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Journal of Sport and Health Science 8 (2019) 32–38
www.jshs.org.cn

Original article

The descriptive epidemiology of sitting in Chilean adults: Results from the National Health Survey 2009–2010

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Received 11 November 2016; revised 20 April 2017; accepted 24 May 2017
Available online 23 August 2017

Abstract

Background: Although evidence on the health effects of sedentary behavior (SB) has grown systematically in recent years, few developing countries have reported population levels of SB, especially in South America. Our objective was to describe time spent sitting in a representative sample from Chile categorized by age, gender, educational level, and body mass index (BMI).
Methods: A national health survey was conducted in Chile in a nationally representative sample ($n = 5411$) in 2009–2010. Sitting time (ST) was measured with the Global Physical Activity Questionnaire Version 2.
Results: Data were from 5031 participants (43.26 ± 0.41 years, mean ± SE; 40.3% male). Overall, there were no gender differences in mean ST (men: 158.10 ± 5.80 min/day, women 143.45 ± 4.77 min/day; $p = 0.05$). ST was lower in those who lived in rural areas compared with urban areas (99.4 min/day *vs.* 160.0 min/day; $p = 0.001$). ST increased significantly with increasing BMI, but only in men ($p = 0.009$), and was positively related to years of education in both men and women ($p < 0.0001$).
Conclusion: The findings were different from those reported in other countries and contexts, reinforcing the need for international surveillance and monitoring over time to inform policy makers. Differences in ST across different groups emphasize the need to develop tailored messages and interventions for reducing ST in different population subgroups.

Keywords: Ageing; Health behavior; Health inequalities; Lying; Preventive medicine; Reclining; Screen time; Surveillance

1. Introduction

Large amounts of time spent in sedentary behavior (SB), defined as activities during waking hours with an energy expenditure of <1.5 metabolic equivalent of tasks (METs) while sitting or lying down,[1] are associated with risk factors for cardiovascular disease[2–4] and sleep disorders,[5] and with higher risk of cancer,[6] cardiovascular disease,[6,7] and all-cause mortality.[7,8] Although evidence on the health effects of SB has grown exponentially in recent years, few developing countries have reported population levels of SB. This point is important because monitoring SB in many contexts may provide a better understanding of the influences of social and economic development or transitions in SB to target populations at risk. This understanding will aid in the design of preventative strategies through international comparison and collaboration.

Researchers have reported differences in SB in different countries.[9] Most of the evidence in SB has been derived from self-report measures of total sitting time (ST). Many studies have used the single question about ST from the International Physical Activity Questionnaire (IPAQ). This question has shown good reliability and acceptable validity against accelerometers.[10] The Global Physical Activity Questionnaire (GPAQ) Version 2 also includes a question for assessing SB, which asks for the total

Peer review under responsibility of Shanghai University of Sport.
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https://doi.org/10.1016/j.jshs.2017.08.002
2095-2546/© Cite this article: Aguilar-Farias N, Martino-Fuentealba P, Cortinez-O'Ryan A, Chandia-Poblete D, Celis-Morales CA, Bahamondes P, et al. The descriptive epidemiology of sitting in Chilean adults: Results from the National Health Survey 2009-2010. *J Sport Health Sci* 2019;8:32–8. (http://creativecommons.org/licenses/by-nc-nd/4.0/)

time spent sitting or lying on a normal day.[11,12] The GPAQ question for SB differs slightly from the one in the IPAQ, as the last one includes only sitting, and has been used in countries such as South Africa[13] and Czech Republic.[14]

To the best of our knowledge, of the 12 countries in South America, only Argentina, Brazil, Colombia, Paraguay, and Uruguay have collected population-level SB data.[15–18] Bauman et al.[9] have reported that Colombia and Brazil are among those countries with the lowest daily ST (median 180 min/day), while Argentina has ST similar to that in European countries (median 300 min/day). In order to better understand the differences in ST in South America, there is a need for more data on both physical activity (PA) and SB levels in more South American countries. South American countries are experiencing different stages of economic development and face different and increasing levels of the burden of disease, while South America remains as one of the most economically unequal regions in the world.[19] Therefore, surveillance data from different areas of this region will improve tracking and help to anticipate trends in health behaviors (i.e., SB) that may involve increased risk for non-communicable diseases. For these reasons, the aim of this study was to describe subjectively measured daily ST in a representative sample of Chilean adults using data from the National Health Survey 2009–2010 (ENS2010).

2. Methods

2.1. Participants

In 2009–2010, a national health survey was conducted in Chile using a nationally representative sample ($n = 5411$). Complex random stratified sampling was conducted for each of the regions in the country by gender, age, socioeconomic status, residence type (urban or rural), and regional population distribution based on National Census data. Participants were contacted in their homes and were visited twice by trained nurses, first for collection of demographic data in the initial visit and then for collection of biological samples for laboratory tests in the second contact. The response rate from the eligible population was 85%. All procedures performed in this study involving human participants were in accordance with the ethical standards of the Research Ethics Committee of the School of Medicine, Pontificia Universidad Catolica de Chile and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

2.2. Procedures

Sample characteristics were derived from the ENS2010 questionnaire, which included questions about age, educational level, and cardiovascular risk. For the current study, those participants younger than 18 ($n = 225$) and with missing values for GPAQ ($n = 155$) were excluded. Age was self-reported and then recoded as 18–29, 30–39, 40–49, 50–59, 60–69, and 70+ years to facilitate comparisons across countries. Height and weight were measured with a stadiometer and scale, respectively, and used to calculate body mass index (BMI), which was categorized as underweight ($<18.5\ kg/m^2$), normal ($18.5–24.9\ kg/m^2$), overweight ($25.0–29.9\ kg/m^2$), and obese (Class I obesity: $30.0–34.9\ kg/m^2$, Class II obesity: $35.0–39.9\ kg/m^2$, Class III obesity: $\geq 40.0\ kg/m^2$). Waist circumference was measured just above the iliac crest to the nearest 1 mm using a steel measuring tape. Abdominal obesity was defined as a waist circumference >88 cm in women and >102 cm in men.[20] To determine educational level, participants were asked to report years of education, which was categorized as low (<8 years), medium (8–12 years), or high (>12 years). Cardiovascular risk was determined with the Framingham risk calculator.[21] PA levels were measured with the GPAQ which includes 16 questions.[11] Total PA in METs was derived from 3 different settings or domains (activity at work, travel to and from places, and recreational activities) and then classified into low (<600 min/week), moderate (600–2999 min/week), high (≥3000 min/week) PA levels according to standard procedures.[22]

A single question from the GPAQ was used to measure SB. This question in Chile has shown fair validity as was similarly reported in other countries ($r = 0.23–0.26$).[23,24] The GPAQ was conducted via face-to-face interview and included the following preamble for measuring ST as an open question: "The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, travelling in car, bus, or train, reading, playing cards or watching television, but do not include time spent sleeping." The single question was: "How much time do you usually spend sitting or lying (reclining) on a normal day?"

2.3. Statistical analysis

Survey data settings in Stata, Version 12 (StataCorp., College Station, TX, USA) were used in order to consider the weighting for each observation and the complex survey design (strata) of the ENS2010. Due to its skewed distribution, and following the recommendations from the National Health and Nutrition Examination Survey (NHANES) from the USA,[25] ST was transformed for each participant using the natural logarithm. Geometric means were calculated from this log-transformed sitting variable to be reported in tables and figures. The log-transformed value was used in comparison analyses. Logistic regressions were used to assess differences in ST between groups. Analyses were performed to test whether an ordered relationship (trend) across the categories and ST was observed in this sample for a combination of different groups: (1) age and gender; (2) gender, BMI, and educational level; (3) age, gender, and educational level; and (4) age, gender, and BMI. All models were adjusted for age group, gender, PA level, educational level, nutritional level, and abdominal obesity, Framingham cardiovascular risk, and residence type (urban or rural). Significance level was set at $p < 0.05$.

3. Results

In total, 5031 participants (age: 43.30 ± 0.41 years, mean ± SE; 40.3% male) were included in the study. Sample characteristics are displayed in Table 1. There were some gender differences in these characteristics. For example, the men were more

Table 1
Characteristics of the sample included in the study. National Health Survey 2009–2010, Chile.

	Total sample ($n=5031$)	Men ($n=2027$)	Women ($n=3004$)	p
Age (year) (mean ± SE)	43.30 ± 0.41	42.60 ± 0.64	43.90 ± 0.52	0.13
Residence type (%)				
Urban	84.4	85.4	84.8	0.37
BMI (%)				
Underweight	1.3	0.6	1.8	<0.001
Normal	27.8	27.6	27.9	
Overweight	41.0	47.6	36.5	
Class I obesity	19.3	19.6	22.3	
Class II obesity	7.8	2.8	8.0	
Class III obesity	2.8	1.8	3.5	
Abdominal obesity (%)[a]	37.1	21.9	51.3	<0.001
Educational level (%)				
Low (<8 years)	19.6	17.5	21.5	0.16
Medium (8–12 years)	54.3	56.2	52.6	
High (>12 years)	26.1	26.3	25.9	
Framingham CV risk (%)				
Low	90.7	83.5	97.4	<0.001
Moderate	7.5	12.9	2.5	
High	1.4	2.8	0.1	
Very high	0.4	0.8	–	
GPAQ physical activity level (%)				
Low	27.6	23.2	31.6	<0.001
Moderate	19.9	16.9	22.6	
High	52.5	59.9	45.8	
GPAQ sitting time (min/day)				
Geometric mean	150.40	158.10	143.50	0.05
SE	3.65	5.80	4.77	
95%CI	143.4–157.7	147.1–169.9	134.4–153.1	
Median	150	180	150	
IQR	75–285	90–300	70–241	

[a] Abdominal obesity was defined as waist circumference >88 cm for women and >102 cm for men.
Abbreviations: BMI = body mass index; CI = confidence interval; CV = cardiovascular; GPAQ = Global Physical Activity Questionnaire; IQR = interquartile range.

likely to be overweight and the women to be obese ($p < 0.001$). More men had moderate or high Framingham risk scores ($p < 0.001$), but more women had low levels of PA ($p < 0.001$).

3.1. Differences by gender and age

When comparing self-reported ST in men and women at different ages, no significant differences were observed between genders (Fig. 1). There was a trend for mean ST to decrease with increasing age for women ($p = 0.044$) until age 50–59 (50–59 years: 125.15 ± 7.44 min/day; 60–69 years: 128.74 ± 11.89 min/day; mean ± SE), but ST was much higher in the oldest group of women (≥70 years: 158.00 ± 24.47 min/day, mean ± SE).

3.2. Differences by residence type

Table 2 shows ST according to different subgroups by residence type. ST was higher in participants who lived in urban areas rather than those in rural areas (160.0 min/day *vs.* 99.4 min/day; $p = 0.001$).

In urban areas, ST was higher in men than women ($p < 0.001$) and for participants with high ($p < 0.001$) and medium

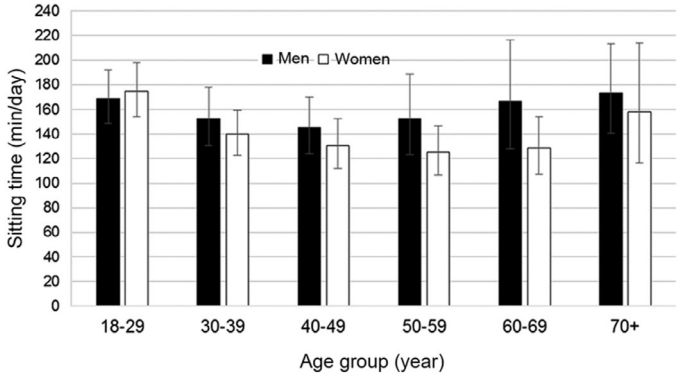

Fig. 1. Geometric mean (min/day)% ± 95% confidence interval self-reported sitting time for each age group stratified by gender. National Health Survey 2009–2010, Chile.

($p = 0.003$) educational levels *vs.* low education levels. ST was lower in those aged 30–59 years when compared with the oldest group (all $p \leq 0.007$) and for participants who reported moderate and high PA levels ($p < 0.001$).

For those living in rural areas, ST was higher for those with high cardiovascular risk than for those with low cardiovascular risk ($p = 0.002$) and for those who were underweight *vs.* normal weight ($p = 0.03$). ST was lower for those aged 50–59 years when compared to the oldest group ($p = 0.04$) and was lower for those participants with high ($p = 0.002$) or moderate ($p = 0.01$) levels of PA versus low levels of PA.

3.3. Differences by gender and PA levels

Mean ST decreased with increasing PA level ($p < 0.001$) in the total sample (Table 2). ST was lower in women than in men with moderate PA levels (129.73 ± 9.67 min/day *vs.* 172.79 ± 12.55 min/day, mean ± SE; $p < 0.001$) and high PA levels (127.82 ± 6.59 min/day *vs.* 144.25 ± 6.52 min/day, mean ± SE; $p < 0.001$).

3.4. Differences by gender and BMI

Differences in ST by BMI were observed only when stratifying ST by gender (Fig. 2A). ST was lower in women than in men in the overweight (130.43 ± 7.91 min/day *vs.* 170.18 ± 8.59 min/day, mean ± SE; $p = 0.001$) and obese (136.13 ± 8.59 min/day *vs.* 168.21 ± 11.21 min/day, mean ± SE; $p = 0.02$) categories. In men, the overall trend showed that ST increased with increasing BMI ($p = 0.043$) despite underweight participants reported higher ST than other groups, while ST decreased with increasing BMI in women ($p = 0.019$).

3.5. Differences by gender and educational level

When stratifying ST by gender and educational level (Fig. 2B), no differences were found between men and women, but ST increased with increasing years of education in both groups ($p < 0.0001$). In addition, when including a comparison of ST by years of education and gender across age categories (18–39, 40–59, and ≥60 years), participants with higher

Table 2
Sitting time across different categories in the total sample according to residence type ($n = 5031$). National Health Survey 2009–2010, Chile.

	Total			Urban			Rural		
	Mean ST	95%CI	*p*	Mean ST	95%CI	*p*	Mean ST	95%CI	*p*
Overall	150.4	143.4–157.7	–	160.0	152.0–168.3	–	99.4	88.7–111.4	–
Gender									
Women	**143.5**	**134.4–153.1**	**<0.001**	**150.9**	**140.5–162.1**	**<0.001**	101.5	83.5–123.5	0.54
Men	158.1	147.1–169.9	Ref	170.3	158.0–183.5	Ref	97.2	77.0–122.7	Ref
Age (year)									
18–29	171.8	157.2–187.9	0.94	185.8	170.0–202.9	0.78	93.0	67.9–127.2	0.77
30–39	**146.6**	**132.3–162.3**	**0.005**	**154.7**	**138.4–172.8**	**0.007**	95.4	72.3–125.9	0.27
40–49	**136.7**	**122.6–152.4**	**<0.001**	**138.8**	**122.9–156.7**	**<0.001**	123.0	98.9–152.9	0.94
50–59	**137.9**	**120.9–157.3**	**<0.001**	**149.4**	**129.2–172.8**	**<0.001**	**88.2**	**69.4–112.0**	**0.04**
60–69	**145.4**	**124.3–169.9**	**0.001**	**162.8**	**140.6–188.4**	**0.001**	79.1	49.7–125.9	0.44
70–79	164.4	135.3–199.9	Ref	171.7	136.1–216.7	Ref	133.3	105.0–169.3	Ref
PA level									
Low	183.2	165.8–202.4	Ref	195.8	176.9–216.8	Ref	116.8	83.9–162.6	Ref
Moderate	**145.8**	**131.3–162.0**	**<0.001**	**148.6**	**132.7–166.5**	**<0.001**	**118.8**	**94.7–149.1**	**0.01**
High	**136.6**	**127.9–145.9**	**<0.001**	**147.0**	**136.9–157.9**	**<0.001**	**88.2**	**72.0–108.1**	**0.002**
Educational level									
Low	123.8	111.6–137.4	Ref	136.1	121.1–153.0	Ref	98.3	80.8–119.5	Ref
Medium	**142.3**	**133.0–152.1**	**0.007**	**149.2**	**138.7–160.5**	**0.003**	100.1	86.4–116.0	0.60
High	**195.1**	**179.2–212.6**	**<0.001**	**199.0**	**182.5–217.0**	**<0.001**	108.7	70.9–166.6	0.70
BMI									
Underweight	183.4	138.3–243.2	0.61	181.7	135.6–243.5	0.89	**235.2**	**170.7–324.1**	**0.03**
Normal	151.4	138.2–165.9	Ref	160.7	146.1–176.8	Ref	94.1	73.8–119.9	Ref
Overweight	151.8	139.0–165.7	0.34	160.9	146.3–177.0	0.26	101.2	83.7–122.3	0.78
Class I obesity	146.8	132.4–162.9	0.45	158.3	142.2–176.2	0.42	101.2	78.2–130.9	0.85
Class II obesity	136.4	102.4–181.9	0.88	139.9	101.5–192.9	0.75	112.4	80.2–157.5	0.54
Class III obesity	176.2	127.2–244.1	0.16	177.6	124.5–253.3	0.35	162.8	110.8–239.1	0.13
Abdominal obesity									
Yes	152.8	140.5–166.1	0.07	164.3	150.3–179.6	0.07	99.5	86.1–115.0	0.80
No	148.9	140.5–157.9	Ref	157.5	148.0–167.6	Ref	99.2	81.9–120.3	Ref
CV risk									
Low	158.9	148.4–170.2	Ref	168.5	156.3–181.6	Ref	102.7	89.4–118.0	Ref
Moderate	132.8	122.8–143.6	0.14	141.1	130.0–153.1	0.06	90.0	72.9–111.1	0.55
Moderately high	173.1	139.6–214.5	0.86	188.8	149.4–238.7	0.96	100.1	77.5–129.2	0.61
High	**150.8**	**129.5–175.7**	**0.03**	160.5	136.9–188.0	0.33	107.5	**70.7–163.3**	**0.002**
Very high	228.0	172.2–301.8	0.20	236.5	175.6–318.7	0.29	159.1	96.8–261.6	0.50

Notes: All models were adjusted for age group, gender, PA level, educational level, nutritional level, abdominal obesity, Framingham cardiovascular risk, and residence type (urban or rural). Significantly different estimates from the reference for each category in bold.
Abbreviations: CI = confidence interval; CV = cardiovascular; PA = physical activity; Ref = reference; ST = sitting time.

educational levels reported more ST for all combinations, except for women in the oldest age category (≥70 years) ($p = 0.83$).

3.6. Differences by age, gender, and BMI

Mean times spent sitting stratified by gender and BMI across age categories (18–39, 40–59, and ≥60 years) are shown in Fig. 3. No significant differences in ST between genders were observed for those aged 18–39 years (Fig. 3A). In this age group, ST increased with increasing BMI (except in underweight), but only in men ($p = 0.009$). In the 40–59 years category, ST was higher in men (171.00 ± 28.07 min/day) than in women (58.87 ± 24.02 min/day) ($p = 0.016$) in the underweight category, but no trends across BMI categories were observed in either men ($p = 0.67$) or women ($p = 0.67$) (Fig. 3B). In those aged 60 years or older, there were significant differences between men and women in the overweight (184.10 ± 18.79 min/day *vs.* 126.60 ± 11.91 min/day; $p = 0.007$) category (Fig. 3C). When independently analyzing ST in morbidly obese participants, no differences were observed between women (185.59 ± 28.94 min/day) and men (114.63 ± 42.24 min/day) ($p = 0.05$). In the oldest category, however, these figures were the highest among combinations of categories. Overall, no differences in ST were observed between participants with and without abdominal obesity ($p = 0.33$) or on those in different categories of cardiovascular risk ($p = 0.64$) when classifying by gender and age categories.

4. Discussion

Overall, the findings presented here suggest that Chilean adults report lower overall ST (150.4 min/day, 95% confidence interval (CI): 143.4–157.7 min/day) than adults who responded to the GPAQ in Paraguay (264.5 min/day, 95%CI: 255.2–273.9 min/day)[17] and Santander, Colombia (260.4 min/day, 95%CI: 247.8–273.6 min/day).[16] Also, ST was lower among Chilean adults than among those adults who responded to a similar question in Brazil (median = 180 min/day,

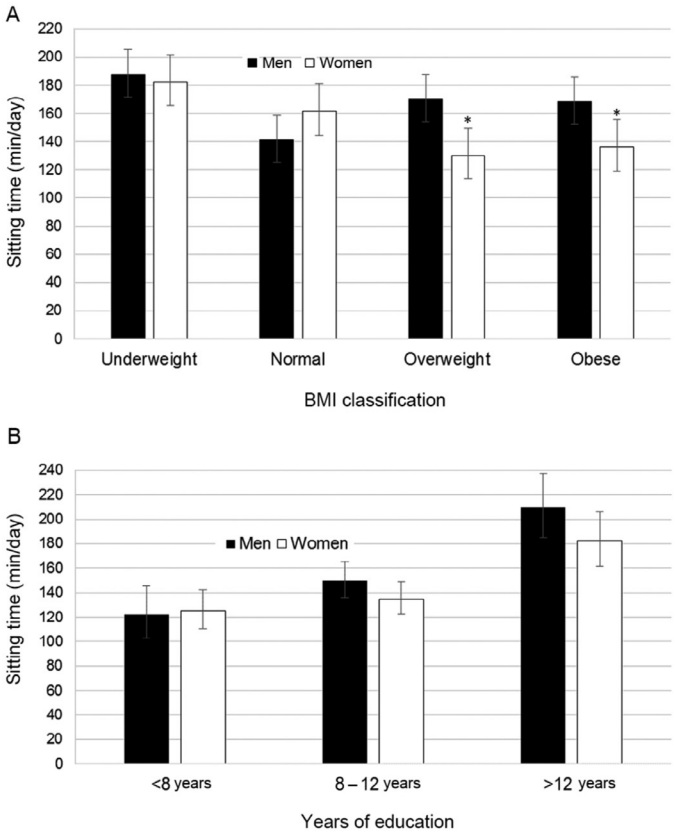

Fig. 2. Geometric mean (min/day) ± 95% confidence interval self-reported sitting time stratified by (A) gender and BMI and (B) gender and educational level. National Health Survey 2009–2010, Chile. * $p < 0.05$, significant difference between gender. BMI = body mass index.

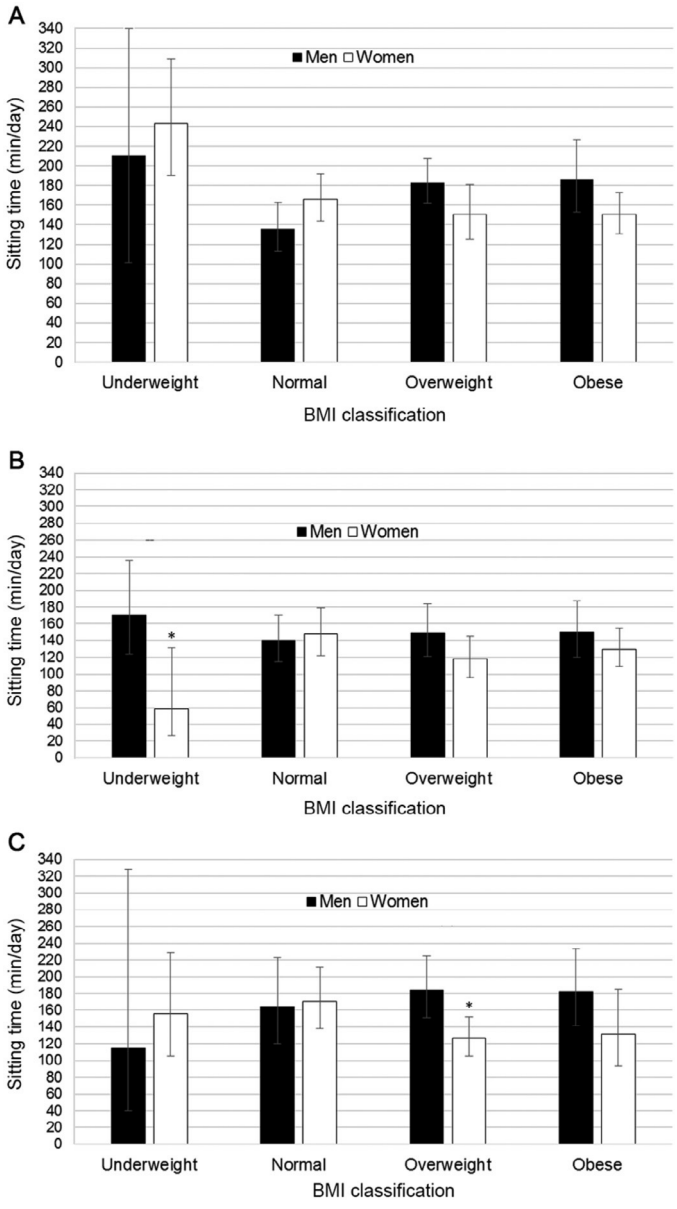

Fig. 3. Geometric mean (min/day) ± 95% confidence interval self-reported sitting time stratified by gender and BMI across the age categories (A) 18–39 years old group; (B) 40–59 years old group; and (C) 60 years old and more group. National Health Survey 2009–2010, Chile. * $p < 0.05$, significant difference between gender. BMI = body mass index.

interquartile range (IQR) 120–270 min/day)[9] and among the non-Mexican Hispanic population in the USA (males 235 min/day, 95%CI: 201–275 min/day; females 227 min/day, 95%CI: 209–245 min/day).[26] When comparing Chilean data with other regions, this survey confirms that ST is lower in Chile (150.4 min/day) than among a sample of women in South Africa (median = 180 min/day),[13] a sample of Malayan adults (median = 360 min/day),[27] and a sample of Czech adults aged 20–64 years (mean range 308–343 min/day).[28]

Notwithstanding Chileans' somewhat lower levels of ST, the findings of this study are important in that they show positive associations between ST and BMI in men and between ST and educational levels in both men and women.

While some European countries have reported differences in ST by gender,[28,29] the present study showed no differences in ST between female and male participants in different age groups (Fig. 1). The GPAQ study of the Czech population conducted in 2011 also found no overall differences in ST between genders,[14] but this is in marked contrast to the findings from NHANES 2003–2006, which reported higher ST in women, especially in older age.[30] In the sample from NHANES 2003–2006, Mexican-American men reported lower ST than non-Hispanic whites across all age groups, while Mexican-American women followed a similar distribution except for the 70+ age category, where a large increase in ST was observed, and those values were higher than for non-Hispanic whites. In contrast with the NHANES data, the current study showed a trend for decreased ST with increasing age for women up to 70 years of age ($p = 0.044$).

Similar to another study conducted in Mexico,[31] urbanicity was associated with increased ST in the overall population, which supports the notion that urbanization in Latin America is associated with activities that require lower energy expenditure. Chile started a rapid transition from rural life to urban life at the end of the 1970s and began rapid economic development in the 1980s,[32,33] which may reflect current changes in the health status and behaviors not only of those who experienced the transition but also in younger generations, as shown in our data.[19] In this study, living in

a rural area was not only associated with lower ST but also with a lack of difference in ST when compared across gender, age groups, and educational levels. Thus, other countries in this region facing similar transitions in coming years may anticipate an increase not only in ST but also in physical inactivity, obesity, and non-communicable diseases, especially in urban settings.

Relationships between ST and BMI categories were somewhat different from those reported by researchers in the USA[26] and Sweden.[34] Women from the United States reported more ST as their BMI increased, while in Sweden no differences were found to be associated with BMI for both male and female adults. ST was found to be associated with BMI in Chilean men mainly in the youngest and oldest age groups. Larger differences in ST were also associated with gender as BMI increased in the Chilean population. Differences in these relationships reinforce the need for studies across countries because these findings suggest that ST varies according to the demographic, cultural, religious, and health characteristics of various countries.[35,36] Such comparisons may be improved through standardized measurement and data processing systems, as well as through the use of objective measurement methods, as suggested by a transnational study conducted in Europe.[37]

Our observation that ST was positively associated with educational level is similar to findings from countries in different continents and with different levels of development.[9,26,29,36] These findings may reflect the fact that occupations that require lower educational levels tend to involve less ST and higher energy expenditure than those largely desk-based occupations that require higher educational levels.[38,39] An exception in our study was the lack of difference of ST in women older than 60 when compared across different educational levels, which provides relevant support for developing strategies to reduce ST in this target group independently of their years of education. This exception may be explained by the role of women in this society after retirement, when older women with different educational backgrounds may tend to conduct activities or maintain social interactions in a similar fashion (i.e., taking care of grandchildren). Similarly, the decreasing ST among women as age increases until the age of 50 may be explained by the role that most women play while taking care of their family members and homes, involving activities that may reduce ST at this stage of life. For example, only 15% of women older than 60 participated in the workforce, compared with 43% of men.[40] This may explain differences observed in educational levels of men and its relationship to occupation types. However, more research is needed to confirm these findings.

Some limitations of this research should be acknowledged. Data on ST were obtained from a self-report survey (GPAQ) with a single-item question.[23] It is well known that self-report methods are subject to recall bias and social acceptability;[41] therefore, measurement error, especially underreporting,[42,43] may be expected to occur when applying this instrument because its validity is low compared to an accelerometer.[23] However, self-report methods are more practical for population surveillance, as they have lower costs and lower burdens for participants than objective methods such as accelerometry. In terms of the associations reported here, the cross-sectional design means that causality cannot be determined, especially in those cases where trends were observed in ST according to gender, BMI, and educational level. It is, for example, likely that as weight increases, ST increases, rather than the reverse.

Despite these limitations, this study included a large and representative sample of participants from each Chilean region according to gender, age, socioeconomic status, and residence type (urban or rural). However, the total sample was apparently healthy, since about 90% of the participants showed low cardiovascular risk. Thus, it is likely that the 15% of the eligible population who rejected participation would have increased the percentage having cardiovascular risk, but the complex sampling method used in this study was designed and implemented to reduce this bias.

5. Conclusion

This is the first national survey to consider ST in Chile. The results show somewhat lower ST than in other South American countries, while showing significant differences across gender, age groups, residence type, educational level, and BMI. These findings reinforce the need for national surveillance and international monitoring over time to better understand contextual and developmental differences across countries. Because Latin American countries are at different stages of development, PA and SB monitoring will provide increased understanding of the potential health burden each country may face in the future. In the meantime, the inequalities in ST across different demographic subgroups reported in this study emphasize the need to develop targeted and tailored messages and interventions for reducing ST in Chilean adults.

Acknowledgments

The authors would like to thank the participants for the time given to this study and especially health professionals from Pontificia Universidad Catolica de Chile involved in the development and data collection of the National Health Survey. The study was funded by the Ministry of Health, Chile. NAF was supported by the Direccion de Cooperacion Internacional (26/2016), Universidad de La Frontera. PMF was supported by the Direccion de Investigacion, Universidad de La Frontera (DIUFRO16-0110).

Authors' contributions

NAF conceived of the manuscript, analyzed and interpreted data, summarized findings, drafted and critically reviewed the manuscript; PMF conceived of the manuscript, interpreted data, summarized findings, and critically reviewed the manuscript; ACO interpreted data, summarized findings, and critically reviewed the manuscript; DCP interpreted data, summarized findings, and critically reviewed the manuscript; CACM interpreted data, summarized findings, and critically reviewed the manuscript; PB critically reviewed the manuscript; JLZ critically reviewed the manuscript; WJB interpreted data, summarized findings, and critically reviewed the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

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