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Neighborhood environmental characteristics and sedentary behavior in later life: the EpiFloripa Study

Características do ambiente do bairro e comportamento sedentário em idosos: o estudo EpiFloripa

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ABSTRACT

Little is known about the relationship between perceived environmental characteristics and sedentary behavior (SB) using accelerometry in older adults. The aim of this study was to investigate the association between perceived neighborhood environmental characteristics and SB using accelerometry in 423 older adults from Florianopolis, Brazil. The time spent in SB was measured by an accelerometer (Actigraph-GT3X and GT3X+) for seven days and it was defined as < 100 counts per minute. Neighborhood characteristics were assessed using the 17-item of the A-NEWS scale. Linear regression was used to examine the association between perceived neighborhood environmental characteristics and SB. The results showed that older adults spent about 631.9 minutes/day in SB which corresponds to 66% of their waking time/day. Men who reported *"access to shops"* (β = *-66.87; 95%CI:* -113.80; -19.66), *"access to services"* (β = *-65.65; 95%CI:* -118.63; -12.61), "access to *food shops*" (β = -78.38; 95%CI: -123.79; -32.93) and "*access to bus stop*" (β = -66.69; 95%CI: -110.32; -22.95) spent over one hour less in SB. In women, lower SB was associated to easier "*access to clubs and gyms*" (β = -24.57; 95%CI: -48.13; -0.89) and "*access to open spaces gyms*" (β = *-31.67 95%CI: -58.80; -4.21). These findings indicate that better access and greater diversity of places in the neighborhood environment could be an important factor to reduce SB in older Brazilian adults.*

Keywords: Sedentary behavior; Accelerometry; Neighborhood environment; Older adults, Brazil.

RESUMO

Pouco se conhece sobre a associação entre características do ambiente e comportamento sedentário (CS) medido por acelerometria em idosos. Esse estudo objetiva analisar a associação entre as características do ambiente percebido e CS em idosos de Florianópolis, Brasil. Participaram 423 idosos (62,1% mulheres) de Florianópolis, selecionados entre os participantes do Projeto EpiFloripa. O tempo despendido em CS foi mensurado por acelerometria (Actigraph-GT3X e GT3X+) por sete dias, considerado como CS abaixo de 100 counts. As características da vizinhança foram medidas por 17 itens da escala A-NEWS. Análise de regressão linear foi utilizada para testar a associação entre o as características percebidas do ambiente da vizinhança e o CS. Para essa finalidade foi usado o software Stata 13.0, utilizando o comando "svy" para amostra complexas e considerando pesos amostrais. Os resultados mostram que os idosos passam em média 631,9minutos/dia em CS, o que representa cerca de 66% do tempo em que estão acordados. Para os homens que reportaram perceber a presença de "comércio de venda produtos" (β = -66,87; IC95%: -113,80; -19,66), "comércio de serviços" (β = -65,65; IC95%: -118,63; -12,61), "comércio de venda de alimentos" (β = -78,38; IC95%: -123,79; -32,93) e "presença de pontos de ônibus" (β = -66,69; IC95%: -110,32; -22,95) o CS foi de aproximadamente uma hora a menos do que os que não percebem estes atributos do ambiente. Entre as mulheres idosas o menor CS foi associado com a "presença de clubes e academias" (β = -24,57; IC95%: -48,13; -0,89), "presença de academias ao ar livre" (β = -31,67; IC95%: -58,80; -4,21). Os resultados indicam que melhores acessos e maior diversidade de lugares no ambiente da vizinhança podem ser fatores importantes para reduzir o CS em idosos.

Palavras-chave: *Comportamento sedentário; Acelerometria; Ambiente da vizinhança; Idosos; Brasil.*

Introduction

Sedentary behavior (SB) has been defined as any waking behavior characterized by an energy expenditure ≤ 1,5 metabolic equivalents (METs), while in a sitting, reclining or lying posture[1]. A growing body of evidence highlights the negative consequences of prolonged SB, after adjusting for physical activity in all age groups[2–4]. In older adults (≥ 60 years old) the negative outcomes

of excessive SB time are associated with metabolic syndrome, adverse cardio-metabolic biomarkers, raised waist circumference, overweight/obesity, mental disorders, cancer and higher mortality risk[3,5]. Evidence shows that older adults are the most sedentary group, with average levels of objectively assessed sedentary behavior reaching 500 minutes/day or more[6], representing about 66% of their waking time[7].

The identification of factors leading to SB could contribute to the development of more effective interventions aimed at reducing SB[8]. Among the various factors that may influence SB (i.e. intrapersonal, interpersonal and environmental), neighborhood environmental characteristics have been under investigated[9], especially in the Latin America context[10]. The literature shows that long distances from home, unfavorable walking places and cycling facilities and poor traffic safety could increase sedentary transportation[11]. In addition, some residential aspects, like living near specific facilities (e.g. Santos, the largest port in Latin America), could increase time spent in SB and physical inactivity[12] in older adults. Therefore, neighborhood environmental characteristics could be associated and influence older adults' health.

Evidence also suggests that the pattern and amount of time spent in SB differ by sex, with men being more susceptible to low-expenditure energy activities, like TV watching, compared to women[8]. Furthermore, objectively measured data investigating the association between neighborhood environmental characteristics and time spent in SB in older adults, considering sex differences, are still scarce in Brazil. Most studies investigated TV time through IPAQ measures, however, these methods tend to underestimate the time spent in SB[11]. Thus, the aim of this study was to examine the association between perceived neighborhood environmental characteristics and sedentary behavior in older adults from Florianopolis, Brazil.

Methods

This was a cross-sectional study using data from the second wave of the Health Conditions of Oder Adults cohort (EpiFloripa Ageing Study) conducted in Florianopolis, Santa Catarina, Southern Brazil. The study included older adults aged 60 and older of both genders living in the urban area. The city is the capital of Santa Catarina state and is characterized by a high Human Development Index compared to the national Brazilian average (0.847 versus 0.755)[13].

The first wave of the EpiFloripa Ageing Study occurred in 2009/10 (n = 1,705) and the second in 2013/14 (n = 1,197). The baseline (2009/10) sampling method used was clustering in two stages. In the first stage, 80 of 420 census tracts were systematically selected, taking the average of monthly household income into consideration. In the second stage, the households were the units. Sectors with fewer than 150 households were grouped and those with more than 500 households (according to the corresponding income decile) were divided, resulting in 83 census sectors. The sample size was calculated based on the prevalence that generated the maximum data variability (50%), a margin of error of 4 percentage points and confidence level of 95%. The sample was doubled to correct the design effect. An extra 35% was also added due to the expected non-response rate and controlling for confounding variables in the multivariate analysis. Therefore, the final sample included 1,599 older adults[14].

For the second wave an active search aiming at recruiting all participants who took part at wave 1was done using telephone contacts, letters, posters, electronic media and health information systems. From 1,702 respondents in the first wave, we identified 376 losses (22,1%), which included 217 deaths and 129 refusals (7,6%), totaling 1,197 participants in 2013/2014 (response rate of 70.3%)[14].

In 2013/14, participants were invited by telephone to undergo clinical and imaging examinations and monitoring tests. Participants who refused to undergo the tests after three unsuccessful telephone contacts were considered refusals. Those who did not attend the examinations after the third scheduled visit were considered losses. The sub-sample consisted of 604 participants. All procedures were approved by the Ethics Committee on Research Involving Humans of the Federal University of Santa Catarina (Approval No. 526.126).

SB was evaluated with GT3X and GT3X+ accelerometers (Actigraph) and the data were analyzed with the Actilife software (Actigraph). The participants were instructed to use the accelerometer for seven consecutive days, attached on the right side of the hip with an elastic belt, removing it only for sleeping, having a shower or performing activities involving water (for instance hydroginastic and swimming). Participants showing low mobility (wheelchair users, bedbound individuals and those with locomotion difficulty) were considered ineligible. Monitoring and quality control of accelerometer use were performed by telephone

contact on the second and fifth day of use. Consecutive values of zero (with a tolerance of two minutes) over 60 minutes or more were interpreted as a period of non-use and were excluded from the analysis. The data were only considered valid when a participant had used the accelerometer and had accumulated a minimum number of records over four days of use during the week (i.e. 10 hours/day) and one weekend day (8 hours/day)[15]. The mean SB value was calculated using the following cut-off point: SB (0-99 counts/minute)[16]. All data were analyzed as minutes/day to adjust for the number of days when the device was used.

Perceived neighborhood environmental characteristics were measured using a previous validated Neighborhood Environmental Walkability Scale (NEWS)[17,18]. Seventeen questions related to the residents' perceptions of the environmental attributes of their local area were used in the present study. Ten questions assessed the neighborhood infrastructure: presence of trade in products; trade in services; food trade; bus stops; public recreation areas; clubs and gyms; outdoor gyms; sidewalks; green areas along the sidewalks and garbage accumulation. Two items about traffic safety: difficulty to move due to traffic and presence of pedestrian traffic light and/or footbridge). There were two items about safety in the neighborhood (security in the surroundings during the day and security in the surrounding during the night). Social support was measured using three items (Invitation by friends/neighbors to physical activity (PA) in the neighborhood; invitation by relatives to PA in the neighborhood; presence of neighborhood-oriented PA). The responses were dichotomized as yes or no.

Sociodemographic data were collected during a face-to-face interview at the participant's home. The following covariates were used: gender (female and male), age group (60 to 69, 70 to 79, and ≥ 80 years), education level (0-4, 5-11, and ≥ 12 years of schooling) and the self-rated health status was obtained by asking "In general, would you say that your health is very good, good, regular, poor, or very poor?" The response options were grouped into three categories: very good/good, regular, and poor/very poor. BMI was calculated considering the cut-off points of the Food and Nutritional Surveillance System[19] (< 22 kg/m^2: low weight; ≥ 22 and < 27 kg/m^2: eutrophic; ≥ 27 kg/m^2: excess weight) and dichotomized into adequate (low weight + eutrophic) and excess weight. The models were adjusted using BMI as a continuous variable. The mean value for each physical activity intensity was calculated: light physical activity (100-1951 counts/min), moderate physical activity (≥ 1,952 counts/min)[16]. Individuals were regarded as meeting physical activity guidelines if they have engaged in moderate to vigorous intensity physical activity 30 minutes or more per day[20]. Participants reporting ≥ 150 minutes MVPA/week measured by an accelerometer were classified as active and those performing ≥ 10 to 149 min MVPA/week as insufficiently active[21].

Descriptive statistics were performed and relative and absolute frequencies, means, standard deviations and 95% confidence intervals (95%CI) were reported. Linear regression models were used to assess the association between perceived neighborhood environmental characteristics and sedentary behavior in older adults. Each variable of the perceived neighborhood environmental characteristics was tested with sedentary behavior in minutes/day. All models were adjusted for age group (60 to 69, 70 to 79, and ≥ 80 years), education level (0-4, 5-11, and ≥ 12 years of schooling), body mass index (BMI) and self-rated health status. A significance level of 5% was adopted in all analyses. The analyses considered the sampling weights and were performed using the Stata 13.0® software (Stata Corporation, College Station, USA).

Results

Of the 604 participants initially invited to participate in the study 5% (n = 30) were losses, 3% (n = 18) were refusals and 22% (n = 133) were exclusions. The final sample comprised 423 older adults aged 63 to 92 years (62% women), with mean age of 73.95 (IC95%: 73.50-74.45). Almost half (40.43%) of the sample had four years or less of schooling. Over half of the participants (65.84%) rated his/her health as poor/very poor and had overweight (56.35%). The proportion of older adults meeting the PA guidelines was about 1/4 (24.184%). The average time spent in SB was 631.94 (SD = 5.13) minutes per day, meaning 65.75% (SD = 0.42) of total waking time (Table 1).

Overall, the results from the analyses using the total sample and stratified by sex, both unadjusted and adjusted, showed that several neighborhood environmental characteristics were significantly associated with less time spent in SB (Table 2). In the total sample model the presence of "access to shops" (β = -36.88; 95%CI: -59.92; -13.89), "access to food stores"(β = -39.83; 95%CI: -69.38; -10.02), "access to bus stop"(β = -48.87; 95%CI: -88.23; -9.64), "access to leisure public spaces" (β = -25.04;

Table 1 – Descriptive characteristics of the older adult's sample. Florianopolis, Brazil, 2013-2014 (n = 423).

Variables	n	%
Gender		
Men	160	37.82
Women	263	62.20
Age (years)		
60-69	189	44.73
70-79	178	42.15
≥ 80	56	13.23
Schooling (years)		
0-4	171	40.44
5-11	135	31.96
≥ 12	117	27.79
Self-rated health		
Very good/good	22	5.26
Regular	122	28.98
Poor/very poor	278	65.99
BMI (kg/m^2) categories		
Low weight (< 22)	36	8.52
Eutrophic (< 27)	148	35.17
Excess weight (≥ 27)	237	56.31
Meeting physical activity guidelines[a]	102	24.18
Sedentary time, minutes per day[a]– mean (SE)	631.94 (5.13)	
Light physical activity, minutes per day[a]– mean (SE)	308.76 (4.84)	
MVPA, minutes per day[a]– mean (SE)	19.41 (10.09)	

a Information on sedentary time and physical activity were derived from accelerometers. Continuous sedentary time and physical activity are in minutes per day. The intensity levels are based on Freedson's cut-points; i.e. sedentary time (0–99 counts per minutes, cmp), light-intensity physical activity (100–1951 cpm), and moderate to vigorous intensity physical activity (≥1,952 cpm). Individuals were regarded as meeting physical activity guidelines if engaging in moderate to vigorous intensity physical activity 30 min or more per day.

95%CI: -49.75; -0.17), "access to clubs and gyms" (β = -30.81; 95%CI: -50.64; -10.76), "access to open space gyms" (β = -36.71; 95%CI: -61.04; -12.33) and "access to oriented physical activity program at the neighborhood" (β = -30.01; 95%CI: -52.38; -7.62) remained significantly associated (p-value ≤ 0.05) with less time spent in SB after adjustment. The presence of "access to services commerce" (β = -25.49; 95%CI: -54.14; 3.53) was also associated (p-value ≤ 0.10). The presence of "greenness upon sidewalks" was associated (p-value ≤ 0.10) with increased time spent in SB (β = 18.76 95%CI: -4.21; 41.73).

In the stratified analysis by sex, men's environmental perception was further associated with time spent in SB than women. After adjustment, particular environmental characteristics were associated (p-value ≤ 0.05) with less time spent in SB for men: presence of "access to shops" (β = -66.87; 95%CI: -113.80; -19.66), "access to services commerce" (β = -65.65; 95%CI: -118.63; -12.61), "access to food stores" (β = -78.38; 95%CI: -123.79; -32.93) and "access to bus stop" (β = -66.69; 95%CI: -110.32; -22.95). The presence of "greenness upon sidewalks" and "accumulated trash in the streets" was associated (p-value ≤ 0.10) with increased time spent in SB for men. For women, less time spent in SB was associated (p-value ≤ 0.05) with presence of "access clubs and gyms" (β = -24.57; 95%CI: -48.13; -0.89), "access open spaces gyms" (β = -31.67; 95%CI: -58.80; -4.21), and (p-value ≤ 0.10) "access to shops" (β = -25.42; 95%CI: -51.80; 1.18). There were no neighborhood environmental characteristics significantly associated with increased SB in women.

Discussion

Favorable neighborhood environmental characteristics were associated to less time spent in sedentary behavior in older adults. The findings highlighted gender differences, with men reporting more neighborhood characteristics associated to time spent in SB compared to women. Overall, our findings showed that access to shops, bus stop, leisure spaces, clubs and open air and indoor gyms was associated to spending less time in SB (i.e. a reduction between 25 and 49 minutes per day). For men, having access to various types of businesses and bus stops in the neighborhood was associated with reductions in time spent in SB greater than an hour (i.e. -66 and -78 minutes per day, respectively). Among women, a reduction between 25 and 32 minutes per day spent in SB was associated to the presence of gyms and leisure clubs both indoor or outdoor. To the best of our knowledge, this is the first study in Brazil to investigate the role of neighborhood environmental characteristics as risk factors to reduce sedentary behavior in later life using an objective measure i.e. accelerometry. Older adults are more likely to be sedentary and this behavior has been measured by TV watching time[9,22,23]. However, TV watching represents only 1/3 of the total time spent in SB[24]. SB is highly prevalent in older adults and it is a risk factor for various health problems[3,5-7].

Our findings showed some sex differences. Men who reported having access to various types of businesses and shops spent less time in SB. Our findings corroborate previous research showing that older adults living in areas with more businesses and services spent less time in SB[11,23,25]. Data from the US, Australia and Belgium showed that proximity and diversity of places to go are associated to less sitting time and less sedentary time during displacement in older adults[11]. A

Table 2 – Multiple linear regression analysis for the association between perceived neighborhood environmental characteristics and sedentary behavior in older adults from Florianopolis, South, Brazil, 2013-2014 (n = 423).

Environmental variables†	All (n = 423)		Men (n = 160)		Woman (n = 263)	
	Crude	Adjusted[a]	Crude	Adjusted[a]	Crude	Adjusted[a]
	β (95%CI)	β (95%CI)	β (95%CI)	β (95%CI)	β (95%CI)	β (95%CI)
Access to facilities						
Access to shops	-37.11 (-62.98; -11.40)*	-36.88 (-59.92; -13.89)*	-59.08 (-109.09; -9.11)*	-66.87 (-113.80; -19.66)*	-25.44 (-52.19; 0.94)**	-25.42 (-51.80; 1.18)**
Access to services commerce	-29.42 (-59.54; 0.76)*	-25.49 (-54.14; 3.53) **	-52.29 (-104.26; -0.50)*	-65.65 (-118.63; -12.61)*	-15.83 (-47.87; 15.80)	-7.13 (-37.62; 23.46)
Access to food stores	-42.15 (-70.51; -13.65)*	-39.83 (-69.38; -10.02)*	-66.62 (-111.35; -21.63)*	-78.38 (-123.79; -32.93)*	-25.43 (-59.05; 7.81)	-16.82 (-47.84; 14.08)
Access to bus stop	-54.76 (-106.65; -2.80)*	-48.87 (-88.23; -9.64)*	-65.21 (-109.92; -20.25)*	-66.69 (-110.32; -22.95)*	-45.95 (-115.55; 23.39)	-46.11 (-103.15; 10.87)
Access to leisure public spaces	-21.91 (-46.73; 3.08)**	-25.04 (-49.75; -0.17)*	-30.09 (-69.73; 9.62)	-31.02 (-74.85; 12.69)	-18.83 (-47.22; 9.21)	-21.79 (-48.97; 5.45)
Access to clubs and gyms	-30.32 (-52.01; 8.75)*	-30.81 (-50.64; -10.76)*	-26.65 (-67.41; 14.43)	-47.18 (-84.69; 0.15)	-33.54 (-62.5; 4.52)*	-24.57 (-48.13; -0.89)*
Access open spaces gyms	-38.94 (-63.01; -14.81)*	-36.71 (-61.04; -12.33)*	-47.34 (-86.48; -7.83)*	-47.29 (-91.55; -2.93)*	-34.69 (-63.92; -5.01)*	-31.67 (-58.80; -4.21)*
Places to walking						
Sidewalks	20.48 (-7.63; 48.61)	24.11 (-12.65; 60.8)	55.01 (-24.34; 134.25)	57.22 (-26.6; 141.09)	-2.44 (-34.01; 29.17)	9.85 (-19.3; 38.83)
Greenness upon sidewalks	20.13 (-2.08; 42.55)**	18.76 (-4.21; 41.73) **	40.29 (-3.21; 83.73)**	40.46 (-5.59; 86.62)**	6.21 (-19.47; 32.05)	7.92 (-16.06; 31.91)
Accumulated trash in the streets	34.30 (3.03; 65.45)*	25.33 (-6.87; 57.21)	56.14 (0.11; 112.01)*	53.43 (-3.92; 110.97)**	19.77 (-31.46; 70.8)	0.01 (-44.25; 44.24)
Safety related to traffic						
Difficulty in active transportation due to traffic	-5.36 (-30.13; 19.38)	-7.49 (-29.45; 14.34)	16.21 (-18.36; 50.93)	15.91 (-15.94; 47.77)	-20.37 (-58.15; 17.53)	-24.01 (-56.93; 8.97)
Access to the pedestrian area, traffic light	3.71 (-24.96; 32.15)	3.83 (-24.14; 32.01)	16.82 (-27.61; 61.42)	15.19 (-27.81; 58.34)	-5.31 (-33.38; 22.72)	2.18 (-26.21; 30.39)
Safety related to crime						
During daytime	10.13 (-24.16; 44.45)	7.98 (-25.25; 41.13)	-2.24 (-54.12; 49.71)	-2.03 (-52.87; 48.72)	16.24 (-28.61; 61.39)	11.13 (-33.53; 55.72)
During night time	-3.15 (-25.23; 18.96)	-0.93 (-22.08; 20.27)	-13.33 (-45.87; 19.29)	-10.37 (-40.00; 19.51)	3.50 (-25.64; 32.92)	9.21 (-16.73; 35.55)
Social support						
Invitation from friends / neighbors for PA	-17.48 (-41.63; 6.70)	-16.66 (-40.33; 6.82)	-19.94 (-70.89; 30.97)	-13.84 (-60.21; 32.7)	-14.91 (-44.71; 14.94)	-13.14 (-45.93; 19.49)
Invitation from relatives for PA	-12.63 (-41.74; 16.54)	-13.98 (-39.72; 12.06)	-12.69 (-50.57; 25.01)	-20.13 (-55.92; 15.61)	-12.27 (-49.21; 24.42)	-9.04 (-42.01; 23.71)
Access to oriented PA program	-27.62 (-47.63; -7.42)*	-30.01 (-52.38; -7.62)*	-44.06 (-84.32; -3.84)*	-44.33 (-98.10; 9.27)**	-15.71 (-49.84; 18.13)	-21.11 (-52.24; 10.13)

β = Beta; 95%CI = 95% Confidence Interval; †Reference = Negative perception of environmental characteristics (strongly disagree and disagree); * = p < 0.05, ** = p < 0.10; aAdjusted for: sex, age, schooling, body mass index and self-rated health.

meta-analysis found a strong association between more physical mobility and the presence of various places to go, both perceived and objectively assessed[25]. Therefore, our association found between greater access to various businesses and services among older men could be partially explained by a greater physical mobility such as walking[25]. Older adults who live closer to shopping facilities are more likely to be motivated to go for walks and thus less time spent in SB. Increasing access to businesses, services and places for the practice of physical activity could be potentially an important strategy to reduce SB through increasing time spent in active mobility, especially among men.

Our analyses showed that both the presence of green areas and rubbish on pavements was associated to more time spent in SB in men. This finding could be explained by residents perceiving the presence of trees and bushes on pavements as well as piles of rubbish as obstacles that increase the risk of falls and, therefore, they were less likely to go for a walk or any physical

mobility. An intervention study in older adults found similar results to ours in that a perception of less green areas as obstacles on their walking paths increase two-fold walking activity in the intervention group (OR = 2.45; 95%CI: 1.01-5.92)[26]. Another study conducted in Santa Catarina state in Brazil showed that pavements in good condition were associated to a greater physical mobility[27]. In addition, it was observed a reduction of time spent in SB in men who lived in neighborhoods that promote physical activities, similarly to the findings from a systematic review showing that the lack of physical activities was associated to more time spent in SB[23].

In our study, women spending less time in SB was associated to the presence of clubs and indoor and outdoor gyms. Therefore, the neighborhood characteristics more important for women were related to leisure. The literature shows that the distance to physical activity places is associated to time spent in SB in terms of leisure[23]. A previous study investigating gender differences related to perceptions of neighborhood characteristics using data from different countries showed similar patterns to our findings[11]. The proximity and diversity of the destinations (e.g. shops) were more important to men but not to women. For example, among Japanese women the presence of places for physical activities in the neighborhood was associated to less SB and more physical mobility[25].

Surprisingly, perceptions about traffic safety and crime were not associated to SB among our participants. Despite the lack of studies investigating this aspect in older adults, it is likely that in safer neighborhoods there is more active mobility of their residents and less SB[8,11]. Therefore, there is a need for more research on the impact of safety on SB in later life. Evidence shows that in safer neighborhoods there is more physical activities especially among women and older adults[28-30].

Our study contributes to the understanding of the relationship between SB and neighborhood environmental characteristics as well as sex differences. While for men proximity and diversity of places that can be reached by walking showed a significant association with SB, for women, the presence of infrastructure promoting the practice of physical activities were more important factors. Importantly, the sex differences described above should be considered when planning interventions aiming at reducing SB in older adults.

This study has some limitations and strengths that should be acknowledged. We have used data from a sub-sample of participants of EpiFloripa who were not selected at random. Another limitation is its cross-sectional nature which does not allow us to establish causality. On the other hand, to the best of our knowledge, this is one of the few studies to investigate the relationship of SB with neighborhood environmental characteristics in later life using accelerometry. Another strength relates to the use of a validated and widely used instrument to measure neighborhood perceptions which was applied through a face-to-face interview. The use of an objective measure of physical activity i.e. accelerometer increased the reliability and relevance of our findings.

In conclusion, neighborhood environmental characteristics can affect the time spent on sedentary behavior among older Brazilian adults and this association varied by sex. For men, the neighborhood characteristics associated to less time in SB were related to transportation such proximity and diversity of places to go. For women, characteristics related to leisure (i.e. clubs and gyms) were more important and associated to less time spent IN SB. Therefore, considering the negative health impacts of great amount of time spent in SB, especially among older adults, our findings suggest that environmental interventions are an important strategy aiming at reducing sedentary behavior in later life. Further research should explore the associations found longitudinally.

Conflict of interest

The authors declared no conflict of interest.

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Author´s contribuition

All authors made substantial contributions to the design of the study. Arins GCB, was responsible for writing, analysis and interpretation of data. Santos CES, participated in the writing and data collect. Giehl MWC, participated in interpretation of data and critical review of the text. Benedetti TRB, Oliveira C, and D'Orsi E, participated in the writing and critical review of the text. D'Orsi E, was also responsible for the EPIFLORIPA project. Rech CR, participated in the initial concept and design of the study, analysis and interpretation of data and critical review of the text. All authors read and approved the final manuscript.

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