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What are the characteristics that influence the sitting time in university students?

Quais são as características que influenciam o tempo sentado em universitários?

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Abstract – The objective was to estimate the relationship between sociodemographic characteristics, link with the university, behavioral, biological, and self-rated related to health, with time sitting in university students at federal institutions in the state of Bahia, Brazil. This cross-sectional study was carried out with university students from six institutions (Federal University "Recôncavo da Bahia", Federal University of "Bahia", Federal University of "Oeste da Bahia", University of International Integration of Afro-Brazilian Lusophony, Federal University of "Vale do São Francisco" and Federal University of "Sul da Bahia") in the state from Bahia in 2019. Time sitting in hours per day was investigated and relation sociodemographic, link with the university, behavioral, biological, self-rated of stress and health variables. Path analysis was used to apply multivariate linear regression. The significance status was 5%. A total of 1,217 university students participated of the study. The final model accounts for 6% of sitting time. Self-rated health as positive (β: -0.117; p: <0.001), increasing age (β: -0.115; p: <0.001) and physical activity practice (β: -0.113; p: <0.001) contributed to the decrease in sitting time. The increase in the amount of inadequate eating habits (β: 0.063; p: 0.032) favored the increase in sitting time. The adjustment indices were satisfactory. Concluded that self-rated health as positive, advancing age and physical activities practice were determinants of reduced sitting time, on the other hand, irregular eating behaviors favored sedentary behavior.

Key words: Brazil; Cross-sectional studies; Lifestyle; Sedentary behavior; Students.

Resumo – *O objetivo foi estimar a associação entre as características sociodemográficas, de vínculo com a universidade, comportamentais, biológicas e de autoavaliação relacionada a saúde, com o tempo sentado em universitários de instituições federais do estado da Bahia, Brasil. Este estudo transversal foi realizado com universitários de seis instituições (Universidade Federal do Recôncavo da Bahia, Universidade Federal da Bahia, Universidade Federal do Oeste da Bahia, Universidade da Integração Internacional da Lusofonia Afro-Brasileira, Universidade Federal do Vale do São Francisco e Universidade Federal do Sul da Bahia) do estado da Bahia em 2019. Foi investigado o tempo sentado em horas/dia em relação as variáveis sociodemográficas, de vínculo com a universidade, comportamentais, biológicas e de autoavaliação do estresse e saúde. Empregou-se a análise de caminhos por meio da regressão linear múltipla. O nível de significância foi de 5%. Participaram do estudo 1.217 universitários. O modelo final explicou 6% do tempo sentado. Os universitários que autoavaliaram a saúde como positiva (β: -0,117; p: <0,001), aqueles com maior idade (β: -0,115; p: <0,001) e que apresentam mais tempo de prática de atividades físicas (β: -0,113; p: <0,001) apresentaram diminuição do tempo sentado. O aumento da quantidade de hábitos alimentares inadequados (β: 0,063; p: 0,032) favoreceu o aumento do tempo sentado. Os índices de ajuste foram satisfatórios. Concluiu-se que a autoavaliação da saúde como positiva, o avanço da idade e a prática de atividades físicas foram determinantes da redução do tempo sentado, por outro lado, os comportamentos alimentares irregulares favoreceram o sedentarismo.*

Palavras-chave: *Brasil; Estudos transversais; Estilo de vida; Comportamento sedentário; Estudantes.*

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INTRODUCTION

Sedentary behavior (SB) is defined as any waking activity that requires an energy expenditure lower than 1.5 basal metabolic rate[1] and represents an emerging concern in the health status of the populations[2]. Studies have been showing that higher expositions the sedentary activities can contribute, in adults, for all-cause mortality, fatal and non-fatal cardiovascular disease, and others morbidities[2-4]. Curiously, despite of the coronavirus pandemic is shown an increase sitting time (ST) in university students (US), male and female, and with two years or more of exposition time the university[5].

Among SB, it is possible to characterize those that are discretionary and non-discretionary[1]. Discretionary behaviors include sitting in activities that are not related to school or work, whereas non-discretionary activities correspond to sitting at work, to study or while commuting[6]. The activities related to attending classes and studies, which involve long periods of sitting for US, as well as the activities associated to intensive course and classroom hours, participation in extra-class study activities in libraries and academic work with the use of cell phones, tablets, computers, among others, constitute screen based SB[1]. Therefore, academic activities can, indeed, represent a rise in the time spent sitting[7]. In addition, other biological, social, economic, demographic, and environmental factors have been associated with excessive ST in US[8-10].

Despite the advancement of knowledge and the greater interest in recent years on the theme, especially about the ST, that can operationally be used as a measure global of SB[11] in US. Studies were realized about screen time[10]. The understanding of the factors associated with ST in US can guide the planning of specific educational programs and the implementation of actions that aim its prevention, as well as direct public policies aimed at combating the time spent sitting during academic studies. Besides, it can contribute to expand scientific knowledge about this issue in this population group.

It is important to consider the growth of US in recent years because of the expansion of higher education in Brazil[12]. In state of Bahia, located in the northeastern region of the country, it has a higher number of students enrolled in federal educational institutions comparing to the other states in that region[12]. Consequently, the objective of this study was to estimate the relationship between sociodemographic, link to university, behavioral, self-perceived of health, and biological characteristics, with ST in US from federal institutions in the state of Bahia, Brazil.

METHODS

This cross-sectional study is derivative of the research executed in 2019. All participants previously signed the informed consent form. This study was approved by the Research Ethics Committees of Federal University of "Recôncavo da Bahia" (UFRB), Federal University of "Bahia" (UFBA), Federal University of "Oeste da Bahia" (UFOB) and University of International Integration of Afro-Brazilian Lusophony (UNILAB).

The study population consisted of US of courses at campuses at Federal Universities (FUs) located in the state of Bahia, Brazil. The institutions involved were: UFRB, UFBA, UFOB, UNILAB, Federal University of "Vale do São Francisco" (UNIVASF) and Federal University of "Sul da Bahia" (UFSB).

The sample was estimated considering 95% confidence level and an acceptable error of three percentage points, population of 35,805 US[13]. We added in sample 40% for possible losses and 15% for association studies. The calculated sample was 1,668 US, stratified in proportion to the number of students on each FUs campus. Participation took place at the convenience of the US.

US enrolled in distance learning courses, special enrollment courses (students who completed high school or with a higher education diploma enrolled in undergraduate courses), technical courses and students under the age of 18 were excluded from the study. In addition, US who did not fill in correctly or left blank the fields on the survey concerning which university they belonged to were also excluded.

Data collection was carried out in the first academic semester (first four-month of UFSB) of 2019 in FUs. The invitation to participate was sent to US individually by electronic correspondence. The US were also invited in the institutions' classrooms at times, before or after classes on different days of the week, to participate in the study through on portable computers, as well as guests, who were invited via the institutions' official social networks.

The invitation included a link to access the consent form and the survey. Previously, the US had access to the consent form, in which they could accept or not. If one accepted, it would be possible to answer the survey, with the personal information of acceptance stored in a different place from the other parts of the study. Both the consent form and the questionnaire were made available online, via the Google Forms platform.

The inquiry consisted of 68 objective questions, derived from the Questionnaire of Health Indicators and Quality of Life of Academics[14], questionnaire VIGITEL[15,16] and the International Physical Activity Questionnaire (IPAQ), short version[17], together with sociodemographic issues and questions related to the student's link program to the university.

The dependent variable in this study was ST in hours/day. Measured by IPAQ, having considered a weekday and a weekend day. For this study, the hours in this behavior were considered, with the minutes transformed into hours and the weighted average procedure (day of the week multiplied by 5 + day of the weekend multiplied by 2, divided by 7) was used to estimate the average ST in hours/day. ST is a valid measure in US[18]. The independent variables are represented in Box 1. These variables were structured in the form of a model, adapted of the study of Franco et al.[10] as shown in Figure 1.

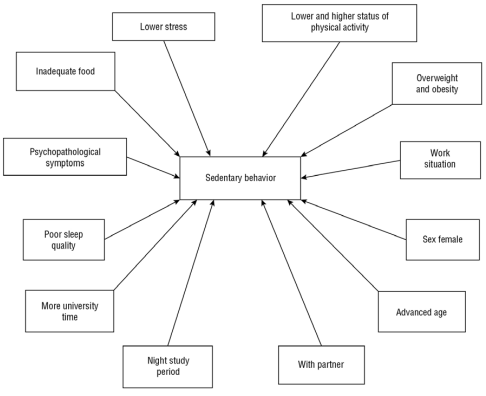

Figure 1. Theoretical model of factors associated with sedentary behavior in university students. Adapted from Franco et al.[10].

Box 1. Description of independent variables.

- Sex (male=0; female=1);
- Age in complete years (quantitative variable);
- Study period (daytime=0; nighttime=1);
- Marital status (without a partner=0; with a partner=1);
- Years of university (quantitative variable);
- Work or internship (do not work/do not do internship=0; do internship or work=1);
- Minutes of moderate to vigorous physical activity (MVPA) per week (practice of walking, activities of moderate intensity and vigorous intensity; the minutes of vigorous physical activities were multiplied by 2);
- Food, measured by a food score, ranging from 5 to 10, resulting from the sum of the five behaviors, fruit consumption (regular=0; irregular=1), raw salad consumption (regular=0; irregular=1), consumption of soft drink or artificial juice (irregular=0; regular=1), consumption of chicken (no=0; yes=1) and consumption of red beef, pig or goat (no=0; yes=1);
- Body mass index (BMI) in kg/m2, estimated by the information referred to body mass and height, and the calculation of body mass divided by height squared. the present variable is valid for application in epidemiologic studies with US[19];
- Health status, very good (value=5), good (value=4), regular (value=3), bad (value=2) and very bad (value=1);
- Stress, never stressed (value=1), rarely stressed (value=2), sometimes stressed, living reasonably well (value=3), almost always stressed (value=4), always stressed, with difficulty to face the daily life (value=5);
- Sleep well, never (value=1), rarely (value=2), sometimes (value=3), almost always (value=4) and always (value=5).
- Satisfaction with life, i do not know (value=1), more or less (value=2), yes (value=3) and no (value=4)

The responses of the volunteers were tabulated in the Excel software, version 2007, and later transferred to the SPSS program, version 25.0, to use descriptive analysis such as mean (standard deviation – SD), absolute and relative frequencies. Finally, the path analysis was performed using the AMOS software, version 25.0. For the present analysis, a listwise procedure was initially performed in relation to the outcome variable, followed by the analysis for the existence of outliers by means of the Mahalanobis squared distance (DM^2) and multivariate normality.

The analysis of the initial multivariate regression model was performed considering the maximum likelihood method (MLM), with all variables simultaneously and the paths with non-significant determination coefficients were identified. Therefore, these variables were excluded, following the order of removal, one at a time, from the variables with the highest p values to those with the lowest p values up to the significance level of p=0.05.

With the readjustment to a final model, the analysis was carried out with the MLM, with analysis of the model's adequacy using the following adjustment indexes with the following classifications: p-value of Chi-square (χ^2), satisfactory with p>0.05; Comparative Fit Index (CFI) and Goodness of Fit Index (GFI), with satisfactory adjustment values >0.90[20,21] and Non-Centrality Parameter (NCP) with an appropriate value closer to 0[21] and 90% confidence interval (90%CI). Were used the Root Mean Square Error of Approximation (RMSEA) and 90%CI, with an adequacy value <0.06[22] and Standardized Root Mean-Square Residual (SRMR) with value adequate <0.08[22].

RESULTS

A total of 1,552 US participated. Twenty participants who reported being linked to distance learning, one with special enrollment with university, twenty-one underage participants and four who did not complete the information on their relationship with the university were excluded. The final sample consisted of 1,506 US (response rate of 90.29%). Among those who did not participate, 15 reported not having an interest in participating (refusal).

Posteriorly, 378 participants who did not present information for one of the investigated variables were excluded. The DM² analysis was carried out and one participant was excluded (outlier). At the end, the sample of this study was 1,217 US. The level of kurtosis tests for multivariate normality was 0.810. Participated 34.5% male, with mean of age of 23.34 (SD=4.48), 72.1% were of daytime study period, 79.1% without a partner, the mean of years of university was 3.40 (SD=2.00) and 59.3% did not work/did not do an internship. The mean of ST was of 8.68 (SD=3.57) hours/day.

Figure 2 shows the initial model for determining ST. Table 1 shows the coefficients of determination and the level of significance of the paths in relation to ST. Significant paths were observed in relation to MVPA, health status and age.

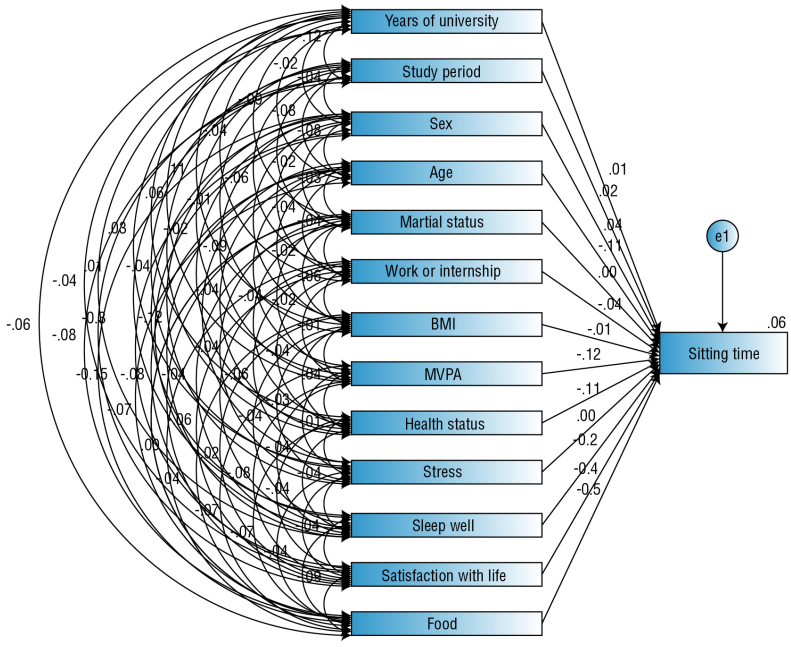

Figure 2. Initial model for determining sitting time in university students. Bahia. 2019.

The non-significant paths were excluded, and the following ST determination model is presented in Figure 3. This model explains 6% of ST. It was observed that the increase in self-rated health status as positive (β=-0.117; p<0.001), the increase in age (β: -0.115; p <0.001) and of the practice of MVPA (β=-0.113; p<0.001) contributed to the decrease in hours per day of ST. On the other hand, the increase in eating habits to an inadequate level was associated with an increase in ST by 0.06 hours per day (β=0.063; p=0.032).

Table 1. Standardized coefficients in the association of exploratory characteristics in relation to sitting time in the initial model in university students. Bahia. 2019.

Variables	β	p
Years of university	0.008	0.813
Sex	-0.035	0.247
Marital status	0.001	0.961
BMI	-0.008	0.781
Health status	-0.114	<0.001
Satisfaction with life	-0.038	0.248
Study period	0.015	0.621
Age	-0.111	0.001
Work or internship	-0.038	0.235
MVPA	-0.117	<0.001
Stress	-0.001	0.968
Sleep well	0.016	0.632
Food	0.055	0.068

BMI: body mass index; MVPA: Moderate to Vigorous Physical Activity.

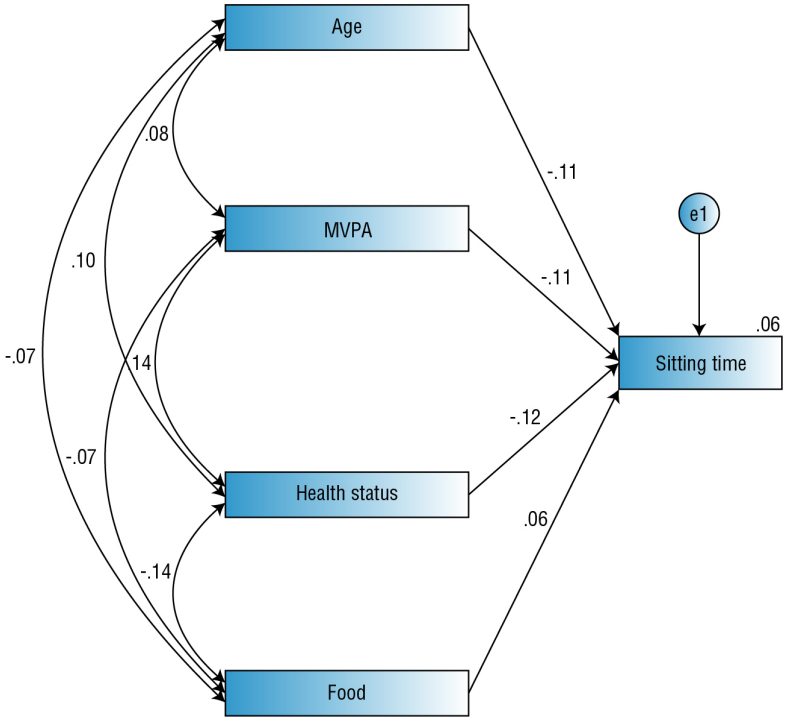

Figure 3. Final model for determining sitting time in university students. Bahia. 2019.

There was a significant Chi-square test value (<0.001), and GFI (value: 1.00) and CFI (value: 1.00) with a maximum score level. The values of RMSEA (90%CI) and NCP (90%CI) were of 0.104 (0.088; 0.120) and 0.001 (0.000; 0.002), respectively. The value of SRMR was <0.001.

DISCUSSION

The final model explains 6% of the variability in ST. This value is expressive and considering that SB has been remarkable in US, as shown in a systematic

review that asserts that the prevalence can vary from 34.0% to 92.0%[10]. In addition, approximately a quarter of the adult population in Brazilian capitals shows involvement in screen-based SB in different years (2008: 24.60%; 2017: 24.60%), however, higher levels of education seem to demonstrate a protective role in the occurrence of this behavior[23].

Obviously, other characteristics that were not measured in this study can determine SB, as shown by Franco et al.[10], that states that a diversity of behaviors, attributes related to the link with the university and health perceptions demonstrate association with SB. It is also relevant to consider others different types of SB, as screen time, as smartphone use and internet browsing, and not exclusively ST, can be determined by different factors[24]. However, this review shows important information about Brazilian US that was employed in this study[10].

It was noted that the highest MVPA levels were associated with less ST in US, which corroborates Franco et al.[10] by showing that this behavior presents a protective role in relation to internet browsing and video gaming time. In addition, another review study showed a negative association between physical activity and ST[25]. Presenting an active lifestyle can assist in the lower occurrence of SB[23], which may be linked to the role of physical activity in favoring greater self-efficacy and performance in daily activities.

It was shown that a higher quantity of inadequate eating habits determines an increase in ST in US. In children and adolescents, a healthy eating does not show marker associated SB[26]. In contrast, in US, an inadequate diet can favor greater exposure to SB, especially on the screen, such as using the internet[10]. It is interesting to note that older ages were associated with decreased exposure to ST. This result corroborates with a review of SB in US[10]. In review studies focusing on students at school, a public with routine in school and home of studies, it was shown that older age represented both a protective factor[26] and a risk factor[27] in relation to screen behaviors. In this study, possibly due to the predominant participation of groups from social classes C, D and E (lower social levels), and thus may present a greater routine of daily physical efforts, with greater active commuting and work activities that do not require excessive ST, can justify our results.

The positive self-rated health status was found to be a determinant of lower occurrence of ST among US in the state of Bahia. This characteristic was not associated with Brazilian adults[23]. On the other hand, screen behaviors revealed a lower level of happiness in students of school[26], which can be understood as a perception of a poor level of health. Thus, actions that can maximize positive self-rated health are related, among other factors, to the reallocation of time in SB by the practice of physical activities during leisure[28].

In this study, the average ST was 8.68 hours/day (SD: 3.57). This value is higher than the average observed in other studies with US who used the same measure (6.39 hours/day)[29]. It is important to address that there is no cutoff point in the literature that define risks, however, 8 hours was predictor of abdominal obesity in US from state Bahia[30].

The adjustment indicators demonstrated good quality of the model. Observed that the GFI indicator that deals with the proportion of determination of the model in relation to the baseline model was perfect; in addition, the CFI compares the percentage of increase in the quality of fit of the model compared to the worst possible model[21] with excellent adjustment. The NCP indicator,

that represents the adjustment of the model in relation to the structure of the variances and covariance, was close to 0, which represents a satisfactory quality of the tested model[21].

On the other hand, the Chi-square was significant, which indicates an unwanted adjustment; however, this indicator is influenced by the sample size. The RMSEA indicator was higher than the criterion related to a good quality of the model, which could minimize the extrapolation of information to the university public, however, the 90%CI was close to the adjustment criterion, this characteristic is possibly the sampling process that considered the selection for convenience. The SRMR showed a perfect adjustment, which indicates less discrepancy between the model and comparison matrix as to the residuals of the observed variables.

Among the limitations of this study, as already mentioned, the selection process for convenience may favor a possible selection bias. Additionally, the use of the questionnaire to measure behaviors also represents a limitation; however, the measures employed have a satisfactory level of validity. The online collection procedure may have contributed to the participation of US with easier access to the internet. Nonetheless, it was sought during data collection to minimize this limitation, offering the possibility of participation in portable electronic devices provided by data collection team.

This study has strengths because it represents the collection of information from US in the state of Bahia in all federal educational institutions that are distributed both in the capital and in the interior. The information in this study may favor a better understanding of the behavior of different characteristics in relation to SB, to encourage institutional actions aimed at adopting an active and healthy lifestyle.

CONCLUSION

It might be concluded that behavioral characteristics such as inappropriate eating habits and MVPA practice determine the occurrence of ST, as well as age and health status. The realization of other research that can analyze other SBs, as well as the direct and indirect effects in relation to this conduct, become essential.

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COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committees – Federal University of Recôncavo of Bahia (protocol, no. CAAE: 88803818.3.1001.0056), Federal University of Bahia (protocol, no. CAAE: 88803818.3.3001.5531), Federal University of Oeste of Bahia (protocol, no. CAAE: 88803818.3.3004.8060) and University of International Integration of Afro-Brazilian Lusophony (protocol, no. CAAE: 88803818.3.1001.0056) and were written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conception and design of the study: TFS and FOC. Data collection: TFS, FOC, ESS, FCM, DCGS, ALS, and GRB. Statistical analysis: TFS. Writing of the manuscript: TFS, FOC, ESS, FCM, DCGS, ALS, GRB, SCFF, and SAF. Critical revision of the text: FOC, SCFF, and SAF.

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