

Aggregation of Excessive Sedentary Behaviors in Schools of the Public Network

¹Brenaráise Freitas Martins dos Santos, ²Hector Luiz Rodrigues Munaro
¹Student of Pos-Graduate Program in Nursing and Health, State University of Southwestern Bahia
²Department of Health, State University of Southwestern Bahia

ABSTRACT: Objective: To estimate the prevalence and factors associated with aggregation of four excessive sedentary behaviors in the public school network of Jequié / Bahia (BA), Brazil. Methodology: Survey of high school students in the sampled schools. The four sedentary behaviors observed were: screen time watching TV during and at the end of the week and the the display time and period of the week for computers/video games. Demographic variables and lifestyle (predictors) were evaluated to identify associations between the predictors and the aggregation of the four sedentary behaviors (outcome). The association was constructed by the Prevalence Ratio (PR) with a 95% confidence interval (CI). Results: The study showed a prevalence of 6.5% and the degree of aggregation of the four life habits was increased in those who did not have adequate vegetable intake, though this relationship was not statistically significant. However, females were less likely to show the four sedentary behaviors. Conclusions: There was a high aggregation value of the four sedentary behaviors. Female students were less likely to be exposed to the outcome; however, those who did not work, were considered insufficiently active, and did not reach adequate vegetable consumption levels had increased likelihoods of aggregation of the four sedentary behaviors.

KEYWORDS: Sedentary, Adolescent Behavior, Conglomerate Analysis, Lifestyle

I. INTRODUCTION

Sedentary behavior is defined as a set of activities with energy expenditure close to resting values, usually performed in the sitting position, including activities such as watching television, using a computer, playing video games, talking on the phone, talking to friends^{1,2}. One of the most used criteria for the estimation is the sitting time watching television and in front of the computer or video game (screen time), in which it is considered with excessive sedentary behavior, those who stay two hours or more a day in front of the device during a typical week or at weekends³. The risks of sedentary behavior become a public health alert, with a direct influence on chronic non-communicable diseases, such as cardiovascular, renal, endocrine, neuromuscular and osteoarticular diseases that compromise the individual's health, as well as the subject's socioeconomic expenditures, family and society⁴.

In Brazil, the National School Health Survey (PeNSE),^{5,6} with data from 26 capitals and the Federal District, estimated the prevalence of excessive time ahead of television of 78.6% in 2012 and 60,0% in 2015, among schoolchildren aged approximately 15 years. Regarding screen time using computer / video game, the study showed, in 2015, that the prevalence was 56.1%. Possibly this reduction is due to the fact that the schoolchildren decrease the time spent watching television and increase the time using computer or video games⁷. Studies on the aggregation of excessive sedentary behaviors and lifestyle risk factors (insufficient levels of physical activity, inappropriate eating habits, consumption of alcoholic beverages and tobacco)^{8,9} and demographic, in schoolchildren in Brazil, although in numbers limited, are very limited and restricted to specific populations, disregarding the needs of each region as well as the cultural and demographic contrasts existing in them, since they are directly related to the exposure of health risk factors¹⁰. Given the divergence of the factors associated with the different types of excessive sedentary behaviors based on screen time, predominance of surveys in large urban centers, high income regions, the present study aimed to estimate the prevalence and factors associated with behavior aggregation sedentary schoolchildren in public schools in Jequié-BA.

II. METHODS

Cross-sectional epidemiological study of a monitoring of health risk behaviors in high school students of the state education network in the city of Jequié, Bahia. The population of this study comprised 3,040 schoolchildren from 98 classes of all 12 urban state public schools in the municipality, duly enrolled in high school, morning and afternoon shifts, in 2015 .

The selection of the sample was random, by two-stage conglomerates. In the first stage of sample selection, the sample unit was the colleges. Those who offered high school in the morning and afternoon shifts were selected, and were located in the urban area (n = 12). Schools were excluded from rural areas (n = 3) and the College of Military Police, where there is a selection system for vacancies and the teaching model differs from the others. In the second stage of sample selection, the sample unit was the high school class, selected in proportion to the number of series, in each college, since there were colleges of larger size, with number of classes per distinct series. About 30 students were identified per class, where they were selected, by lot, carried out in the presence of the manager of each unit. The sample consisted of 48 classes. All colleges (n = 12) were represented with at least one class from each grade, and the proportional representation of each college was maintained. The parameter for the determination of the sample size was the estimated prevalence of the phenomenon of 50%. The confidence interval was 95% and a maximum error of three percentage points was adopted, effect of the delineation of 1.5 and 15% for cases of losses or refusals. Thus, a minimum sample of 1,388 students was reached. Data collection took place in July and August 2015. For this purpose, the COMPAC¹¹ questionnaire was used, which was applied in the classroom by previously trained researchers, with an average duration of 28 minutes.

In this study, the variables used for analysis were self-reported by the students, being:

- TV Week (TVW): A television question was used: "How many hours a day do you watch television?"¹¹ during a typical week;
 - Weekend TV (WTV): A question about: "How many hours a day do you watch television?"¹¹ during a weekend;
 - Computer / Videogame during the Week (CVW): A question about computer / video game was used: "How many hours a day do you use a computer and / or play video games?"¹¹ during a typical week;
 - Weekend Computer / Videogame at the weekend (WCV): A question about computer / video game was used: "How many hours a day do you use a computer and / or play video games?"¹¹ during a weekend;
- For analysis purposes, all screen time variables were categorized as "< 2 hours per day" and "≥ 2 hours per day", considered as excessive sedentary behavior, screen time ≥ 2 hours per day².

The demographic variables were: sex (male and female); age range in full years dichotomized in "< 16 years" and "≥16 years"; occupation (working and not working); marital status (single and married / other); marital status (single and married / other); (< 8 years of schooling and ≥ 8 years of schooling) and monthly family income (< 2 minimum wages and ≥ 2 minimum wages). In the period of data collection, a minimum wage corresponded to US\$ 204,00.

Regarding lifestyle, for physical activity level, a frequency question was used: "During a typical (typical) week, on how many days do you engage in moderate to vigorous physical activity (physical activity at leisure, work, and in the displacement)?"¹¹ and another question about duration: "During a typical (typical) week, how much time do you engage in moderate to vigorous physical activity (physical activity at leisure, work and travel)?" Those who did not accumulate the recommended minimum of at least five days in the week and 60 minutes per day of moderate to vigorous intensity activity¹² were considered insufficiently active. For consumption of fruits and vegetables, consumption of a daily portion (fruits or vegetables)¹¹, categorized as inadequate consumption "< 5 days/week" and adequate "≥ 5 days / week" was used as criterion;

The consumption of alcoholic beverages was determined by consumption, regardless of the number of doses, and categorized as "yes" and "no". Finally, for tobacco consumption, consumption was used as a criterion, regardless of the number of cigarettes¹¹, and categorized as "yes" and "no". Aggregation was considered when the combination of observed prevalence (OP) of risk behaviors exceeded the expected prevalence (EP)^{3,5- 8-10}. The expected prevalence of each combination of health risk behaviors (lifestyle) was obtained by multiplying the individual probability of occurrence of each behavior based on the observed occurrence in the sample. For example, suppose that the observed prevalence of the four aggregate sedentary behaviors is: TVW = 32.4%; WTV = 40.2%; CVW = 27.0% and WCV = 37.1% use, the aggregation would be: 0.324 x 0.0402x 0.0270 x 0.371 0.065 (6.5%). However, the expected prevalence for the same aggregate behaviors was 1.3%, in this case the OP / EP would be 4.98. The prevalence ratio observed by the expected (OP/ EP) over 1 means the aggregation between health risk behaviors. Poisson Regression, with robust variance, was performed to analyze the relationship between the dependent variable (exposure to the four aggregate behaviors) and the independent variables such as demographic variables (gender, age, occupation, family income and mother's education) and lifestyle (consumption of fruits, vegetables, alcohol, tobacco and physical activity level with Confidence Interval (CI) of 95%, included in the adjustment the confounding variables with values of p <0.20.

The present study was approved by the Human Research Ethics Committee of the State University of Southwest of Bahia (83.957 / 14). The students who participated in the study were authorized by the parents and those who were 18 years of age or older signed the free informed consent form.

III. RESULTS

In this study, the final sample consisted of 1098 students, the largest proportion being female (57.7%, n = 633). The descriptive characteristics of the sample are shown in table 1. When observing estimates of the prevalence of sedentary behaviors (Table 1), the excessive screen time watching television was 40.9% (95% CI, 37.9-43.9). For computer / video games on weekends, it was 37.5 (95% CI, 34.7-40.3). The proportion of schoolchildren under 16 years of age was 79.95% (n = 877, 95% CI: 77.5-82.0) and those who did not work (81.1%, n = 890- 95% CI: 78.7-83.5). Regarding lifestyle, the estimated prevalence for inadequate vegetable consumption was 60.4% (95% CI, 57.5-63.2) and 80.9% (95% CI, 78.6-83.2) were insufficiently active.

Table 1. Descriptive characteristics of the sample. Jequié, BA, 2015.

Variables	%	n	CI(95%)
Dependent			
Screen time (TVW)			
< 2 hours per day	66,4	729	63,4-69,4
≥ 2 hours per day	33,6	369	30,6-36,6
Screen time (WTV)			
< 2 hours per day	59,1	649	56,1-62,1
≥ 2 hours per day	40,9	449	37,9-43,9
Screen time (CVW)			
< 2 hours per day	72,5	796	69,8-75,0
≥ 2 hours per day	27,5	302	25,0-30,2
Screen time (WCV)			
< 2 hours per day	62,5	686	59,7-65,3
≥ 2 hours per day	37,5	412	34,7-40,3
Independent			
Demographic			
Sex			
Female	57,7	633	54,9-60,5
Male	42,3	465	39,5-45,1
Age (years)			
< 16	79,9	877	77,5-82,0
≥ 16	20,1	221	18,0-22,5
Ocupation			
Don't working	81,1	890	78,7-83,5
Working	18,9	208	16,5-21,3
Mother's schooling(years)			
< 08	38,1	418	35,1-40,9
≥ 08	61,9	680	59,1-64,9
Monthly family income (minimum wages)			
< 02	70,8	777	67,9-73,4
≥ 02	29,2	321	26,6-32,1
Lifestyle			
Fruits Consumption			
Inappropriate	45,6	501	42,7-48,6
Appropriate	54,4	597	51,4-57,3
Vegetables consumption			
Inappropriate	60,4	663	57,5-63,2
Appropriate	39,6	435	36,8-42,5
Alcohol consumption			
Yes	23,9	262	21,3-26,3
No	76,1	836	73,7-78,7
Tobacco consumption			

Yes	5,7	63	4,5-7,2
No	94,3	1035	92,8-95,5
Physical active level			
Insufficiently	19,1	210	16,8-21,4
Sufficiently	80,9	888	78,6-83,2

Note: TVW: television viewer in week; WTV: television viewer in weekend; CVW: computer/videogame viewer on week; WCV; computer/videogame on weekend; Confidence Interval: CI

Table 2 presents the estimated prevalence of aggregation of excessive sedentary behaviors (6.5%). Among the sixteen patterns of behavioral combinations, six presented OP / EP values greater than 1. The high aggregation value (4.98, 95% CI: 4.33-5.04) stands out for the presence of the four behaviors sedentary, where the observed prevalence exceeded that expected by almost five times.

Table 2. Estimates of prevalence and aggregation of sedentary behaviors, Jequié, BA, 2015.

Aggregation					OP(%)	EP(%)	OP/EP(CI95%)
n	TVW	WTV	CVW	WCV			
0	-	-	-	-	33,9	18,6	1,83 (1,78-1,88)
1	+	-	-	-	4	8,9	0,45 (0,28-0,62)
1	-	+	-	-	8,2	12,5	0,66 (0,52-0,80)
1	-	-	+	-	1,7	6,9	0,25 (0,007-0,43)
1	-	-	-	+	4,2	10,9	0,38 (0,23-0,54)
2	+	+	-	-	11,1	6,0	1,86 (1,87-2,04)
	+	-	+	-	0,8	3,3	0,24 (0,06-0,42)
2	+	-	-	+	1,2	5,2	0,23 (0,04-0,42)
2	-	+	+	-	0,8	4,6	0,17 (-0,01-0,16)
2	-	+	-	+	4,4	7,4	0,60 (0,42-0,70)
2	-	-	+	+	9,9	4,0	2,44 (2,26-2,63)
3	+	+	+	-	1,2	2,2	0,54 (0,39-0,70)
3	+	+	-	+	4,4	3,5	1,25 (1,07-1,43)
3	+	-	+	+	2,6	1,9	1,34 (1,20-1,48)
3	-	+	+	+	2,9	2,7	1,07 (0,80-1,24)
4	+	+	+	+	6,5	1,3	4,98 (4,33-5,04)

Note: n: behaviors numbers; (+): behavior present; (-): behavior absent; TVW: television viewer in week; WTV: television viewer in weekend; CVW: computer/videogame viewer on week; WCV; computer/videogame on weekend; OP: observed prevalence; EP: expected prevalence; OP/PE: ratio between observed and expected combination; CI: confidence interval; bold values: behaviors aggregation.

After the adjusted analysis (Table 3), students with insufficient active (PR = 2,689 CI95% 1,172-6,169), those with inadequate vegetable consumption (PR = 1,647 CI95% 1,010-2,686) and students who did not work (PR =

2,115 IC95% 1,019-4,391), were more likely to be exposed to the outcome. However, female schoolchildren (PR = 0, 611 IC95% 0, 399-0, 935) had a lower probability of exposure to the aggregation of the four behaviors.

Table 3. Regression analysis with estimates of Prevalence Ratio for aggregation of the four behaviors, according to demographic and lifestyle variables. Jequié, BA, 2015.

	Gross PR (IC95%)	p	Adjusted PR (IC95%)	p
Demographic				
<i>Sex</i>				
Female	0,671(0,435-1,033)	0,070	0,611(0,399-0,935)	0,023
Male	1		1	
<i>Age (years)</i>				
< 16	0,947(0,563-1,594)	0,839	-	-
≥ 16	1		-	-
<i>Ocupation</i>				
Don't working	0,680(0,436-1,059)	0,088	2,115(1,019-4,391)	0,045
Working	1		1	
<i>Mother's schooling(years)</i>				
< 08	1,005(0,642-1,573)	0,982	-	-
≥ 08	1		-	-
<i>Monthly family income (minimum wages)</i>				
< 02	0,680(0,436-1,059)	0,088	0,695(0,448-1,080)	0,106
≥ 02	1		1	-
Lifestyle				
<i>Fruits Consumption</i>				
Inappropriate	1,089(0,704-1,683)	0,702	-	-
Appropriate	1		-	-
<i>Vegetables consumption</i>				
Inappropriate	1,838(1,120-3,017)	0,016	1,647(1,010-2,686)	0,045
Appropriate	1		1	
<i>Alcohol consumption</i>				
Yes	1,351(0,845-2,161)	0,209	-	-
No	1		-	-
<i>Tobacco consumption</i>				
Yes	0,878(0,331-2,333)	0,795	-	-
No	1		-	-
<i>Physical active level</i>				
Insufficiently	2,702(1,189-6,136)	0,018	2,689(1,172-6,169)	0,020
Sufficiently	1		1	

Note – PR- prevalence ratio; CI: confidence interval: Bold values: p<0,05.

IV. DISCUSSION

The present study showed a high value of aggregation between the four sedentary behaviors and increased probability of exposure to the outcome among those who did not work, with inadequate vegetable consumption and insufficiently active. However, females had lower odds of exposure. Regarding the isolated sedentary behaviors, the estimated prevalence of excessive screen time watching TV was 40.9% and for computer and video game at weekends was 37.5%. A study carried out in the interior of Santa Catarina¹², with schoolchildren and a similar instrument, found prevalence of excessive screen time in front of the television of 60.7% and the excessive screen time in front of the computer of 38.1%, already in relation to videogame this study showed a prevalence of 27.8% for boys. Differences in prevalence may be related to the needs of each region, as well as to cultural and demographic contrasts, which are exemplified in the northeast region due to the lack of accessibility of leisure equipment and the precariousness of physical activities. Although no previous studies of aggregation of excessive sedentary behaviors were found, a systematic review to estimate the prevalence of risk behaviors among adolescents found that sedentary behaviors (screen time) in most studies, were associated with girls, adolescents under 15 years old, with low monthly family income and low parents' schooling¹⁴. However, another review showed that sedentary behavior was more frequent among boys, overweight and obesity status, and low parental schooling^{15,16}. The conflicting results of studies, in relation to correlates, seem to be related to the definition of the measure (total or separate time, week or weekend), age groups and study designs (transversal or longitudinal)^{17,18}. In relation to sex, girls presented a lower probability of exposure to the four aggregate behaviors. Previous studies^{19,20} found that there were lower prevalence of excessive screen time during the week and weekend for girls compared to boys. One of the factors that must be taken into account is the cultural definition of the adolescent, since it has its activities divided between school, friends and learning / experience of domestic activities, which are mostly in the care of girls²¹. Those who did not work were more exposed to the four aggregate behaviors. A previous study¹² showed that not working was associated with sedentary behavior. This fact can be explained because having some occupation contributes to the school being more active, making use of the TV, computer or video game for less time^{2,22}. When physical activity levels were observed, those considered insufficiently active independently increased by almost three times the probability of exposure to the four behaviors. Previous studies have shown that there is a high prevalence of insufficiently active schoolchildren and that in adolescence physical activity begins to decrease²¹⁻²². This can be explained by the important and precarious influence of both family and schooling on the practice of physical activity²¹⁻²².

With regard to eating habits, schoolchildren who did not consume vegetables regularly increased the likelihood of exposure to the outcome. Systematic review²³ revealed that 85% of the articles investigated showed an association between low consumption of fruits and vegetables and high consumption of salted or soda, excessive time watching television. The authors indicated that, when watching television or using computers, schoolchildren tend to eat unhealthy foods (soft drinks and snacks), reducing the possibility of eating healthier foods²⁴. One of the factors that contribute to health benefits is the management of a healthy diet rich in vegetables, this factor has several implications in adolescence, since the energy deficit can lead to expenditures in the development of the adolescent²⁵.

V. CONCLUSIONS

It was concluded that, in general, there was a high aggregation value of the four sedentary behaviors. Female students were less likely to be exposed to the outcome. However, those who did not work, who were considered insufficiently active and did not reach adequate consumption of vegetables, increased the probability of aggregation of the four sedentary behaviors. In view of the presented results, it is necessary strategies that strengthen the intervention in school environment focused on the promotion of health, autonomy to the practice of physical activity, adequate eating habits and reduction of the sedentary behavior.

REFERENCES

1. World Health Organization. (WHO) Global recommendations on physical activity for health. Geneva, SW: World Health Organization, 2010.
2. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*. 2012;380(9838):247-257.
3. Silva DA, Peres KG, Boing AF, González-Chica DA, Peres MA. Clustering of risk behaviors for chronic noncommunicable diseases: a population-based study in southern Brazil. *Prev Med*. 2013;56(1):204.
4. Meneguči J, Santos DAT, Silva RB, Santos RG, Sasaki JE, Tribess S, et al. Comportamento sedentário: conceito, implicações fisiológicas e os procedimentos de avaliação. *Rev Motricidade*. 2015;11(1):160-74
5. PeNSE. Pesquisa Nacional de Saúde do Escolar 2012. Rio de Janeiro: IBGE; 2013. 254 p.
6. PeNSE. Pesquisa Nacional de Saúde do Escolar 2015. Rio de Janeiro: IBGE; 2016. 123 p.

7. GROWING up unequal: gender and socioeconomic differences in young people's health and well-being: health behaviour in school-aged children (HBSC) study: international report from the 2013/2014 survey. Copenhagen: World Health Organization - WHO, Regional Office for Europe, 2016. 276 p
8. Tassitano RM, Dumith SC, Chica DAG, Tenório MCM. Aggregation of the four main risk factors to non-communicable diseases among adolescents. *Rev Bras Epidemiol*. 2014;17(2):465-78.
9. Leech RM, McNaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. *Int J Behav Nutr Phys Act*. 2014;11(4):1-9.
10. Brito ALS, Hardman CM, Barros MV. Prevalence and factors associated with the co-occurrence of health risk behaviors in adolescents. *Rev Paul Pediatr*. 2015 Dec;33(4):423-30.
11. Silva KS, Lopes AS, Hoelfelmann LP, Cabral LGA, De Bem MFA, Barros MVG et al. Health risk behaviors project (COMPAC) in youth of the Santa Catarina State, Brazil: ethics and methodological aspects. *Braz J Kin Hum Per*. 2013;15(1):1-15.
12. World Health Organization (WHO). Global recommendations on physical activity for health. Geneva, SW: World Health Organization; 2010.
13. De Souza GR, DAS Silva. Sedentary behavior in adolescents in small city in the south of the country. *Medicina (Ribeir Preto. Online)*.2018; 49 (3), 212-222
14. Pate RR, Mitchell JA, Byun W, Dowda M. Sedentary behaviour in youth. *Brit J of Spo Med*. 2011;45(11): 906-13.
15. Van Der Horst K, Paw MJ, Twisk JW, Van Mechelen W. A brief review on correlates of physical activity and sedentariness in youth. *Med Sci Sports Exerc*. 2007; 39(8):1241-50.
16. TammelinT, Ekelund U, Remes J, Näyhä S. Physical activity and sedentary behaviors among Finish youth. *Med Sci Sports Exerc*. 2007; 39 (7): 1067-74.
17. MacLeod KE, Gee GC, Crawford P, Wang MC. Neighbourhood environment as a predictor of television watching among girls. *J Epidemiol Community Health*. 2008; 62: 288-92.
18. Barbosa Filho VC, Campos W, Bozza R, Lopes AS. The prevalence and correlates of behavioral risk factors for cardiovascular health among Southern Brazil adolescents: a cross-sectional study. *BMC Pediatr* 2012;25:12-130.
19. Christofaro DG, De Andrade SM, Mesas AE, Fernandes RA, Farias Júnior JC. Higher screen time is associated with overweight, poor dietary habits and physical inactivity in Brazilian adolescents, mainly among girls. *Eur J Sport Sci*. 2016;16:498-506
20. De Aguiar Greca JP, Santos Silva DA, Loch MR. Atividade física e tempo de tela em jovens de uma cidade de médio porte do Sul do Brasil. *Rev Paul Pediatr*. 2016;34(3):316-22
21. Farias Júnior J, Mendes J, Barbosa D, Lopes A. Fatores de risco cardiovascular em adolescentes: prevalência e associação com fatores sociodemográficos. *Rev. bras. epidemiol*. 2011; 14(1): 50-62.
22. Smith-Menezes A, Duarte MFS, Silva RJS. Inatividade física, comportamento sedentário e excesso de peso corporal associados à condição socioeconômica em jovens. *Rev. bras. Educ. Fís. Esporte* 2012;26(3):411- 418.
23. Rossi CE, Albernaz DO, Vasconcelos FDAGD, Assis MAAD, Di Pietro PF. Influência da televisão no consumo alimentar e na obesidade em crianças e adolescentes: uma revisão sistemática. *Rev. Nutr*. 2010; 23(4): 607-20
24. Coutinho R, Santos W, Folmer V, Puntel R. Prevalência de comportamentos de risco em adolescentes. *Cad Saúde Col*. 2006; 21(4), 441-449.
25. Toral N. Comportamento alimentar de adolescentes em relação ao consumo de frutas e verduras. *Rev Nutr* 2006;19(3):331-40.