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EXCESSIVE TV VIEWING TIME AND ASSOCIATED FACTORS IN BRAZILIAN ADOLESCENTS FROM A RURAL AREA

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ABSTRACT
Purpose. Sedentary behavior has been identified as a risk factor for chronic non-communicable diseases. This study identified the prevalence of excessive TV viewing time during the week and weekend and associated factors in adolescents living in a small urban and rural area. **Methods.** A cross-sectional study involving 283 students (aged 10–19 years) from Brazil was conducted in 2010. Data on TV viewing time and sociodemographic information were collected by questionnaires, cardiorespiratory fitness was evaluated by the 20-m shuttle run test, and anthropometric characteristics were obtained by measuring waist circumference and skinfold thickness. Statistical analysis involved binary logistic regression. **Results.** The prevalence of excessive TV viewing time (≥ 2 h) was 76.7% during on weekdays and 78.4% on the weekend. Adolescents aged 10–12 years (OR = 6.20; 95% CI = 2.91, 13.19; $p < 0.001$) and 13–15 years (OR = 2.57; 95% CI = 1.28, 5.18; $p = 0.008$) were more exposed to excessive TV viewing time during the week. No associations were found for excessive TV viewing time on the weekend. **Conclusions.** Approximately 8 in 10 adolescents presented excessive TV viewing time; excessive TV viewing time during the week was associated with age.

Key words: sedentary lifestyle, television, behavior, school health

Introduction

The time spent watching television (TV) has been used as an indicator of sedentary behavior in adolescents [1]. Studies conducted in different countries have indicated the presence of excessive TV viewing time (more than 2 h per day) in most children and adolescents, i.e. 80% of adolescents (aged 11–14 years) in Bulgaria [2] and 94% of young people (aged 9–16 years) in Australia [3]. In Brazil, a systematic review revealed the prevalence of excessive TV viewing time ranging from 11.3% to 79.5% [4]. In addition, some studies have differentiated TV viewing time during the week and on the weekend [5, 6].

This situation is a matter of concern since watching TV is related to metabolic risk factors among adolescents including excess weight gain [7], hypertension [8], excess abdominal fat [9], metabolic syndrome [10], low cardiorespiratory fitness, and high cigarette consumption in adulthood [11]. According to the World Health Organization [12], young individuals who watch TV more than 2 h per day show high consumption of high-calorie foods and soft drinks and low intake of fruits and vegetables. In addition, energy expenditure is below recommended levels for this age group.

In addition to these risk factors related to physical health, excessive TV viewing time is also associated with sociodemographic factors such as income, parent educational level, and socioeconomic status [13]. However, the direction of these associations can differ, even between regions/cities of the same country [9, 14]. Other sociodemographic variables such as sex, age, housing area, work situation, and period under study have also been associated with excessive TV viewing time, with the latter factor related to differences observed between measurements during the weekday and weekend [5]. Regarding sex, various national studies [5, 14] highlighted the relationship between excessive TV and screen viewing time (computer and video games) in boys, while others [4] showed no evidence of such an association. A systematic review of the available data [4] indicated that the pattern of sex differences can change according to the cutoff points adopted to define sedentary behavior. In regards to age, national [9] and international studies [15, 16] showed a trend in which younger individuals show longer TV viewing time.

Although the prevalence of sedentary behavior and associated factors have been widely discussed, there is a lack of research on this subject involving adolescents from small towns/cities with rural characteristics – regions with a low Human Development Index (HDI) [5] – where important differences in infrastructure and technology are observed when compared with larger urban centers. Knowledge of excessive TV viewing time and factors associated with this behavior can help further characterize this behavior in small-town adolescent populations. Furthermore, identifying a population-based profile may assist in targeting interventions that

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focus on the prevention and reduction of sedentary time among adolescents from small towns in an attempt to reduce the risk of comorbidities.

In view of the above considerations, the objective of the present study was to identify the prevalence of excessive TV viewing time during weekdays and the weekend controlling for sociodemographic characteristics and health risk factors in an adolescent population (aged 10–19 years) from a small town and rural area.

Material and methods

This study protocol was approved by the Human Research Ethics Committee of the Universidade Federal de Santa Catarina in Brazil. It utilized data from the project "Physical activity and lifestyle: a study of three generations in São Bonifácio, Santa Catarina", a cross-sectional, school-based epidemiological survey conducted in 2010. The municipality under study is located in southern Brazil approximately 70 km from Florianópolis, the capital of the state of Santa Catarina, and totals 3008 inhabitants, 77.23% of them living in a rural area. The economy of the municipality is based on agriculture, mainly from the cultivation of tobacco, horticulture, and dairy production [17]. The HDI of São Bonifácio is 0.731, which places it in the medium category [17].

The population sample comprised students from the elementary to high school levels enrolled in São Bonifácio public schools (n = 297). The students attended the five schools of the municipality: one state school located in the center of the town with the largest number of students and four municipal schools located in rural areas with a smaller number of students. All students were invited to participate in the study. Inclusion criteria were being aged from 10 to 19 years and providing the signed informed consent of the participant's legal guardian. Three students were excluded as they were not in the targeted age group, thus 294 adolescents were included in the study.

Excessive TV viewing time during the week and on the weekend (outcome variables) was obtained by administering a questionnaire with the following questions: "How much time per day do you spend watching TV during the week (Monday to Friday)? And on the weekend (Saturday and Sunday)?" The participants were asked to record the average time per day in hours and minutes. Excessive TV viewing time was defined as watching TV for 2 h or more per day [11] for both outcome variables. Data such as sex (male, female), age group (10–12 years, 13–15 years, 16–19 years), housing area (urban, rural), and school shift (morning, afternoon, evening) were self-reported by the participants in the questionnaire.

To identify socioeconomic status and head of household education level, a questionnaire developed by the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa) [18] was completed by the participant's legal guardian. It was answered and returned to the researchers at the school within one day of it being delivered by the participant. This questionnaire evaluates the purchasing power of families and classifies it into socioeconomic classes from high to low (A1, A2, B1, B2, C1, C2, D, E) based on the accumulation of material goods, housing conditions, number of domestic employees, and the educational level of the head of the household [18]. Socioeconomic status was treated as a dichotomous variable: high (classes A, B) and low (classes C, D, E). Head of household education level was also grouped into two categories: ≤ 8 and > 8 years of schooling.

Additional data were also collected on the participants. It included how the participant commuted to school by the question: "How do you go to school?" Commuting to school was classified as either active (walking, cycling, walking for more than 10 min and then using public transportation) or passive (bus, car, motorcycle). The frequency of consumption of unhealthy foods was obtained by the question: "On how many days of the last week did you eat processed snacks (e.g., chips, cheetos, french fries, fandangos), salty snacks (drumsticks, sfihas, hot dogs), or other salty foods (ham, mortadella, sausage, salami)?". This question is part of the Youth Risk Behavior Survey [19], which showed satisfactory validity and reliability in a study on Brazilian adolescents [20]. The responses were categorized as "never", "1–3 days", and "4–7 days".

Body weight and height was measured with a digital scale (Filizola, Brazil) and stadiometer (Sanny, Brazil), respectively. Waist circumference was measured with flexible anthropometric tape (Sanny, Brazil) at the point of smallest trunk circumference [21]. The age- and sex-specific cutoff values proposed by Taylor et al. [22] were used to determine abdominal obesity (absent or present). Triceps and subscapular skinfold thicknesses were measured according to the procedure of Marfell-Jones et al. [23] using a skinfold caliper (Cescorf, Brazil) to calculate body fat percentage according to Slaughter et al. [24]. Two measurements of each skinfold were obtained and the mean was considered for analysis. When these two measurements differed by more than 5%, a third measurement was performed and the median of the three was considered. All measurements were performed by two trained examiners. Adolescents with elevated levels of body fat were identified using the sex- and age-specific cutoff values proposed by the Fitnessgram [25] Revision 8.6 and 9.x [21] and defined as either appropriate or high.

The 20-m shuttle run test [22] was used to evaluate the cardiorespiratory fitness of the participants. Test data were processed using the equations proposed by Leger [26]. Adolescents who fell outside the healthy zone of physical fitness, based on the sex- and age-specific cutoff values described by the Fitnessgram [25] Revision 8.6 and 9.x. [25], were classified with low cardiorespiratory fitness.

The data were collected in September at all five schools during school hours by a team of 14 individuals including teachers and undergraduate and postgraduate students. The examiners had been previously trained in the application of the adopted instruments in order to standardize all data collection procedures. The questionnaires were administered in each class with instructions provided. To control for measurement reliability, intra- and inter-observer technical errors of measurement (TEM) [27] were calculated based on measurements obtained from a group of 17 adolescents (10 girls and 7 boys) who were not part of the study sample. Intraobserver TEM was 2.23% and 1.94% for subscapular and triceps skinfolds, respectively, and 0.33% for waist circumference. Interobserver TEM was 8.83%, 6.66%, and 0.88%, respectively. These values were considered to be acceptable according to Gore et al. [27].

Data were analyzed using the SPSS ver. 15.0 (IBM, USA). Descriptive analysis involved calculating the distribution of frequencies and measures of central tendency and variability. The prevalences of excessive TV viewing time during the week and weekend were determined from the distribution of the relative frequencies. Binary logistic regression was used to identify factors associated with excessive TV viewing time during the week and weekend (outcome variables), with the estimation of odds ratio (OR) and 95% confidence intervals (95% CI) in crude and adjusted analyses. Considering a hypothetical temporal relationship of the variables, a hierarchical model with four levels was adopted [28]: the first level included demographic variables (sex, age group, housing area); the second level included socioeconomic variables (socioeconomic status, household head education level); the third level included the variables school commute and consumption of unhealthy foods; and the fourth level included anthropometric indicators (abdominal obesity and fat percentage) and cardiorespiratory fitness (20-m shuttle run results). The variables were controlled for all other variables at each level of the hierarchical model and by the variables of the previous level that showed a p value ≤ 0.20. A level of significance of 5% was adopted for final analyses.

Results

Eleven of the 294 initial participants were excluded because they did not answer the questionnaire related to TV viewing time. Thus, the present study was based on the data of 283 adolescents (girls aged 13.67 ± 2.09 years, boys aged 13.75 ± 2.51 years), corresponding to 96.2% of the sample. Some variables were analyzed using a smaller sample size due to incomplete data. A number of adolescents refused to participate in the collection of anthropometric data (skinfolds: n = 17, waist circumference: n = 14) or the shuttle run test (n = 24), others had incomplete data or incorrectly completed the questionnaires related to TV viewing time on the weekend (n = 28), household education level (n = 35), socioeconomic status (n = 39), and school commute (n = 4). However, these adolescents were not excluded from analysis of the other collected variables.

The prevalence of excessive TV viewing time was 76.7% during the week and 78.4% on the weekend. A higher proportion of adolescents lived in a rural area, studied in the morning, and had a household head with 8 years or less of schooling. There was a higher proportion of adolescents aged 10–12 years compared with the other age groups. Most adolescents were passive school commuters and consumed unhealthy foods 1–3 days per week. The prevalence of abdominal obesity was 20.4%; 29.3% of the adolescents exhibited high fat percentage and 18.5% had low cardiorespiratory fitness (Table 1).

The variables that were associated with excessive TV viewing time during the week in crude analyses were age group, school shift, and cardiorespiratory fitness. Only age group was associated with excessive TV viewing time in adjusted analysis. Here the odds ratio for excessive TV viewing time during the week was 2.57 (CI 95%: 1.28, 5.18) and 6.20 (CI 95%: 2.91, 13.19) in adolescents aged 13–15 years and 10–12 years, respectively, compared with those aged 16-19 years (Table 2). None of the analyzed variables were associated with the excessive TV viewing time during the weekend (Table 3).

Discussion

The main findings of this study revealed that more than half the sample spent 2 h or more per day watching TV during the week (76.7%) and weekend (78.4%), demonstrating that this sedentary behavior is also a problem among adolescents from smaller and more rural locations. Among the considered variables, only age was associated with excessive TV viewing time and only during the week.

A similar prevalence of excessive TV viewing time was reported in studies involving Brazilian adolescents from medium- and large-sized cities. One study, conducted in 44 cities in the state of Pernambuco, showed that 40.9% of schoolchildren spent 3 h or more per day watching TV during the week; on the weekend this prevalence rate was 49.9% [5]. A systematic review found a prevalence higher than 50% on weekdays among Brazilian adolescents in most of the studies (60%) that were analyzed [4].

A lower prevalence of this behavior was reported for adolescents from other countries: 32.9% on weekdays in the United States [10] and 24% and 50% among schoolchildren from Spain during the week and weekend, respectively [6]. Taken together, these findings show that the consequences of technological advances and the process of urbanization are not restricted to large urban centers but are also found in smaller and less developed cities. This scenario is a matter of concern since it indicates that adolescents

Table 1. Absolute (*n*) and relative (%) distribution of the study variables (total *n* = 283)

Variable	*n*	%
TV viewing time/day during the week (*n* = 283)		
< 2 h	66	23.3
≥ 2 h	217	76.7
TV viewing time/day during the weekend (*n* = 255)		
< 2 h	55	21.6
≥ 2 h	200	78.4
Sex (*n* = 283)		
Female	132	46.6
Male	151	53.4
Age (*n* = 283)		
10–12 years	125	44.2
13–15 years	100	35.3
16–19 years	58	20.5
Area (*n* = 283)		
Rural	190	67.1
Urban	93	32.9
School shift (*n* = 283)		
Morning	111	39.2
Afternoon	87	30.7
Evening	85	30.0
Economic level (*n* = 244)		
Low	123	50.4
High	121	49.6
Parental education (*n* = 248)		
≤ 8 years	190	76.6
> 8 years	58	23.4
School commute (*n* = 279)		
Active	84	30.1
Passive	195	69.9
Non-healthy food intake (days of week) (*n* = 283)		
None	30	10.6
1–3 days	147	51.9
4–7 days	106	37.5
Abdominal obesity (*n* = 269)		
Absent	214	79.6
Present	55	20.4
Body fat percentage (*n* = 266)		
Appropriate	188	70.7
High	78	29.3
Cardiorespiratory fitness (*n* = 259)		
Appropriate	211	81.5
Low	48	18.5

from small towns are also adopting behaviors typical of a sedentary lifestyle. It is therefore important to plan and implement intervention measures designed to reduce sedentary behaviors that target adolescent populations in both large cities and small towns.

In relation to age, students aged 13–15 years were more likely to watch TV for a longer period of time during the week compared with older students (16–19 years), and this likelihood increased almost twice as much among students aged 10–12 years. A similar finding was reported in a study investigating a medium-sized town in the south of Brazil [9], in which the prevalence of adolescents watching TV for more than 4 h per day was higher among those younger than 16 years old. These results are similar to those observed among Australian adolescents [15]. Younger adolescents tend to spend more time performing indoor activities since they do not have the autonomy affording by social mobility, thus increasing time spent watching TV [16]. Thus, strategies to reduce TV watching time among adolescents should mainly consider the characteristics and preferences of those aged 10–15 years.

No associations with the outcome variables were observed for sex, housing area, socioeconomic status, school commute, consumption of unhealthy foods, abdominal obesity, body fat percentage, or cardiorespiratory fitness. In this study, an association was only observed between excessive TV viewing time and age during the week but not for the weekend. However, other studies have demonstrated an association between sex with sedentary behavior. TV watching time on the weekend was greater among Brazilian boys [5] and another study also found that screen time (including computer and video games) was greater among Brazilian boys [14]. In this study, excessive TV viewing time was similar in boys and girls and in agreement with the results of other studies conducted in Brazil and reported in a recent systematic review [4].

With respect to housing area, the results of the present study agree with Olds et al. [15], who analyzed screen time (TV, video games, computer) and found no differences between different geographic areas. This finding reflects the development of rural areas in Brazil, which have been modernized over recent years in terms of electrification and the use of machinery and electronics. Consequently, most dwellings even in rural areas have a TV and do not differ in this perspective from urban areas.

Previous studies have shown an association between TV watching time and abdominal obesity [9], body adiposity [7], and low cardiorespiratory fitness [11]. Studies analyzing screen time (TV, video games, computer) also found an association with abdominal obesity [8] and body adiposity [29]. Such associations were not found in the present study, showing that those with low cardiorespiratory fitness and a high amount of body fat did not necessarily spend more time in front of the TV. In this sense, further study on this subject should also analyze

Table 2. Odds ratio (OR) and confidence intervals (95% CI) of crude and adjusted analysis (hierarchical model) for excessive TV viewing time during the week in relation to the independent variables

Variable	*n*	%	Excessive TV viewing time during the week			
			Crude analysis		Adjusted analysis*	
			OR (CI 95%)	*p*	OR (CI 95%)	*p*
1st level						
Sex						
Female	97	73.5	1.00		1.00	
Male	120	79.5	1.40 (0.80, 2.43)	0.236	1.53 (0.85, 2.75)	0.155
Age						
10–12 years	110	88.0	**5.96 (2.82, 12.58)**	< 0.001	**6.20 (2.91, 13.19)**	< 0.001
13–15 years	75	75.0	**2.44 (1.23, 4.85)**	0.011	**2.57 (1.28, 5.18)**	0.008
16–19 years	32	55.2	1.00		1.00	
Area						
Rural	148	77.9	1.00		1.00	
Urban	69	74.2	0.82 (0.46, 1.45)	0.490	0.83 (0.45, 1.52)	0.536
2nd level						
School shift						
Morning	97	87.4	**4.85 (2.39, 9.84)**	< 0.001	2.20 (0.78, 6.19)	0.135
Afternoon	70	80.5	**2.88 (1.46, 5.71)**	0.002	1.12 (0.41, 3.08)	0.829
Evening	50	58.8	1.00		1.00	
Economic level						
High	89	73.5	1.00		1.00	
Low	98	79.7	1.41 (0.78, 2.56)	0.260	1.17 (0.58, 2.36)	0.665
Parental education						
≤ 8 years	146	76.8	1.00		1.00	
> 8 years	45	77.6	1.04 (0.52, 2.11)	0.906	1.60 (0.70, 3.65)	0.270
3rd level						
School commute						
Active	66	78.6	1.00		1.00	
Passive	148	75.9	0.86 (0.46, 1.59)	0.628	0.83 (0.43, 1.59)	0.827
Non-healthy food intake						
None	22	73.3	1.00		1.00	
1–3 days	111	75.5	1.12 (0.46, 2.74)	0.802	0.07 (0.41, 2.77)	0.898
4–7 days	84	79.2	1.39 (0.55, 3.54)	0.492	1.58 (0.58, 4.31)	0.368
4th level						
Abdominal obesity						
Absent	163	76.2	1.00		1.00	
Present	45	81.8	1.41 (0.66, 2.99)	0.374	1.12 (0.39, 3.23)	0.836
Body fat percentage						
Appropriate	145	77.1	1.00		1.00	
High	61	78.2	1.06 (0.56, 2.01)	0.848	0.85 (0.34, 2.17)	0.737
Cardiorespiratory fitness						
Appropriate	170	80.6	1.00		1.00	
Low	32	66.7	**0.48 (0.24, 0.96)**	0.038	1.06 (0.47, 2.38)	0.897

* Adjusted analysis by hierarchical levels, reference category of less than 2 h of TV per day;
values in bold indicate statistical significance

Table 3. Odds ratio (OR) and confidence intervals (95% CI) for excessive TV viewing time on the weekend in relation to the independent variables

Variables	*n*	%	Excessive TV viewing time on the weekend			
			Crude analysis		Adjusted analysis*	
			OR (CI 95%)	*p*	OR (CI 95%)	*p*
1st level						
Sex						
Female	96	79.3	1.00		1.00	
Male	104	77.6	0.90 (0.50, 1.64)	0.738	0.89 (0.49, 1.63)	0.711
Age						
10–12 years	87	77.7	1.00		1.00	
13–15 years	73	79.3	1.05 (0.47, 2.33)	0.914	1.02 (0.44, 2.37)	0.965
16–19 years	40	78.4	1.10 (0.56, 2.16)	0.773	0.94(0.42, 2.10)	0.880
Area						
Rural	137	79.7	1.00		1.00	
Urban	63	75.9	0.81 (0.43, 1.50)	0.496	0.80 (0.43, 1.50)	0.489
2nd level						
School shift						
Morning	74	83.3	0.59 (0.28, 1.25)	0.170	0.51 (0.21, 1.21)	0.125
Afternoon	61	78.2	0.72 (0.32, 1.60)	0.418	0.50 (0.20, 1.22)	0.127
Evening	65	74.7	1.00		1.00	
Economic level						
High	82	78.1	1.00		1.00	
Low	89	78.1	1.00 (0.53, 1.90)	0.996	1.16 (0.56, 2.40)	0.688
Parental education						
≤ 8 years	132	77.6	1.00		1.00	
> 8 years	43	81.1	1.2 4 (0.57, 2.69)	0.590	1.31 (0.55, 3.14)	0.546
3rd level						
School commute						
Active	62	83.8	1		1.00	
Passive	135	76.3	0.62 (0.31, 1.26)	0.189	0.63 (0.31, 1.27)	0.195
Non-healthy food intake (days of week)						
None	21	75.0	1.00		1.00	
1–3 days	105	79.5	1.30 (0.50, 3.37)	0.594	1.36 (0.52, 3.57)	0.532
4–7 days	74	77.9	1.18 (0.44, 3.14)	0.748	1.17 (0.43, 3.15)	0.760
4th level						
Abdominal obesity						
Absent	163	76.2	1.00	0.431	1.00	
Present	45	81.8	0.89(0.43, 1.81)	0.738	0.90(0.34, 2.36)	0.826
Body fat percentage						
Appropriate	129	78.2	1.00		1.00	
High	55	74.3	0.81 (0.43, 1.53)	0.513	0.92 (0.37, 2.26)	0.854
Cardiorespiratory fitness						
Appropriate	146	77.2	1.00		1.00	
Low	35	79.5	1.15 (0.51, 2.57)	0.742	1.19 (0.52, 2.70)	0.680

* Adjusted analysis by hierarchical levels, reference category of less than 2 h of TV per day

other behavioral variables such as diet and physical activity. In addition, studies of a longitudinal nature involving small-city and rural population samples also are needed to clarify these issues.

One limitation of the present study was the fact that only TV watching time was analyzed as an indicator of sedentary behavior, although computers, videogames, and tablets are also used by adolescents. Furthermore, the use of self-reporting questionnaires and related measures can show recall bias and may have their validity questioned. Additionally, the cross-sectional design of the study does not permit the establishment of a causal relationship between the analyzed variables. Another limitation was the use of categories instead of continuous variables (abdominal obesity, body fat percentage, cardiorespiratory fitness) in the statistical analyses.

Nevertheless, the present study contributes to the literature by providing important results on excessive TV viewing time and associated factors in Brazilian adolescents from a small town and rural area, as studies on this subject have concentrated on populations from larger and more developed cities [5, 7, 9]. It is noteworthy that the study used a census sample representative of the area under study. Another strength was the separate analysis of excessive TV viewing time on the weekend as well as including variables not explored in sufficient detail in studies on sedentary behavior such as the type of transport used to commute to school, consumption of unhealthy foods, and body fat percentage.

Conclusions

Approximately 8 in 10 adolescents watched TV for 2 h or more per day during the week and/or on the weekend, demonstrating that the level of sedentary behavior found in large cities is also highly prevalent in small towns. During the week, the habit of TV watching was associated with a younger age (10–15 year olds). On the weekend, TV viewing time was similar between the physical and sociodemographic characteristics of the participants. These findings indicate the importance of planning and elaborating measures designed to reduce sedentary behavior in adolescents from small towns while paying special attention to more at-risk groups as well as providing parents with guidelines designed to promote changes in sedentary behavior.

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