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Sedentary behavior in the city of São Paulo, Brazil: ISA-Capital 2015

Comportamento sedentário na cidade de São Paulo: ISA-Capital 2015

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ABSTRACT: ***Introduction:*** The excessive sitting time involved in activities of low energy expenditure (sedentary behavior) can contribute to the development of chronic diseases. Assessing factors related to this behavior in a population is important to identify its most vulnerable segments. ***Objective:*** To describe sitting time distribution in the adult population of São Paulo City according to sociodemographic and environmental characteristics and health conditions. ***Methods:*** This is a cross-sectional study involving 2,512 individuals, aged 20 to 65 years, who participated in the Health Survey in the City of São Paulo (*Inquérito de Saúde no Município de São Paulo* – ISA-Capital) 2015. Data relating to sitting time were collected using the International Physical Activity Questionnaire (IPAQ), initially analyzed continuously, and, afterward, dichotomized by the median to analyze categorical variables. ***Results:*** The total sitting time median in the sample was 180 min/day. The variables that, after adjustments, remained related to sedentary behavior were: schooling (prevalence ratio — PR = 1.41; 95% confidence interval — 95%CI 1.35 – 1.48); marital status (PR = 1.05; 95%CI 1.02 – 1.08); neighborhood safety (PR = 0.96; 95%CI 0.93 – 0.99); age (PR = 0.91; 95%CI 0.87 – 0.95); income (PR = 1.07; 95%CI 1.00 – 1.15); self-rated health (PR = 1.03; 95%CI 1.01 – 1.07), and gender (PR = 0.96; 95%CI 0.94 – 0.99). ***Conclusion:*** The most vulnerable groups to sedentary behavior in this population are: younger males, with higher schooling and income, who live in neighborhoods considered safe, unmarried, and with negative self-rated health.

Keywords: Sedentary lifestyle. Exercise. Adult health.

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RESUMO: ***Introdução:*** O excessivo tempo sentado envolvido em atividades de baixo gasto energético (comportamento sedentário) pode contribuir para o desenvolvimento de doenças crônicas. Avaliar fatores associados a esse comportamento numa população é importante para identificação dos segmentos mais vulneráveis. ***Objetivo:*** Descrever a distribuição do tempo sentado na população adulta do município de São Paulo segundo características sociodemográficas, ambientais e de condições de saúde. ***Metodologia:*** Estudo transversal envolvendo 2.512 participantes do Inquérito de Saúde no município de São Paulo (ISA-Capital) 2015, com idade entre 20 e 65 anos. Os dados referentes ao tempo sentado foram coletados por meio do Questionário Internacional de Atividade Física (IPAQ), analisados inicialmente na forma contínua e, a seguir, dicotomizados pela mediana, para a análise de dados categóricos. ***Resultados:*** A mediana de tempo sentado total para amostra foi de 180 min/dia. As variáveis que após ajuste permaneceram associadas foram: escolaridade (razão de prevalência — RP = 1,41; intervalo de confiança de 95% — IC95% 1,35 – 1,48); estado civil (RP = 1,05; IC95% 1,02 – 1,08); segurança no bairro (RP = 0,96; IC95% 0,93 – 0,99); idade (RP = 0,91; IC95% 0,87 – 0,95); renda (RP = 1,07; IC95% 1,00 – 1,15); autopercepção de saúde (RP = 1,03; IC95% 1,01 – 1,07) e sexo (RP = 0,96; IC95% 0,94 – 0,99) ***Conclusão:*** Homens mais jovens, com mais escolaridade e renda, que residem em bairros considerados seguros, não casados e com autopercepção negativa de sua saúde estão entre os mais vulneráveis ao comportamento sedentário nessa população.

Palavras-chave: Estilo de vida sedentário. Exercício. Saúde do adulto.

INTRODUCTION

In recent years, an important behavior to investigate is the time we spend sitting down, given the impact of technological, social, and environmental progress on the structure and lifestyle of modern society[1]. Due to this progress, people are increasingly spending more time in the sitting position, engaged in activities requiring a decreasing level of energy expenditure[2].

The term *sedentary behavior* (from Latin *sedere*, sit), once considered as a synonym to physical inactivity, currently is used to describe the time spent in a sitting position performing low energy expenditure activities (≤ 1.5 Metabolic Equivalent of Task – METs). The term *physical inactivity*, on the other hand, is appropriate to describe the condition of not achieving the recommended amount (150 min/week for adults) of moderate to vigorous physical activity (MVPA)[3].

The relationship between sedentary behavior and health outcomes has been investigated, and a growing evidence body points to sedentary behavior as a health risk factor, different and regardless of MVPA practice. A systematic review concluded that there is strong evidence to associate sedentary behavior with all-cause mortality, cardiovascular disease mortality, cardiovascular diseases, type 2 diabetes, and metabolic syndrome. Sitting time represented a risk even to individuals considered

physically active[4]. These findings indicate the importance of researches that contribute to assess and develop health policies aimed at increasing physical activity (PA) and reducing sitting time[5]. Identifying the most vulnerable segments and the characteristics of the population exposed to sedentary behavior can contribute to achieving this goal.

Developed countries have invested a lot in this field, but in countries like Brazil, researches that adopt this new sedentary behavior concept are just beginning. The few studies involving adults, thus far, assessed only sociodemographic aspects.

This investigation aimed at describing the sitting time distribution in the adult population of São Paulo City according to sociodemographic and environmental characteristics, as well as health conditions, using as an indicator of sedentary behavior the total sitting time estimated by self-reported measure.

METHODS

This work analyzed data from the adult population (aged between 20 and 65 years)[6] who took part in the Health Survey in the City of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital) 2015. This is a cross-sectional study whose purpose was to investigate socioeconomic, morbidity, lifestyle, and health service utilization characteristics.

This survey sample was probabilistic and stratified, with a two-stage cluster: census tracts and households. Data from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE) provided the basis for the random selection of urban census tracts. Stratification was done by geographical (health coordination offices: North, Midwest, Southeast, South, and East) and demographic domains (adolescents aged 12 to 19 years; women aged 20 to 59 years; men aged 20 to 59 years; and older adults aged 60 years or more). The first selection stage covered census tracts (30 per health coordination office) and the second, households. The sample size was defined considering a 50% prevalence estimate, a 95% confidence level, a sampling error of 0.10, and a design effect of 1.5[7]. The fieldwork ended on December 2015 with 4,043 interviews. This study used data from individuals aged 20 to 65 years (2,538). The survey used consisted of questions organized into 16 thematic groups. For quality control, new interviews (random samples of 5%) by telephone or directly at home were performed. Description of the design, characteristics, and the questionnaire of ISA-Capital are available on: <http://www.fsp.usp.br/isa-sp>. All variables of this study came from data collected in this survey.

Sedentary behavior was expressed as total sitting time (TST), estimated according to data from the International Physical Activity Questionnaire (IPAQ), long form, validated to assess the level of PA and sedentary behaviour[8]. Data were collected from IPAQ questions referring to the sum of sitting time during the week and on weekends. Weighted averages

were calculated as follows: time on weekdays multiplied by 5 added to time on days of the weekend multiplied by 2; the result is divided by 7 to obtain the mean number of hours per day spent in the sitting position[9].

The independent variables of this study were:

- Demographic: gender (male and female); age range in completed years (20–29, 30–39, 40–49, 50–59, 60–65); marital status (married or unmarried);
- Socioeconomic: schooling in completed years (0–3, 4–7, 8–11, 12 and/or more); income based on minimum wages (MW) (1 MW or less, > 1 to 5 MW, > 5 to 10 MW, > 10 MW);
- Environmental: proximity to a recreation area (yes or no); perceived neighborhood safety (yes or no);
- Health status (self-reported): hypertension, diabetes, depression, back pain; self-rated health (positive or negative); and PA (physically active: ≥ 150 min/week; or insufficiently active: < 150 min/week, taking into account the total PA, according to IPAQ data).

Outcome-related data were initially analyzed continuously and, then, dichotomized by the median for analysis of categorical variables[10]. The distribution of outcome data was asymmetric. Despite the asymmetry, data were expressed not only as median but also as mean, to facilitate the comparison with other studies[10].

The analysis of the continuous variable of TST compared means (95%CI) and medians (interquartile range), applying Student's *t*-test and the test to compare medians, respectively. Poisson regression was performed for the categorical analysis, using the dichotomized variable of TST to express prevalence, defining the group exposed to sedentary behavior as the one with values above the median[11]. A 5% significance level was adopted.

Variables with p-value ≤ 0.20 in the bivariate analysis were included in the multiple regression model, applying the stepwise forward method, and retaining those that remained associated with the dependent variable with p-value < 0.05. Gender, age, schooling, and PA variables were adjusted. Data were analyzed with Stata 12.0, which allows consideration of the effects of the complex sample (survey module).

The Research Ethics Committee of the Medical School of Universidade de São Paulo approved this project (Report no. 1,360,768), complying with the Resolution no. 466/12 of the National Health Council (NHC).

RESULTS

Among the 2,538 individuals eligible for the study, 26 did not answer the questions concerning the study outcome and were excluded. Therefore, the analysis involved 2,512 participants[12]. TST had an average of 230.7 min/day and a median of 180 min/day.

Most of the study population consisted of females, aged 30–39 years, married, with 9 to 11 years of schooling, and income between 1 and 5 MW. Most of them lived in neighborhoods considered safe and near a recreation area. Median TST values were greater among men, aged 20 to 29 years, unmarried, with 12 years of schooling or more, income higher than 12 MW, and living in a safe neighborhood. All variables mentioned presented statistically relevant difference, except for proximity to recreation area (Table 1).

Table 1. Sample description and distribution of total sitting time (min/day) according to sociodemographic variables and facilitators. Health Survey in the City of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital). São Paulo, SP.

Variables	%*	N**	Mean	95%CI	Median	(25–75)	P***
Sitting time (min/day)	100	2,512	230.7	223.2 – 238.1	180	90–326	
Gender							
Male	47.1	1,085	260.2	241.7 – 278.8	201	111–342	< 0.001
Female	52.9	1,427	233.6	220.7 – 246.6	171	77–308	
Age range							
20–29	25.0	551	309.7	284.5 – 334.8	240	120–420	< 0.001
30–39	27.1	611	245.2	224 – 266.4	197	90–334	
40–49	22.0	518	221.6	201.2 – 242.0	163	64–300	
50–59	18.0	463	206.9	189.2 – 224.7	163	86–274	
60–65	7.9	369	206.9	188.7 – 225.1	157	77–266	
Marital status							
Married	61	1,529	229.1	212.8 – 245.4	171	81–300	< 0.001
Unmarried	39	977	274.0	258.1 – 289.7	214	111–369	
Schooling[a] (years)							
0–4	14.3	456	143.4	128.6 – 158.2	120	51–187	< 0.001
5–8	16.4	455	194.8	176.3 – 213.3	154	73–266	
9–11	49.6	1,194	249.4	235.5 – 263.2	201	107–343	
12 or more	19.8	394	357.9	327.5 – 388.3	334	201–463	
Income[b]							
1 MW or less	19.7	512	216	196.5 – 235.4	163	77–274	< 0.001
> 1 to 5 MW	62.6	1,516	236.4	222.7 – 250.0	180	90–313	
> 5 to 10 MW	12.2	262	313.4	277.6 – 349.1	257	120–420	
> 10 MW	5.5	106	327.2	278.7 – 375.6	296	137–420	

Continue...

Table 1. Continuation.

Variables	%*	N**	Mean	95%CI	Median	(25–75)	P***
Neighborhood safety[δ]							
Yes	55.4	1,327	264.4	245.5 – 283.3	197	101–343	< 0.001
No	44.6	1,167	224.6	212.3 – 237.0	167	81–309	
Proximity to recreation area[δ]							
No	41.9	1,049	243.9	229.2 – 258.7	189	94–326	0.35
Yes	58.1	1,388	250.4	234.1 – 266.8	180	89–326	

95%CI: 95% confidence interval; (25–75): interquartile range; δ: missing; *weighted percentage; **number of individuals in the unweighted sample; ***K test to compare medians; [a]in years of schooling; [b]based on the current minimum wage (MW) – R$ 788.

Table 2 shows that the most frequently mentioned morbidity was back pain. Most of the population had positive self-rated health and declared being physically active. The median TST value showed a statistically significant difference regarding hypertension, back pain, and PA level.

The variables associated with sedentary behavior in the crude analysis were: gender, ethnicity, neighborhood safety, age range, marital status, schooling, income, hypertension, back pain, and PA level (Tables 3 and 4). After the adjusted analysis, the variables that remained related to sedentary behavior were: schooling, marital status, neighborhood safety, age range, income, negative self-rated health, and gender (Table 5).

DISCUSSION

In this study, the value found for sitting time (180 min/day) was the same than that of adults in Brazil in a study comparing IPAQ data on sitting time in 20 countries[13]. In that study, the lowest TST values were found in Brazil, Portugal, and Colombia (≤ 180 min/day), and the highest ones in countries such as Norway, Japan, and Saudi Arabia (≥ 360 min/day)[13].

Variations in sitting time according to location can reflect differences in socioeconomic development, culture, and environmental conditions. More developed areas tend to report a higher sitting time as a consequence of the population's higher schooling, the prevalence of sedentary occupations, more frequent use of cars, and more access to electronic entertainment and home amenities[14]. Taking this trend into consideration, we could expect higher sitting time values in this study, since São Paulo is regarded as the 11th most globalized city on the planet, rated an alpha world city[15], and ranked second in city development level. One of the explanations for this shorter sitting time compared with other developed places concerns the possible climate effects on people's behavior. Locations with milder

temperatures, such as São Paulo, favor the engagement in open air activities, which would inherently be less sedentary. Another aspect to consider in the interpretation of these data concerns to the use of self-reported measures that, according to studies, can underestimate the sitting time. For instance, a study revealed that the TST median in Portugal was 180 min/day when calculated by IPAQ and 529 to 612 min/day when assessed by an accelerometer, underestimating the sitting time by 370 min/day[14].

Accumulating evidence so far has not allowed us to confirm if the exposure to sitting time reported in this study can be harmful to health, given that a consensus is still to be reached regarding the threshold to consider sitting time as excessive.

Table 2. Sample description and distribution of total sitting time (min/day) according to self-reported health status. Health Survey in the City of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital) 2015. São Paulo, SP.

Variables	%*	N**	Mean	95%CI	Median	(25–75)	P***
Hypertension							
No	81.4	1,957	254.1	240.3 – 267.9	190	94 – 343	0.01
Yes	18.6	552	209.7	193.8 – 225.7	165	79 – 266	
Diabetes							
No	94.4	2,328	247.6	234.7 – 260.6	180	94 – 326	0.47
Yes	5.6	179	222.4	196.5 – 248.3	180	77 – 297	
Depression, anxiety		2					
No	84.6	2,096	245.7	232.2 – 259.2	180	90 – 326	0.35
Yes	15.4	412	248.4	224 – 272.8	197	90 – 314	
Back pain							
No	63.7	1,557	252.3	237.2 – 267.5	197	99 – 334	0.001
Yes	36.3	953	235.8	218.5 – 253.0	167	77 – 300	
Self-rated health							
Positive	73.5	1,781	250.1	236.2 – 264.1	188	94 – 334	0.06
Negative	26.5	725	236.27	217.2 – 255.3	175	83 – 308	
Physical activity level							
Insufficiently active	16.3	398	282	256.7 – 306.7	221	103 – 373	0.001
Physically active	83.7	2,088	239.7	226.2 – 253.2	180	90 – 316	

95%CI: 95% confidence interval; (25–75): interquartile range; *weighted percentage; **number of individuals in the unweighted sample; ***K test to compare medians; δ: missing.

Table 3. Prevalence of sedentary behavior (total sitting time — TST > 180 min/day) and prevalence ratio (PR) according to sociodemographic variables and facilitators. Health Survey in the City of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital) 2015. São Paulo, SP.

Variables	> 180 min (%)	95%CI	PR (crude)	95%CI	p
Sitting time (min/day)	52.4%	49.3 – 55.5			
Gender					
Male	55.6	51.5 – 59.6	1	1	0.006
Female	49.6	46.1 – 53.1	0.96	0.93 – 0.99	
Age range (years)					
20–29	64.5	59.4 – 69.6	1	1	< 0.001
30–39	53.3	48.5 – 58.1	0.93	0.89 – 0.97	
40–49	46	40.9 – 51.2	0.88	0.85 – 0.92	
50–59	43.8	38.0 – 49.7	0.87	0.84 – 0.91	
60–65	48.4	41.6 – 55.2	0.9	0.86 – 0.95	
Marital status					
Married	48.2	48.1 – 55.4	1	1	< 0.001
Unmarried	59.2	36.8 – 44.7	1.07	1.04 – 1.10	
Schooling (in years)					
0–4	24.8	20.4 – 29.2	1	1	< 0.001
5–8	40.9	35.7 – 46.2	1.12	1.07 – 1.19	
9–11	54.1	50.8 – 57.4	1.23	1.19 – 1.29	
12 or more	78	72.5 – 83.4	1.43	1.36 – 1.49	
Income (in minimum wages)					
1 MW or less	44.3	51.0 – 60.3	1	1	< 0.001
> 1 to 5 MW	50.7	45.9 – 52.8	1.04	1.00 – 1.08	
> 5 to 10 MW	64.3	28.0 – 43.3	1.14	1.07 – 1.20	
> 10 MW	72.7	15.6 – 39.0	1.2	1.11 – 1.29	
Neighborhood safety					
Yes	56.4	52.1 – 60.7	1	1	< 0.001
No	47.7	44.4 – 51.0	0.94	0.91 – 0.98	
Proximity to recreation area					
No	53.9	49.6 – 58.2	1	1	0.38
Yes	51.8	48.1 – 55.5	0.99	0.96 – 1.02	

95%CI: 95% confidence interval; MW: minimum wage; δ: missing.

However, regardless of the cut-off point adopted for the risk of sitting time, some general considerations can be made. A systematic review found that sitting time similar to the one in this study (> 180 min/day) was related to health outcomes, being responsible for 3.8% of all-cause mortality in the 54 countries participating in the study[16]. Sitting time of > 3 h/day was associated with adverse effects on levels of triglycerides, insulin, and abdominal circumference[17]. In both studies, sedentary behavior represented risk even to those considered physically active. Therefore, even though sitting for long periods is something almost inevitable in modern society, studies like these suggest that reducing this behavior is prudent, aiming to decrease sitting time and improve PA level[18].

Table 4. Prevalence of sedentary behavior (total sitting time — TST > 180 min/day) and prevalence ratio (PR) according to self-reported health status. Health Survey in the City of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital) 2015. São Paulo, SP.

Variables	> 180 min (%)	95%CI	PR (crude)	95%CI	p
Self-reported morbidities					
Hypertension					
No	54.1	50.7 – 57.4	1	1	< 0.001
Yes	45	40.2 – 49.8	0.94	0.91 – 0.97	
Diabetes					
No	52.7	49.5 – 55.9	1	1	0.24
Yes	47.8	39.6 – 56.0	0.97	0.92 – 1.02	
Depression, anxiety					
No	51.7	48.6 – 54.9	1	1	0.19
Yes	55.8	49.6 – 62.1	1.03	0.99 – 1.07	
Back pain					
No	54.5	51 – 58.1	1	1	0.01
Yes	48.8	44.5 – 53.0	0.96	0.94 – 0.99	
Self-rated health					
Positive	53.6	50.3 – 57.0	1	1	0.09
Negative	49.3	44.5 – 54.1	0.97	0.94 – 1.00	
Physical activity level					
Insufficiently active	57.9	52.6 – 63.2	1	1	0.02
Physically active	51.5	48.2 – 54.8	0.96	0.93 – 0.99	

95%CI: 95% confidence interval.

Table 5. Multiple Poisson regression model for exposure to sedentary behavior in adults. Health Survey in the city of São Paulo (*Inquérito de Saúde no município de São Paulo* – ISA-Capital) 2015. São Paulo, SP.

Variables	PR (crude)*	95%CI	p	PR (adjusted)**	95%CI	p
Gender			0.006			0.02
Male	1	1		1	1	
Female	0.96	0.93 – 0.99		0.96	0.94 – 0.99	0.02
Age range			< 0.001			0.002
20–29	1	1		1	1	
30–39	0.93	0.89 – 0.97		0.94	0.90 – 0.98	0.002
40–49	0.88	0.85 – 0.92		0.92	0.89 – 0.96	< 0.001
50–59	0.87	0.84 – 0.91		0.91	0.87 – 0.95	< 0.001
60–65	0.9	0.86 – 0.95		0.96	0.91 – 1.00	0.07
Marital status			< 0.001			< 0.001
Married	1	1		1	1	
Unmarried	1.07	1.04 – 1.10		1.05	1.02 – 1.08	0.001
Schooling			< 0.001			< 0.001
0–4 years	1	1		1	1	0.45
5–8 years	1.12	1.07 – 1.19		1.13	1.07 – 1.19	0.28
9–11 years	1.23	1.19 – 1.29		1.22	1.16 – 1.27	0.03
12 years or more	1.43	1.36 – 1.49		1.41	1.35 – 1.48	< 0.001
Income			< 0.001			0.008
1 MW or less	1	1		1	1	
> 1 to 5 MW	1.04	1.00 – 1.08		1.02	0.99 – 1.05	0.22
> 5 to 10 MW	1.14	1.07 – 1.20		1.06	1.00 – 1.12	0.03
> 10 MW	1.2	1.11 – 1.29		1.07	1.00 – 1.15	0.06
Neighborhood safety			< 0.001			< 0.001
Yes	1	1		1	1	
No	0.94	0.91 – 0.98		0.96	0.93 – 0.99	0.01
Self-rated health			0.09			0.01
Positive	1	1		1	1	
Negative	0.97	0.94 – 1.00		1.03	1.01 – 1.07	0.01

PR: prevalence ratio; 95%CI: 95% confidence interval; *Poisson regression; **regression model adjusted for variables with p < 0.20, remaining in the model those with p > 0.05; MW: minimum wage.

In this study, 83.7% of the population were considered physically active. In recent years, public policies have facilitated access to active transportation and PA practice without costs in public spaces of the city[19]. Such measures can contribute to increasing the population's PA level; nevertheless, it is important to consider that a higher PA level does not always come with the desired reduction in sedentary behavior. It is possible that a person reaches the recommended PA level and, nonetheless, be exposed to sedentary behavior. Recent evidence has indicated the need for public health policies that encourage not only a higher PA level but also a lower sitting time[20]. Health policies aimed at reducing sitting time have the potential to decrease all-cause mortality, cardiovascular diseases, type 2 diabetes, and metabolic syndrome, being able to increase 0.23 year, on average, in the individual's life expectancy[16].

The relationship between chronic diseases and sedentary behavior among adults in Brazil still needs to be explored. This study intended to assess some aspects of this connection in its population. The crude analysis revealed the association of hypertension and back pain with exposure to sedentary behavior; however, this relationship did not persist in the adjusted analysis. This finding is not consistent with current literature, which indicates strong evidence of an association between sitting time and many health outcomes[14]. One of the factors that could explain the results found of this study is the low mean age of the participants – 39.9 years. In this age range, in addition to the prevalence of chronic diseases included in the study being relatively low, the possible adverse effects of sitting time can still be in their latent phase. We also underline that researches using self-reported morbidity present as a limitation, apart from reverse causality, non-differential information bias, which usually tends to underestimate the actual strength of the association between sedentary behavior and health outcomes[14].

Still aiming at assessing the relationship between sedentary behavior and health status, this study examined self-rated health. The way an individual perceives their health status has been indicated as a strong predictor of morbidities and mortality, besides reflecting psychosocial and behavioral aspects[21]. Positive self-rated health can influence the choice of healthier behaviors, among them the adoption of a more active lifestyle. This study found an association between negative self-rated health and exposure to sedentary behavior.

In this study, the TST report varied according to gender. Namely, men were more exposed to sedentary behavior than women. Studies in Brazil[10,23] and other countries[22] found the same results. This finding can be explained by women's double burden, as such an accumulation of roles due to housework and formal work can reduce the time available for sedentary activities. An interesting point to consider, consistent with the idea of sedentary behavior as a phenomenon distinct from physical inactivity, is that differences in sitting time according to gender show that men are, at the same time, more physically active and more exposed to sedentary behavior than women[24].

Regarding age, young people (20-29 years) are more exposed to sedentary behavior than those in the age range of 60-65 years, as seen in Brazil[10] and other countries[13]. This result can reflect greater access of young people to advanced technology for entertainment,

communication, work, and passive transportation, in addition to a possible accumulation of work and study activities, which contribute to a longer sitting time during the day.

In our study, married people spend less time sitting than those unmarried. These findings may suggest that marriage works as a protective factor against non-healthy behaviors. It is also possible that a shorter sitting time among couples be connected to the condition of having or not having dependent children. Investigations found that having younger children at home was a protective factor against a long screen time[25]. Taking care of younger children can reduce opportunities to sit down and increase participation in light physical activity.

Schooling was positively related to TST in this study. Other papers also found a positive association between schooling and sitting time[26], as well as physical activity[24]. Namely, individuals with higher schooling are among the most exposed to sedentary behavior and the most physically active ones. A feasible explanation is that individuals with higher schooling are more involved in sedentary occupations, which are less physically demanding. Furthermore, they often engage in intellectual activities that naturally take place in the sitting position. Also, individuals with higher schooling tend to compensate for the longer sitting time at work, choosing non-sedentary activities during their leisure time. However, it is important to warn this population that the time spent practicing physical activity might not make up for the harmful effects of excessive sitting time to which they are exposed.

Still concerning socioeconomic factors, this study found an association between sedentary behavior and income. Specifically, individuals with higher income report longer TST, corroborating findings of other studies[22]. Differences verified among population groups with distinctive socioeconomic status could be based on iniquities existent among these groups, and not on healthier decisions from people with lower income. With respect to these iniquities, we can speculate that those with higher income have more access to technology and amenities, favoring the increase of sitting time at home, at work, and in transportation. However, at the same time, individuals with higher income have more access to leisure physical activities. Individuals with high income, then, seem to be more exposed to mechanisms that promote both the practice of physical activity and adoption of the sitting position.

This study also addressed the environmental aspect, which has been investigated in other countries. Issues such as neighborhood safety and access to recreation areas can work as barriers or facilitators to sedentary behaviour[27]. In this study, as well as in an investigation in Germany[27], neighborhood safety was positively related to sedentary behavior, as adults who live in safe neighborhoods reported longer TST. This unexpected finding can be a consequence of selection bias, in which people who live in safer neighborhoods are also those with higher schooling and income, factors positively associated with sitting time.

Finally, it is noteworthy that the profile of adults more vulnerable to sedentary behavior found here was similar to the that of adults more physically active (men, young people, with higher schooling and income) in a study that used data from the previous version of the survey ISA-Capital 2008[24]. These data corroborate findings of independence between both constructs and suggest that a person can be, at the same time, active and exposed to sedentary behavior. Bearing in mind that the literature presents scientific evidence of the

negatives effects of exposure to sedentary behavior on the population's health and that the protective factor of the recommended MVPA might not compensate these effects, we emphasize the importance of investing not only in improving physical activity level but also in reducing sitting time[28].

This study presents limitations because of its cross-sectional design, which prevents the identification of the direction of the association. Another issue is that IPAQ does not allow us to evaluate the different domains of sedentary behavior or the way this time is accumulated, limiting the interpretation and application of some data. Another limitation concerns self-report instruments, which, overall, underestimate the data on sitting time and morbidities but are often used in epidemiological studies given their feasibility, good cost-effectiveness ratio, and ability to collect data from large population groups[29].

The advantages of this study also include a greater possibility of comparison with other researches, since IPAQ is one of the most used instruments in the world in estimating sitting time, in addition to the large sample size, which allows robust estimates among the variables of interest.

Future studies in the field should better investigate the way sitting time is accumulated (in long uninterrupted periods or short interrupted intervals), which is attainable with direct measurements. Besides, they must assess other contexts of sedentary behavior, such as in transportation, at school, work, and home, given that each one of them can present different epidemiological patterns. Studies on sedentary behavior in Brazil have recently increased and are a promising area of research, aiming at better identifying and controlling this emerging health risk factor. Identifying factors related to sedentary behavior is an important step in this direction. Another relevant step is developing prospective studies to assess the direction of these associations better.

CONCLUSION

Based on the findings to our sample, the most vulnerable adults to sedentary behavior are younger men, with higher schooling and income, negative self-rated health, unmarried, and living in neighborhoods considered safe. Having identified the most vulnerable segments to sedentary behavior, we hope to contribute to the assessment and elaboration of control measures for this behavior in our population, following the example of other countries.

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