendations: a) vigorous PA– ≥ 5 days/week and ≥30 min/session; b) vigorous PA– ≥ 3 days/week and ≥ 20 min/session + moderate and/or walking ≥ 5 days/week and ≥ 30 min/session).

Finally, the health-related information comprised the Body Mass Index (BMI) and the presence of diseases that increased cardiovascular risk. BMI was calculated from the weight and height reported by the respondent and categorized according to the cutoff points recommended by the World Health Organization (WHO), with BMI up to 24.99 (adequate weight); >25.00 and <29.99 (overweight) and ≥30 (obesity)[14]. The presence of diseases was considered based on the self-reported statement, with a previous diagnosis made by a physician, of the following conditions: diabetes mellitus, systemic arterial hypertension and hypercholesterolemia.

The database was structured using the EpiData 3.1 software with double entry to correct inconsistencies. Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 22.0 software. In the descriptive analysis, the mean and standard deviation or absolute and relative frequency values and measures of association for categorical variables were calculated (Chi-square test), with $p < 0.05$. A stratification strategy by gender was used due to the differences observed in the literature regarding factors associated with SB between men and women, depending on the type of activity considered[15,16].

The discriminatory capacity, sensitivity and specificity of time using the computer to assess the presence of established conditions were performed from the analysis of the Receiver Operating Characteristic (ROC) curves. The area under the curve (AUC) determined the discriminatory capacity of the indicator for the presence or absence of obesity, sedentary lifestyle and risk factors for cardiovascular disease. Areas with values >0.50 and a lower limit of the 95%CI >0.50 were considered discriminatory for estimating the cutoff points[17]. Sensitivity and specificity levels for the cutoff points were estimated and the points that best discriminated the presence of the abovementioned conditions were the ones that showed a balance between these two characteristics[18].

The Guidelines and Regulatory Norms for Research Involving Human Beings were followed, according to Resolution 466 of the Brazilian National Health Council. The Ethics Committees of the Universidade do Vale dos Sinos (Opinion n. 2.892.764) and University de Rio Verde (Opinion n. 2.905. 704) approved the study.

RESULTS

A total of 2,275 university students participated in the study. The mean time spent using the computer for studying, working or leisure was 3.90 (SD ±2.98) hours/day for women and 3.82 (SD±2.96) hours/day for men.

The stratified analysis showed differences between the students regarding age, skin color/ethnicity, economic class, undergraduate course, smoking status, alcohol consumption, physical activity practice, BMI and presence of hypercholesterolemia (Table 1). The study identified a higher proportion of female individuals aged 20 to 24 years (70.7%), of white skin color/ethnicity (58%), non-smokers (90.3%), physically active (42.2 %), without obesity (96.0%) and who did not have hypercholesterolemia (81.5%). Among the male participants, there was a higher prevalence of individuals in economic class A (53.5%), enrolled in the Medicine course (74.2%) and reporting the consumption of alcohol (79.1%) (Table 1) .

Based on the performed analysis, the values of the Areas Under the Curve (AUC) of time using the computer were identified as a discriminator of obesity, sedentary lifestyle and cardiovascular risk factors in university students. It was observed that TC was a good discriminator of sedentary lifestyle among women and men, and the presence of systemic arterial hypertension among women. For the other conditions, the p-value was not statistically significant (Table 2).

By analyzing the cutoff points with greater accuracy and sensitivity and specificity values of the relationship between time using the computer and sedentary lifestyle, it was observed that, among women, the cutoff point that best discriminated this condition was more than 3.5 hours/day (sensitivity = 53% and specificity = 53%) (Graph 1).

Among men, the cutoff point that best discriminated the presence of sedentary lifestyle was also ≥ 3.5 hours/day (sensitivity = 57% and specificity = 55%) (Graph 2).

Graph 3 shows the area under the ROC curve between time using the computer and the presence of SAH in females, and the best cutoff point found was ≥ 4.5 hours/day (sensitivity = 45% and specificity = 66%).

Table 1. Sociodemographic characteristics, students, life habits and health of university students. Goiás, 2018.

Variable	Female		Male		p-value
	N	%	N	%	
Age group (n=2.275)					0.035*
18 to 19 years old	198	12.5	83	12.0	
20 to 24 years old	1120	70.7	462	66.9	
25 to 29 years old	194	12.2	96	13.9	
30 years or more	72	4.5	50	7.2	
Skin color /ethnicity (n=2.275)					0.050*
White	918	58.0	386	55.9	
Black	47	3.0	37	5.4	
Brown	545	34.4	235	34.0	
Other	74	4.7	33	4.8	
Marital status (n=2,259)					0.435
With partner	180	11.4	86	12.6	
Without partner	1396	88.6	597	87.4	
Economic class (n=2.173)					0.000*
A	624	41.0	348	53.5	
B	714	46.9	238	36.6	
C/D/E	184	12.1	65	10.0	
Health course (n=2.260)					0.018*
Medicine	1093	69.3	507	74.2	
Others	484	30.7	176	25.8	
Semester (n=2.258)					0.068
1st to 6th	1006	63.9	465	68.0	
7th to 12th	568	36.1	219	32.0	
Smoking status (n=2.215)					0.000*
Non-smoker	1394	90.3	499	74.4	
Ex-smoker	83	5.4	71	10.6	
Current smoker	67	4.3	101	15.1	
Alcohol consumption (n=2,257)					0.027*
No	398	25.2	142	20.9	
Yes	1179	74.8	538	79.1	
Use of illicit drugs (n=2,174)					0.525
No	1276	84.3	550	83.2	
Yes	237	15.7	111	16.8	
Physical activity practice (n=2,191)					0.000*
Very active	291	19.1	212	31.9	
Active	644	42.2	279	42.0	
Insufficiently active	250	16.4	69	10.4	
Sedentary	341	22.3	105	15.8	
Obesity (n=2225)					0.000*
No	1487	96.0	599	88.6	
Yes	62	4.0	77	11.4	

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TTable 1. (Continuation) Sociodemographic characteristics, students, life habits and health of university students. Goiás, 2018.

Variable	Female		Male		p-value
	N	%	N	%	
Systemic Arterial Hypertension (n= 2,244)					0.108
No	1491	95.3	659	96.9	
Yes	73	4.7	21	3.1	
Diabetes mellitus (n=2,231)					0.255
No	1483	95.1	631	93.9	
Yes	76	4.9	41	6.1	
Hypercholesterolemia (n=2,222)					0.013*
No	1267	81.5	513	76.8	
Yes	287	18.5	155	23.2	

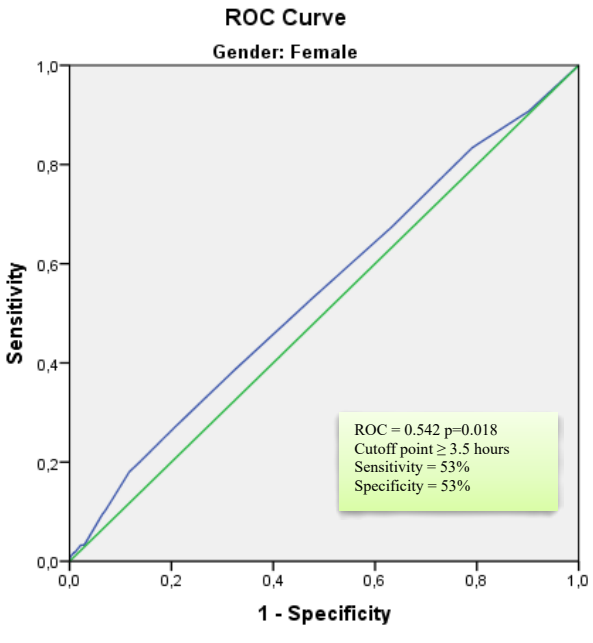
Person's Chi-square test - *p ≤ 0.05.

Table 2. Area under the ROC curve and 95% CI of time using the computer as a discriminator of obesity, sedentary lifestyle and cardiovascular risk factors in University students. Goiás, 2018.

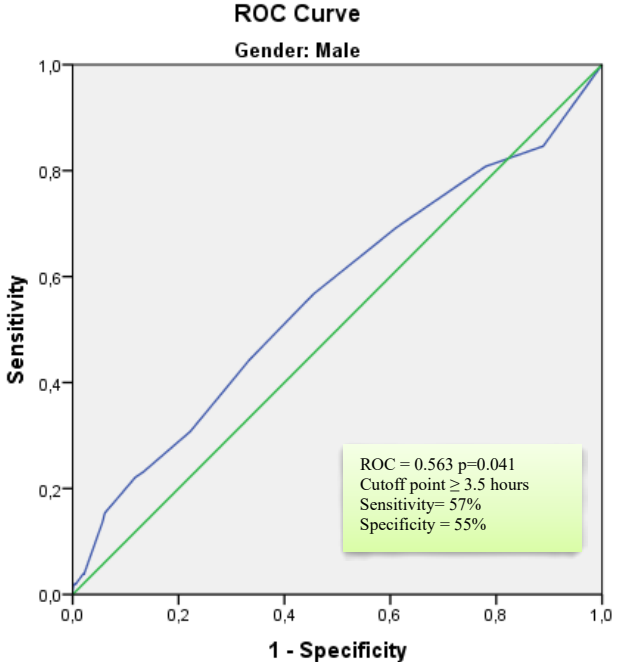
Variables	Female		Male	
	AUC (95%CI)	p-value	AUC (95%CI)	p-value
Obesity	0.560 (0.494-0.627)	0.108	0.535 (0.457-0.613)	0.325
Sedentary lifestyle	0.542 (0.507-0.578)	0.018*	0.563 (0.501-0.627)	0.041*
SAH	0.574 (0.506-0.643)	0.032*	0.499 (0.387-0.611)	0.987
Diabetes	0.509 (0.445-0.572)	0.794	0.534 (0.436-0.632)	0.487
Hypercholesterolemia	0.520 (0.483-0.557)	0.287	0.467 (0.413-0.520)	0.214

AUC = Area under the curve; ROC = Receiver Operating Characteristic; 95%CI = 95% confidence interval; SAH = systemic arterial hypertension; *p<0.05.

Graph 1. Area under the (ROC) curve with cutoff point for computer time as a discriminator of sedentary lifestyle in female university students in Goiás, Brazil, 2018.



Graph 2. Area under the (ROC) curve with cutoff point for computer time as a discriminator of sedentary lifestyle in male university students in Goiás, Brazil, 2018.



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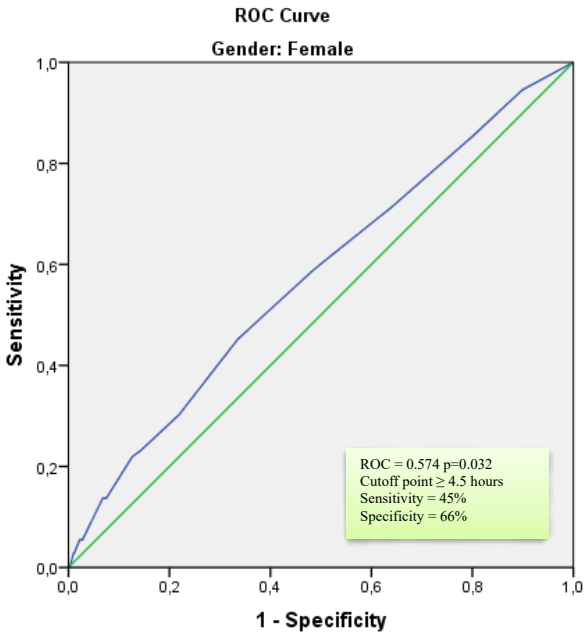
Graph 3. Area under the curve (ROC) with cutoff point for computer time as a discriminator of systemic arterial hypertension in female university students from Goiás, Brazil, 2018.



DISCUSSION

The present study sought to demonstrate the discriminatory power and cutoff point of time using the computer in relation to some conditions such as obesity, sedentary lifestyle and risk factors for cardiovascular disease in university students. Few studies in the literature have used sedentary behavior or one of its components as a discriminator of health conditions in the university population, as opposed to other groups such as children[19], adolescents[20] and the elderly[21,22].

The analysis identified the values that showed the best balance between sensitivity and specificity to discriminate the presence of sedentary lifestyle and SAH among undergraduate students. The data showed that the TC predictive capacity to discriminate the presence of sedentary lifestyle was higher among men than women, as the AUC values for women were lower. For SAH, the TC showed discriminatory power among women, only.

The literature has shown differences regarding SB when comparing men and women because, depending on the considered domain, one gender could overlap the other. A study with data from eight Latin American countries showed that men had higher SB than women when using computers, playing video games, reading and during commuting, regardless of age[15]. However, in the present study, the average time using a computer among male and female university students was equivalent; perhaps because the activities performed daily that involved the use of this device were similar.

Regarding the cutoff points, it is important to emphasize that the literature does not yet have a consensus on the amount of time after which excessive sedentary behavior could be harmful to health, and it is possible to find time periods ranging from 2 hours to 10 hours or more per day[23]. A study that sought to observe the relationship between SB, cardiovascular disease and mortality in adults found that 2 hours/day of screen time was associated with a 5% increase (HR 1.05; 95%CI 1.01-1.09) in cardiovascular events[24].

Other studies carried out in Brazil tried to identify the most appropriate cutoff point for the university population. In the state of Minas Gerais, the authors sought to select the best cutoff points for sitting time as a discriminator of the absence of reported morbidities, such as obesity, overweight, SAH, high cholesterol and high blood glucose levels. They concluded that the best cutoff point for the absence of SAH was 6 hours[25]. In the state of Bahia, a study with nursing students indicated that a sitting time of 8 hours or more per day was the one that best discriminated abdominal obesity among female students[26]. Therefore, these studies found cutoff points that were well above those shown in the analysis of the present study.

A systematic review of the literature on sedentary behavior showed that university students spent an average of 7.29 hours a day sitting, longer than the average of young adults in high-income countries. In this same review, the synthesis of data on the average time using the computer was 2.91 (95%CI 2.32-3.5) hours per day, lower than the value found in the present study, both for men and women[5].

When considering the high possibility that the university students will work in future occupations where they will be exposed to long periods of sitting time during the workday, the data become a matter of concern, as the tendency for this sitting time is to increase. A study carried out with adults in the USA confirmed that sedentary time increased in the last decade in all analyzed subgroups, considering age, gender, level of schooling, skin color/ ethnicity and BMI[27].

The literature shows a negative association between sedentary behavior and physical activity[3]. Physically active university students tend to dedicate less time to sedentary behavior[28]. A sedentary lifestyle can cause several damages to health, such as, for instance, predisposing the individual to overweight and obesity, which in turn are related to other problems. Case-control studies with Bangladeshi university students showed that those who did not engage in any physical activity had a 3.2-fold greater chance of being obese or overweight when compared to physically active ones (OR= 3.2; 95%CI: 1.0 –9.9; p<0.05)[29].

In the present study, although the stratified analysis did not show a great difference, both women and men spent almost

a shift of their day in front of a computer, without considering the other SB components, which represented almost 25% of the time of wakefulness. This fact drew attention and became even more of a concern because, due to the global health situation caused by the Covid-19 pandemic, the routine of most people has changed, with a particular impact on the student sphere, with classes being taught remotely, requiring that students spend more time than usual in front of electronic devices, such as computers and smartphones.

An analysis with university students in Spain showed that sitting time increased during the lockdown period in all groups of evaluated students, reflecting the consequences brought by the restriction period due to the pandemic[30]. In Brazil, a survey that investigated several behaviors of the Brazilian population during the Covid-19 pandemic showed an increase in the average time spent watching TV and using a computer or tablet, with an increase of 1 hour and 30 minutes in relation to the time spent with these activities before the pandemic. The longest average time of computer use was seen among young adults aged 18 to 29 years, with approximately 7 hours and 15 minutes, representing an increase of almost 3 hours over the time of use before the pandemic[31].

The strengths of this study comprise the representativeness of the sample of university students from a region of the country that is still little explored, the stringent study conduct, as well as the relevance of knowledge about a component of sedentary behavior that is very present in this population and its relationship with certain conditions in the health field. Furthermore, there are few studies that performed this type of analysis, especially in Brazil.

Among the limitations are the assessment of TC through a questionnaire and the use of self-reported measures to obtain information on morbidities. However, this type of measure has been frequent in epidemiological studies[3,32]. It is worth noting that the information was collected before the Covid-19 pandemic and that, due to the measures adopted to deal with the disease, the findings may have been modified for the worse. Another limitation is related to the cross-sectional study design, which requires caution when interpreting the findings, since longitudinal or experimental studies would be more adequate to demonstrate the relationship between TC and the presence of certain conditions.

CONCLUSION

It was concluded that the TC had a good capacity to discriminate the presence of sedentary lifestyle in university students and systemic arterial hypertension among female students. The cutoff points that best discriminated these conditions were 3.5 and 4.5 hours, respectively.

When reflecting on the findings, it is suggested that reducing TC and replacing it with active behaviors can contribute to improving the health profile and quality of life of university students, working as a preventive approach against cardiometabolic diseases and sedentary lifestyle. The data may suggest that future epidemiological studies on screen time in university students should pay more attention to the time using a computer.

AUTHORS' CONTRIBUTION

Heloísa Silva Guerra participated in the project design, data collection, analysis and interpretation of data, writing and critical review of the manuscript. Adriana Vieira Macedo Brugnoli and Raiana Rodrigues Costa Melo participated in data collection, data interpretation and critical review of the manuscript. Emílio Hideyuki Moriguchi: participated in data interpretation and critical review of the manuscript. Marcos Pascoal Pattussi participated in the project design, data interpretation and critical review of the manuscript. Juvenal Soares Dias da Costa participated in the project design, data analysis, interpretation and critical review of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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