DOI: 10.1590/1980-549720200008

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Sedentary behavior in elderly residents from the rural area in Southern Brazil

Comportamento sedentário em idosos residentes de zona rural no extremo Sul do Brasil

Otávio Amaral de Andrade Leão[I], Alan Goularte Knuth[II], Rodrigo Dalke Meucci[I]

ABSTRACT: ***Introduction:*** Sedentary behavior has been associated with several health indicators. This study aims to describe this outcome in elderly people living in rural areas. ***Methodology:*** A cross-sectional study was carried out with elderly people from the rural area in the city of Rio Grande/RS, in 2017. Data were collected using an electronic questionnaire. Sedentary behavior was evaluated by eight aspects: watching television/videos/DVDs, using computer/internet, reading, socializing with friends and/or family, driving or riding a car/bike/taking public transport, practicing a hobby, working, and other activities. The analysis was composed by the description of aspects and multivariable (linear regression) analysis to test associations between the outcome and socioeconomic, demographic and physical activity characteristics. Association of the excess of sedentary behavior and time watching television within the independent variables was also verified. ***Results:*** The mean of sedentary behavior was 274.9 minutes/day (n = 1,030), but watching television represented almost half (130.5 minutes/ day). Age was inversely associated with sedentary behavior, while income and schooling presented a direct relation. Income had a positive association with excessive sedentary behavior and time watching television. ***Conclusion:*** The mean sedentary behavior was lower when compared with the literature for the elderly. We suggest that actions to encourage healthy habits aim especially at reducing the time spent watching television.

Keywords: Sedentary behavior. Aged. Rural areas. Public health. Health of the elderly.

[I]Graduate Program in Public Health, Universidade Federal do Rio Grande – Rio Grande (RS), Brazil.
[II]Institute for Education, Graduate Program in Public Health, Universidade Federal do Rio Grande – Rio Grande (RS), Brazil.
Corresponding author: Otávio Amaral de Andrade Leão. Post-Graduate Program in Public Health, School of Medicine, Universidade Federal do Rio Grande, Rua Visconde de Paranaguá, 102, CEP 96203-900, Centro, Rio Grande, RS, Brazil. E-mail: otavioaaleao@gmail.com
Conflict of interests: nothing to declare - **Financial support:** Pastoral da Criança, National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico* - CNPq), Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* - CAPES).

RESUMO: ***Introdução:*** O comportamento sedentário tem sido associado a diversos indicadores de saúde. O objetivo deste estudo é descrever esse desfecho em idosos residentes de zona rural. ***Metodologia:*** Realizou-se um estudo transversal com idosos da zona rural de Rio Grande/RS, em 2017. A coleta de dados foi realizada por meio de questionário eletrônico. O comportamento sedentário foi avaliado pelo somatório de oito aspectos: assistir a televisão/vídeos/DVD, usar computador/internet, ler, socializar com amigos e/ou família, dirigir ou andar de carro/moto/transporte público, praticar algum *hobby*, trabalhar e outras atividades. A análise deu-se pela descrição dos aspectos e pela análise multivariável (regressão linear), para testar associações com características socioeconômicas, demográficas e atividade física. Também foi verificada associação do excesso de comportamento sedentário e tempo assistindo à televisão com as variáveis independentes. ***Resultados:*** A média de comportamento sedentário foi de 274,9 minutos/dia (n = 1.030), e assistir televisão representou quase a metade (130,5 minutos/dia). Idade mostrou-se inversamente associada com o comportamento sedentário, enquanto renda e escolaridade apresentaram uma relação direta. Renda apresentou associação positiva com excesso de comportamento sedentário e tempo assistindo televisão. ***Conclusão:*** A média de comportamento sedentário foi menor quando comparada com a literatura em idosos. Sugere-se que ações para incentivar hábitos saudáveis visem especialmente diminuir o tempo assistindo televisão.

Palavras-chave: Estilo de vida sedentário. Idoso. Zona rural. Saúde pública. Saúde do idoso.

INTRODUCTION

Recently, sedentary behavior has been defined by two characteristics: activities performed in a sitting/reclining position[1] and energy expenditure of these activities that is less than 1.5 METs (one metabolic equivalent of task – MET – is equal to the energy expenditure of a person in a state of rest)[1,2]. On the other hand, physical inactivity is understood as failure to attain the physical activity recommendations set by public health agencies[3]. Thus, an individual may exhibit high sedentary behavior, but may also be physically active[4], indicating two distinct behaviors.

Different aspects of individuals' lives have been studied with regard to sedentary behavior. A review study with adults found the following aspects: time watching television, using a computer, screen time (which includes watching television, using the computer, and playing video games), reading, and total time sitting down[5]. Whereas a review study with the elderly found: time sitting at work, in the car, and at home, watching television, using a computer, sewing, eating, socializing, or reading[6]. Given the above, it is possible to see how there are different ways sedentary behavior is measured, and one that has been widely used is time watching television, which acts as a proxy variable for sedentary behavior as a whole[7,8].

The elderly is the population group that presents the highest values of sedentary behavior when objectively measured, as they sit around 65 to 80% of their waking time[9,10]. In addition, a review study found that, on average, they reported sedentary time around five hours a day, and spent about three hours a day watching television[10]. Despite the

different types of measures and aspects investigated, excessive sedentary behavior is related to an increased risk of mortality in this age group, making the elderly a population that is subject to its negative effects[11,12]. Even though it has been studied in different ways, there is no agreed cut-off point for excess sedentary behavior. Some studies use more than eight hours a day[7] or more than 270 minutes a day[13], whereas, for sitting time watching television, this value is lower, such as more than five hours a day[7] and more than three hours a day[14].

When stratified by area of residence, little is known about the sedentary behavior of the elderly in rural areas. Thus, a review of sedentary behavior in the elderly population found only two studies that compared time watching television in rural and urban areas. However, both studies had opposite results, with one reporting higher sedentary behavior in the rural area and the other reporting the opposite[15]. A study of adult farmers in China found that they spend about 10 hours a week watching television[16]. In Brazil, 21.4% of rural residents, adults and the elderly, watch television three or more hours a day[14]. Although these studies include the elderly, it is not known how much this specific age range translates into sedentary behavior in rural areas.

Some studies have found an association between sedentary behavior and outcomes related to chronic diseases and risk factors such as diabetes *mellitus*, atherosclerosis, body mass index and mortality[17-19]. There is controversy as to whether the effects of sedentary behavior on health are independent of practicing physical activity, as some studies have found no association between sedentary behavior and cardiovascular markers when performing appropriate statistical adjustments for physical activity[20]. A recent meta-analysis found that high levels of physical activity appear to eliminate the risk of mortality associated with long sitting periods, but only mitigate this effect for too much time watching television[7].

Thus, knowing how much elderly people living in rural areas practice sedentary behavior is of great importance, not only because this age group has the highest values of sedentary behavior[10], but also because the Brazilian rural population is more inactive than the urban populations and has been studied less often in epidemiological investigations. Thus, the aim of this article is to describe sedentary behavior among elderly residents in rural areas of a municipality in the extreme south of Brazil, as well as its distribution according to socioeconomic, demographic and physical activity variables.

METHODOLOGY

An epidemiological cross-sectional study was performed, which involved elderly residents in the rural area of the municipality of Rio Grande, in 2017. It was part of a research consortium called "Health of the Rio-Grandina Rural Population" (*Saúde da População Rural Rio-Grandina)* in which several researchers propose themes regarding their interest group,

which in this case could also be children under five and women of childbearing age. To write the article, we used the STROBE checklist.

The municipality of Rio Grande has just under 200,000 inhabitants and is located in the extreme south of the state of Rio Grande do Sul, Brazil, where 4% of the population lives in rural areas. The rural area has 24 census tracts and more than 2,200 permanent households[21].

For the survey sample, a process was used to select 80% of households in rural areas. A number between one and five was drawn, and that number corresponded to the household to be skipped. For example, in the case that a "2" was drawn, it was skipped in a sequence of five households, in other words, it was not included in the sample. This procedure ensured that four out of five households were included in the sample. Any household with at least one of the consortium's three individuals was considered eligible. The sample for this article was composed of elderly (60 years old or older) of both sexes. If the elderly person was unable to answer the questionnaire, it could be answered by a caregiver.

From April to October 2017, one or more teams consisting of interviewers and supervisors, drove daily to a planned sector in the rural area. Upon arriving at a home, the supervisor assigned the elderly person a number in a spreadsheet. After that, he informed the residents about the research objectives, gave them a folder with more information, and invited them to participate if they met the household eligibility. Those eligible were visited at least three times, and if they were not found in the revisits, they were considered losses. After accepting to participate in the study, the individuals signed a free and informed consent form, and the questionnaire was applied by trained interviewers.

Participants could withdraw at any time during the interview and were advised that their data would be treated confidentially. The research project was submitted and approved by the Health Research Ethics Committee (CEPAS) of the Universidade Federal do Rio Grande (Report No. 51/2017). Face-to-face questionnaires were applied. One questionnaire was about household, which involved household-related questions such as income and housing situation. Furthermore, there was an elderly-specific questionnaire, which contained about 200 questions involving the health of the elderly.

The outcome, sedentary behavior, was collected using the adapted questionnaire entitled Measure of Older Adult's Sedentary Time (MOST), which generates a score consisting of the sum of time spent the previous week on each of the eight aspects of sedentary behavior assessed: watching television/videos/DVDs, using the computer/internet, reading, socializing with friends and/or family, driving or riding a car/motorcycle/public transport, doing some hobby, working, and other activities[22] . The work aspect was not part of the original questionnaire and was the only modification made to represent such activity in the studied population. The interviewers were trained to assist the elderly in summing up the outcome time, thus minimizing any kind of reporting or memory bias.

In the analysis, the outcome was treated by means of minutes per day of sedentary behavior. In addition, the prevalence of excess sedentary behavior (more than or equal to eight hours/day) and television time (more than or equal to five hours/day) was verified[7]. The other variables used in the present analysis were gender (male, female), age (60–65, 66–70, 71–75, 76–80 and 81 years or older), marital status (single, married or living with a partner, divorced and widowed), education (0, 1–4, 5–8 and 9 years or more of schooling), total household income (income quartiles) and physical activity for 30 minutes/day in the previous week in three domains, separately: work (no, yes), displacement (no, yes) and leisure (no, yes).

The information was collected on tablets through the RedCap program (Research Electronic Data Capture)[23]. Data conferencing and uploading to the server were performed daily, ensuring the quality and safety of this process. The database was exported from RedCap to the STATA 13.0 statistical package, which also performed data analysis. The study had a power of 80%.

For data analysis, a description of the sample and outcome was performed by the *t* test and analysis of variance (ANOVA). Then, a crude and adjusted analysis (linear regression) was performed, following a hierarchical model that placed variables at different levels to control confounding variables. In the analysis of excess sedentary behavior and time watching television, an association with the other independent variables (Poisson regression) was tested. The hierarchical levels of analysis were: first (sex and age), second (marital status, education and income) and third (physical activity - work, displacement and leisure). The variables with $p < 0.20$ remained in the model, and the significance level adopted was 5%.

RESULTS

A total of 1,131 elderly people from rural Rio Grande were included in the sample, with 7.0% losses and 1.9% refusals. Thus, the total number of individuals in this article is 1,030, of whom 4.5% had information declared by caregivers.

Table 1 presents the characteristics of the elderly included in the study (n=1,030). Most were male; the most prevalent age group was between 60 and 65 years old; most were married or living with a partner; and almost half had one to four years of schooling. Regarding physical activity, it was observed that most elderly people are active at work and in displacement; however, about 2/3 are inactive during leisure times.

In addition, Table 1 also presents the mean sedentary behavior among the independent variables. Those with the highest mean sedentary behavior were married elderly individuals (283.6 minutes/day), who had 9 years or more of schooling (386.9 minutes/day), were in the highest income quartile (307.6 minutes/day) and were not active at work (376.7 minutes/day).

The mean sedentary behavior of the studied sample was 274.9 minutes/day (standard deviation - SD = 170.2) or approximately 4.5 hours/day. The aspect that accounted for most

Table 1. Description of the socioeconomic, demographic and physical activity (PA) characteristics and their respective means of sedentary behavior time in elderly residents of rural areas (Rio Grande/RS, 2017, n=1,030).

Variables	n (%)	Mean (standard deviation)	p#
Sex			
Male	568 (55.2)	271.9 (170.6)	0,53
Female	462 (44.8)	278.5 (170.0)	
Age			
60–65	330 (32.1)	291.6 (181.6)	0.11
66–70	230 (22.3)	273.2 (160.9)	
71–75	202 (19.6)	275.8 (166.9)	
76–80	116 (11.3)	257.9 (159.8)	
80+	151 (14.7)	250.8 (167.9)	
Marital status			
Single	95 (9.2)	230.2 (174.3)	0.03
Married/lives with partner	640 (62.1)	283.6 (166.8)	
Separated	83 (8.1)	271.1 (141.7)	
Widowed	212 (20.6)	270.1 (186.1)	
Schooling (years)			
0	206 (20.3)	257.8 (177.0)	< 0.01
1 to 4	497 (48.9)	257.3 (158.0)	
5 to 8	233 (22.9)	289.6 (170.6)	
9 or more	81 (7.9)	386.9 (183.5)	
Income (Quartile)			
1 (Lowest)	250 (25.1)	249.3 (156.9)	< 0.01
2	337 (33.8)	273.0 (153.2)	
3	175 (17.5)	282.8 (198.1)	
4 (Highest)	236 (23.6)	307.6 (183.6)	
PA at work*			
No	21 (13.6)	376.7 (208.9)	0.01
Yes	133 (86.4)	268.8 (176.5)	
PA in displacement			
No	417 (40.5)	272.6 (177.6)	0.73
Yes	612 (59.5)	276.2 (165.2)	
PA in leisure			
No	638 (62.1)	268.3 (174.5)	0.10
Yes	390 (37.9)	285.9 (163.1)	

#test *t* for dichotomous variables and analysis of variance (ANOVA) for categorical variables; * Only individuals who reported working.

of the outcome was watching television (130.5 minutes/day), while the lowest mean was using the computer (6.7 minutes/day), according to Figure 1.

Table 2 shows the crude and adjusted analyzes of sedentary behavior in relation to the independent variables. In the crude analysis, it was observed that there is a tendency of lower mean sedentary behavior as age increases ($p < 0.01$). Meanwhile, education and income ($p < 0.01$) showed a direct linear relationship with the outcome. Individuals that were married or living with a partner had 53 minutes/day more than the mean sedentary behavior in relation to single individuals. In addition, individuals active at work spent 107 minutes/day less than the mean of the outcome, compared to those that were inactive at work.

In the adjusted analysis, age maintained the previous trend ($p < 0.01$). The variables schooling ($p < 0.01$) and income ($p = 0.01$) also remained associated, reiterating the direct relationship with the mean of the outcome. Marital status and physical activity at work did not maintain the statistical association after adjustment. The variables that remained associated in the final model explain the variation of the outcome in 17% ($R^2 = 0.17$).

Excessive sedentary behavior and watching television showed prevalences of 12.5 and 10.3%, respectively. After the adjusted analysis, both outcomes were associated with higher income quartiles ($p = 0.02$ and $p = 0.04$, respectively), and for the first, prevalence ratio (PR) = 1.19 (95%CI: 1.02–1.38) and for the second, PR=1.18 (95%CI: 1.01-1.40). In addition, excess sedentary behavior was also associated with more schooling ($p < 0.01$), with PR = 1.34 (95%CI: 1.09–1.65), and excess time watching television was associated with marital status ($p = 0.04$). Widowers had a higher probability of this behavior compared to single individuals (PR = 2.53; 95%CI: 1.01 - 6.32) (data not described in the tables).

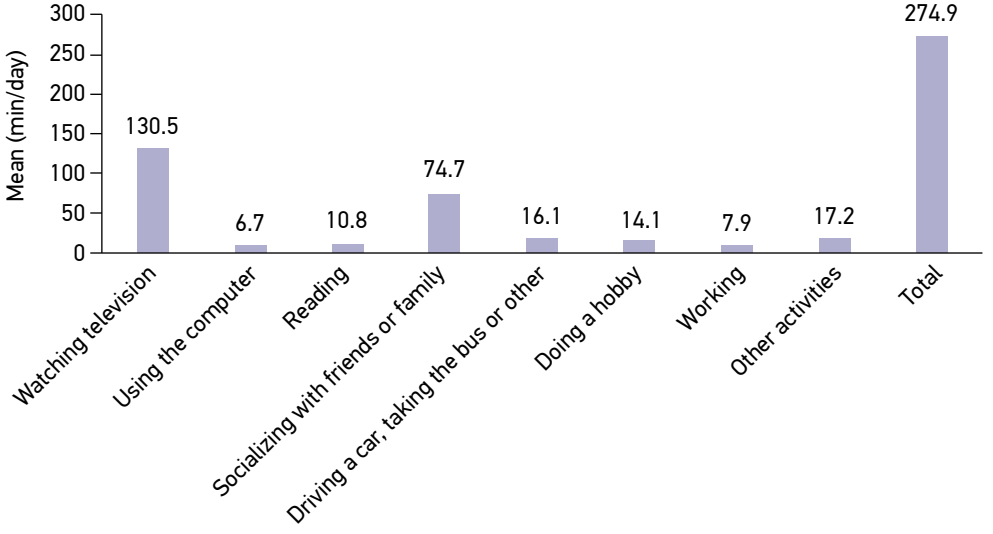

Figure 1. Description of the means of sedentary behaviors of elderly people living in rural areas (Rio Grande/RS, 2017, n=1,030).

Table 2. Multivariate analysis between sedentary behavior and socioeconomic, demographic and physical activity (PA) variables in elderly residents of rural areas (Rio Grande/RS, 2017, n = 1,030).

Variables	Crude Analysis		Adjusted Analysis	
	Beta (95%CI)	p	Beta (95%CI)	p
Sex				
Male	0	0.53	0	0.46
Female	6.6 (-14.3; 27.6)		7.8 (-13.1; 28.7)	
Age				
60–65	0	<0.01*	0	<0.01*
66–70	-18.4 (-47.1; 10.3)		-18.4 (-47.1; 10.3)	
71–75	-15.8 (-45.6; 14.0)		-15.8 (-45.6; 14.0)	
76–80	-33.7 (-69.7; 2.3)		-33.7 (-69.7; 2.3)	
80+	-40.8 (-73.5; -8.0)		-40.8 (-73.5; -8.0)	
Marital status				
Single	0	0.03	0	0.07
Married/lives with partner	53.4 (16.7; 90.0)		45.8 (7.7; 84.0)	
Separated	40.9 (-9.2; 91.0)		44.3 (-7.1; 95.7)	
Widowed	39.9 (-1.2; 81.1)		55.3 (12.5; 98.0)	
Schooling (years)				
0	0	< 0.01*	0	< 0.01*
1 to 4	-0.4 (-27.6; 26.7)		-11.5 (-39.8; 16.8)	
5 to 8	31.8 (0.5; 63.2)		14.6 (-18.4; 47.7)	
9 or more	129.2 (85.9; 172.3)		101.4 (54.8; 147.9)	
Income (Quartile)				
1 (Lowest)	0	< 0.01*	0	0.01*
2	23.8 (-4.2; 51.6)		15.2 (-14.5; 44.9)	
3	33.6 (0.7; 66.5)		28.9 (-5.7; 63.5)	
4 (Highest)	58.4 (29.0; 88.8)		39.9 (7.4; 72.4)	
PA at work*				
No	0	0.01	0	0.14
Yes	-107.9 (-191.9; -23.9)		-63.4 (-149.0; 22.2)	
PA in displacement				
No	0	0.73	0	0.77
Yes	3.6 (-17.6; 24.9)		10.4 (-61.4; 82.3)	
PA in leisure				
No	0	0.10	0	0.37
Yes	17.6 (-3.9; 39.1)		27.2 (-32.2; 86.7)	

Crude and adjusted analyzes performed by linear regression. The hierarchical levels of analysis were: first (sex and age), second (marital status, education and income) and third (physical activity - work, travel and leisure). In the final model, the following variables remained associated (p <0.20): age, marital status, education, income and physical activity at work (R^2 = 0.17); * p-trend.

DISCUSSION

The present study found that the mean amount time spent on sedentary behavior in an elderly population living in a rural area was 274 minutes/day. Among the aspects studied, the habit of watching television represented the largest portion of sedentary time. After the adjusted analysis, the outcome still remained positively associated with socioeconomic variables such as income and education. However, it was negatively associated with age.

The mean sedentary time found seems to be slightly lower compared to other studies of elderly people in urban areas, which is about five hours/day in developed countries[24-27]. As for place of residence, the results of the present study are higher than the mean found in rural adults in China[16]. As such, one must take into consideration the elderly people's situation and how the outcome was collected. The use of eight aspects was more complete than what was found in the literature, where there are studies evaluating aspects such as visiting friends, driving, reading, watching television and working at a table or computer,[24,27] and total sitting time per day[25,26]. In the present study, the measurement of eight aspects allowed a more detailed and accurate description of the sedentary behavior of such individuals.

The aspect with the highest mean was the habit of watching television (130 minutes/day), representing approximately half of the sedentary time found in the study. This aspect is of great importance because it is also unfavorably related to men and women's blood glucose, metabolic syndrome, waist circumference and systolic pressure[8]. In addition, excessive television remains associated with all-cause mortality, regardless of the high levels of physical activity[7]. This relationship of time watching television with health is still unclear, and its effects may have more to do with food consumption than television iteslf[28]. However, this kind of sedentary behavior among the elderly seems to make sense, considering that watching television is the main leisure activity in this age group[29]. It is not up to this paper to deepen the discussion of leisure practices; however, the theme is relevant to people's lives. Excessive television, in addition to its possible health effects, also restricts access to creative, diversified leisure and other means of communication.

Age was negatively associated with mean sedentary behavior, similar to what was found in another adult study in a nearby city[13] and to a systematic review, which found that total sitting time decreased after retirement[30]. On the other hand, a review of the determinants of sedentary behavior in the elderly found that, in general, studies found a positive association with age[15]. Although there is no consensus on the association between age and sedentary behavior, lower values for older individuals appear to have a good result, whereas excess sedentary behavior is related to an increased risk of mortality in this age group[11]. This finding can be explained by the aspects that were investigated, such as time on the television and computer, considering that they are "recent" devices, especially in rural areas, and are part of the daily lives of younger individuals in general.

Regarding education, the results are in agreement with a study of adults in the city of Pelotas, which found higher sedentary behavior means for individuals with higher levels of education[13], which may indicate a characteristic of the region. As such, when excess sedentary behavior (≥ 8 hours/day) in the present study was analyzed, an increased tendency was also observed as education level increased. Nevertheless, several studies have found an inverse association between these variables[31,32]. It should be noted that, in the present study, the population resided in the rural area, which may indicate a different sedentary behavior profile. In addition, education may be related to the aspects investigated, mainly due to its connection with income, such as computer use or having time to sit while working.

Income was positively associated with sedentary behavior, as was also found in other studies[13,17], which may be related to verified aspects of sedentary behavior, such as watching television, using a computer, driving a car or other transport vehicle. In order to have any value in this regard, it is necessary that the individual has a television or computer, which may indicate a higher income level. Another important factor is that income was positively associated with both total sedentary behavior (≥8 hours/day) and watching television (≥ 5 hours/day). Therefore, income is possibly one of the main aspects related to sedentary behavior. Possible initiatives that are interested in modifying behaviors need to consider such a consistent association.

Excessive time watching television remained associated with marital status after adjustment. The results indicated that widowers had a higher probability of outcome than single people. On the other hand, in adults living in rural areas, there seems to be no difference between being married or not[16]. In this sense, the relationship between marital status and sedentary behavior is not well defined[17]. The greater likelihood of widowers having a higher prevalence of excess television watching may be due to the the age and loneliness of these individuals, because of the death of their partner.

Although it did not remain associated in the final model, the practice of physical activity deserves attention, given its relationship with the outcome. Of the domains studied, most of the elderly were not only active during leisure times, but the vast majority were also active at work. These results may help explain the low mean sedentary behavior, considering that the prevalence of physical activity found is higher in leisure and displacement time than in the elderly in rural Minas Gerais[33]. However, it should be recognized that the practice of physical activity at work was only answered by those individuals who work, reducing the number of elderly people in the final model of analysis. The variable was maintained in the final model because it had a similar result being included or not, and it was the only domain of physical activity with any difference in sedentary behavior.

It is important to highlight some strengths and limitations of the present study. The population studied and their place of residence are uncommon in the literature. More studies are found in the elderly population than in the rural population. However, no studies specifically addressing these two characteristics were found. Another factor that makes comparison with other studies difficult is the type of measurement used. In the present study,

we chose to treat the outcome by its mean, but stratified analyzes were also performed from the cutoff points.

Nevertheless, the instrument used, with various aspects of sedentary behavior, allows for a better proxy for overall sedentary behavior. Regarding the limitations, the questionnaire used considered the outcome through the individual's reporting of the previous week, which may present memory errors, considering the age of the population. Furthermore, behavior was not differentiated between weekdays and weekends. The interviewers were trained to collaborate with the individual, giving examples, helping to calculate their time in each aspect, and explaining the questionnaire as clearly as possible. In addition, physical activity was not collected in the best way, preventing a sum of the domains.

CONCLUSION

The mean time spent in sedentary behavior found in the present study seems to be lower compared to literature that includes the elderly population. Therefore, rural elderly may be less exposed to possible consequences of sedentary behavior. However, younger elderly with higher levels of education and income had higher means, and the habit of watching television represented almost half of the total outcome time.

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Received on: 04/13/2018
Revised on: 12/08/2018
Accepted on: 12/10/2018

Author's contributions: O.A.A.L participated in all stages of the article. A.G.K and R.D.M. participated in the writing and editing of the text.