Original Articles

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Physical activity and environment perception among older adults: a population study in Florianópolis, Brazil

ABSTRACT

OBJECTIVE: To estimate the prevalence of the practice of leisure-time physical activity in older adults and to analyze its association with environment perception.

METHODS: Cross-sectional population study conducted from September 2009 to June 2010 with 1.656 individuals aged 60 years or older, living in the urban zone of the city of Florianópolis, Southern Brazil. Leisure-time physical activity was measured using the long version of the International Physical Activity Questionnaire. Environment perception variables were measured by means of a modified version of the Neighborhood Environment Walkability Scale. Crude and adjusted analyzes were carried out using Poisson regression with a 5% significance level.

RESULTS: The prevalence of leisure-time physical activity was 29.7% (95% CI: 26.0; 33.3); 35.6% (95%CI: 29.7; 41.6) among men and 26.3% (95%CI: 23.1; 29.4) among women. The elderly who reported the existence of sidewalks, bike lanes, pedestrian paths and trails in the neighborhood, as well as those who reported receiving support from friends or neighbors to engage in physical activities, were more active in their leisure time. Concerning the influence of the climate, the elderly who reported that it was a barrier were rated as more active.

CONCLUSIONS: The practice of leisure-time physical activity still has low prevalence among the elderly population of Florianópolis. Public spaces for the practice of physical activity and encouraging group activities may play a significant role in the promotion of leisure-time physical activity in older adults.

DESCRIPTORS: Aged. Motor activity. Leisure Activities. Perception Environment. Social Environment. Cross-sectional studies.

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INTRODUCTION

Regular physical activity can reduce the risk factors associated with morbidity and mortality among older adults. Being physically active can alter the course of many diseases that are prevalent in this population.[12,18,22]

It is known that the practice of physical activity decreases as age advances. Thus, a large part of the elderly population is physically inactive, mainly in leisure time.[1,13,25] This population group has more available time due to retirement; therefore, the evaluation of the activities in this domain is an important indicator of their level of physical activity.[25]

This theme has been approached mainly in investigations of the association between levels of physical activity and sociodemographic[13,25] and health[22] factors, leaving a gap in the understanding of the variables related to the

environmental factors that best explain this behavior in the elderly population.

Recent international studies[7,11,15] have shown constant associations between active behavior and environments that facilitate the practice of physical activity. However, only one study was found in Brazil about the theme with the elderly population.[21]

Thus, the aim of the present study was to estimate the prevalence of leisure-time physical activity in older adults and to analyze its association with environment perception.

METHODS

This is a cross-sectional, population, household-based study conducted from September 2009 to June 2010, with a sample composed of elderly individuals aged 60 or older living in the urban zone of the city of Florianópolis, Southern Brazil. The study is part of a comprehensive inquiry[a] into the health conditions of the elderly people of Florianópolis, carried out in 2009/2010, and called *EpiFloripa Idoso*.

The municipality of Florianópolis, the capital city of the State of Santa Catarina, had in 2009[b] an estimated population of 408,163 inhabitants. Of this total, 44,460 belonged to the group with age equal to or above 60 years (10.8% of the overall population). The city presented a municipal human development index of 0.88 in 2000, which placed it in the fourth position among the Brazilian municipalities, and life expectancy at birth was 72.8 years.[c]

Sample size estimation considered population's size of 44,460, estimate of prevalence of leisure-time physical activity of 26%,[6] sampling error of 4 percentage points, a 95% confidence interval, design effect of 2.6, addition of 20% for possible losses and refusals and 15% to control for confounding factors in association studies. Therefore, a sample of 1,604 individuals was necessary. The total sample of *EpiFloripa Idoso* was used, calculated in 1,599 individuals. The calculations were made in the program EpiInfo, version 6.04.

Two-stage cluster sampling was carried out. In the first stage, the 420 urban census tracts were stratified according to income deciles of the head of household. Eight sectors were drawn in each decile (a total of 80 sectors). The sampling units of the second stage were the households, which were drawn in a systematic way. It was necessary to have a stage to update the number of households inhabited in each sector, as the most recent Census had been performed in 2000. The number of

inhabited households varied from 61 to 725. To reduce the coefficient of variation among the number of households of the sampling units, the sectors were merged and divided, respecting the correspondent income decile. Thus, the initial coefficient of variation was reduced from 52.7% (n = 80 sectors) to 35.2% (n = 83 sectors). It was estimated that 60 households should be visited per sector, in order to find 20 elderly individuals. All the elderly living in the drawn households were considered eligible for the study.

Institutionalized elderly individuals were excluded. Interviews that were not performed after four attempts (including the evening period and weekends) were considered losses, and subjects who did not answer the questionnaire as a personal option were considered refusals. No substitutions were made.

Data was collected by trained interviewers who had completed Secondary Education and were fully available to perform the fieldwork. A structured questionnaire with pre-coded questions was administered in the form of face-to-face interviews. Personal digital assistants were used, which eliminated the manual keyboarding of the data. Before the data collection, a pre-test with 30 elderly people and a pilot study with approximately 100 elderly people were carried out, in sectors that were not sampled to the research.

Data consistency was verified on a weekly basis and incomplete or inconsistent information was corrected in a second interview whenever necessary. Quality control was performed once a week by means of the administration of a reduced questionnaire, by telephone, to 10% of the interviews (which were randomly selected).

The outcome variable of the present study was level of leisure-time physical activity, measured by the long version of the International Physical Activity Questionnaire (IPAQ), adapted and validated to older adults of Brazil.[5] Individuals who practiced 150 minutes per week or more of leisure-time physical activity were classified as physically active in this domain.[18]

The exploratory variable was environment perception, collected by means of an adapted version[21] of the Neighborhood Environmental Walkability Scale (NEWS), validated to Brazil.[16] The alternatives of answers of the adapted version of the NEWS scale were standardized as dichotomic (yes or no). Environment perception was composed of 22 questions related to the individual's perception of the physical and environmental structures close to his/her home, like the presence and quality of the sidewalks; presence of

green areas, parks, squares; safety in traffic and safety in the neighborhood. The opportunities for the practice of physical activities, like the presence of bike lanes, trails, walking paths, sports courts, and the occurrence of sports events and guided walks in the neighborhood, as well as the social support for the practice of physical activities and weather aspects were also obtained. The elderly were instructed to consider "close to their homes" the places at which they were able to arrive in up to 15 minutes on foot.

The control variables that were included were: sex; age group; self-reported skin color, excluding yellow and Indian because of the low number of occurrences (n=12, 0.73%; n = 16, 0.97%); marital status; level of schooling; *per capita* family income (1st quartile: ≤ R$ 327.50; 2nd quartile: between R$ 327.50 and R$ 700.00; 3rd quartile: between R$ 700.00 and R$1,500.00; and 4th quartile: > R$ 1,500.00); cognitive status investigated by the Mini-Mental State Examination (MMSE), dichotomized in absence or probable cognitive deficit, using cut-off points that take the level of schooling into account.[10] Functional capacity was determined by the scale of basic and instrumental activities of daily living (ADL) with 15 items, and was categorized into: absence of dependence, mild dependence (incapacity/difficulty in performing 1-3 activities) and moderate/severe dependence (incapacity/difficulty in four or more activities).[19]

Descriptive analyses were conducted (calculation of means, medians and standard-deviation [SD]) for numeric variables. Calculation of proportions and 95% confidence intervals (95%CI) were performed for categorical variables.

To verify the association between the outcome and the independent variables of environment perception, Poisson regression was used to estimate prevalence ratios (PR) in the bivariate and multiple analyses, and 95% confidence interval (95%CI).[4] Based on the results of the bivariate regression, all the variables that presented p<0.20 were included in the multiple analysis, and those with p<0.05 and/or that adjusted the model remained in the final model. The Poisson regression model was built with the variables being included in the model one by one, organized from the lowest to the highest p value.

The effect of each variable of environment perception on leisure-time physical activity was adjusted by demographic variables (sex and age group), socioeconomic variables (level of schooling and *per capita* income) and health status (functional capacity).

All the analyses were conducted in the Stata 9.0 statistical package, using the *svy* command, which considers the effect of cluster sampling design.

The project was approved by the Ethics Research Committee of Universidade Federal de Santa Catarina under the protocol no. 352/2008 on December 23, 2008. The subjects were informed of the study's objectives and were asked to sign a consent document.

RESULTS

In the drawn households, 1,911 eligible elderly individuals were found, of whom 1,705 were interviewed, resulting in a response rate of 89.2% (206 losses and/or refusals). There were 49 interviews answered by caregivers (for elderly people who were unable to answer due to severe cognitive impairment) and it was decided to exclude them from the analysis, as the study aimed to analyze individual perception in relation to environment factors. The reproducibility of some questions used in the study presented kappa values between 0.3 and 0.9.

The sample included more women than men (63.9%). More than 86% of the elderly reported white skin color and 58.8% stated they were married or living with partners. As for the other demographic characteristics, more than half of the elderly were aged between 60 and 69 years, with variation between 60 and 102 years (mean of 70.4; SD = 7.8 and median of 69 years), approximately 40% stated having low level of schooling (≤ 4 years of schooling), with a mean of 7.6 years of schooling (SD = 5.8). The mean *per capita* income was R$ 1,348.97 (SD = R$ 2,596.28; median of R$ 700.00). In relation to health conditions, the proportion of elderly people with absence of cognitive deficit was of 53.2%, while 72.3% of the sample's subjects reported some dependence to perform activities of daily living (Table 1).

The prevalence of elderly people who are physically active in leisure time (≥ 150 minutes of leisure-time physical activity per week) was 29.7% (95%CI 26.0;33.3), being higher in men (35.6% [95%CI 29.7;41.6]) compared to women (26.3% [95%CI 23.1;29.4] (Figure). The elderly individuals' mean of minutes/week of leisure-time physical activity was 131.8 minutes (SD = 216), 161.5 minutes (SD = 240.3) for men and 115.0 minutes (SD = 199.2) for women.

Concerning environment perception, the existence of public lighting at night (90.4%), the sensation of safety during the day (77.5%), the existence of sidewalks (77.3%) and of green areas (67%) and the presence of pedestrian tracks (62.4%) were the perceived environment factors most reported by the elderly. Approximately 70% considered the quality of the sidewalks as regular or poor (Table 2).

Table 2 also shows that leisure-time physical activity was more prevalent among the elderly who perceived

Table 1. Description of the sample of elderly individuals. Florianópolis, Southern Brazil, 2009-2010.

Variable	n	%
Sex		
Male	598	36.1
Female	1,058	63.9
Age group (years)		
60 to 69	846	51.1
70 to 79	596	36.0
80 or more	214	12.9
Skin color		
White	1,410	86.8
Mixed ethnicity (black and white)	131	8.0
Black	84	5.2
Marital status		
Married/with partner	974	58.8
Single/Divorced/Separated/	225	13.6
Widowed	457	27.6
Level of schooling (years)		
≤ 4	716	43.5
5 to 8	315	19.1
9 to 11	231	14.0
≥ 12	386	23.4
Per capita income in reais (quartile)		
1st quartile (lowest)	414	25.0
2nd quartile	418	25.2
3rd quartile	414	25.0
4th quartile (highest)	410	24.8
Cognitive status		
Without cognitive deficit	876	53.2
With cognitive deficit	771	46.8
Functional capacity		
Absence of dependence	458	27.7
Mild dependence	707	42.7
Moderate/severe dependence	491	29.6

the existence of sidewalks (32.1%), of pedestrian tracks (32%), bike lanes, paths and trails (38.7%) and the absence of steep areas (32.0%) in the neighborhood; it was also more expressive among those who reported being invited by friends or relatives to practice physical activities (34.9% and 35.3%, respectively) and among those who perceived the weather as a barrier to the practice of physical activity (33.3%).

Table 3 presents the crude and adjusted values of the PR of the outcome. In the crude analysis, significantly higher prevalence ratios were observed for elderly individuals who reported the existence of sidewalks (PR = 1.48 [95%CI: 1.20; 1.84]), pedestrian tracks (PR

= 1.23 [95%CI 1.00; 1.50]), sensation of safety during the day (PR = 1.24 [95%CI 1.04; 1.49]), invitation from friends and neighbors (PR = 1.24 [95%CI 1.07; 1.44]), or from relatives (PR = 1.27 [95%CI 1.04; 1.56]), to practice physical activities, existence of bike lanes, pedestrian paths or trails (PR = 1.44 [95%CI 1.19; 1.73]), and influence of the weather (PR = 1.23 [95%CI 1.01; 1.51]).

After the adjusted analysis, the following remained positively associated with the outcome: being invited by friends or neighbors to practice physical activities (PR = 1.26 [95%CI 1.03; 1.43]), the existence of bike lanes, pedestrian paths or trails in the neighborhood (PR = 1.25 [95%CI 1.03; 1.43]), and the influence of the weather (PR = 1.26 [95%CI 1.05; 1.52]) (Table 3).

DISCUSSION

The main findings of the present study show important associations between factors of the perceived environment and leisure-time physical activity, independently of the effects of sociodemographic and health variables. The presence of infrastructure in the neighborhood and of social support increased the prevalence of the practice of leisure-time physical activity. Specifically, the existence of bike lanes, pedestrian paths or trails next to the households and being invited by friends or neighbors to practice physical activities were positively associated with higher level of physical activity in this domain. In the same way, although the weather was referred as a barrier to the practice of physical activities, the group who reported this situation was more active.

The proportion of elderly individuals who were physically active in leisure time was 29.7%, slightly higher than the one observed in a previous study (25.7%) carried out in the same city, with the same instrument and cut-off point.[6]

In a study[1] conducted in the Northeast of Brazil, using the short version of the IPAQ, the authors found similar proportions of active elderly people. In the international context, the prevalence of leisure-time physical activity was also similar, 26.9% in the USA and 30.2% in Canada.[2,13] However, the utilization of different instruments or criteria to classify the levels of physical activity hinders the comparison between the results of the studies.

An interesting finding was the association between existence of sidewalks and practice of leisure-time physical activity, an information that corroborates the results of the existing literature;[11,23] however, this variable lost association in the adjusted analysis. It is possible that the regular or poor quality of the sidewalks in the neighborhoods, reported by approximately 70% of the elderly, has influenced this result.

The main physical activity reported by this population was walking[13,21] and the places that were frequently chosen for this activity are streets and sidewalks in the surroundings and other public spaces. These findings illustrate the importance of the presence of good quality

Table 2. Distribution of variables of environment perception and leisure-time physical activity in elderly individuals. Florianópolis, Southern Brazil, 2009-2010.

Variable	n	%	Prevalence LTPA	95%CI
Existence of sidewalks	1,651			
No		22.7	21.6	16.8;26.4
Yes		77.3	32.1	28.2;35.9
Existence of green areas	1,653			
No		33.0	29.0	23.5;34.5
Yes		67.0	30.0	26.0;33.9
Existence of flat streets	1,655			
No		51.7	28.8	24.7;32.8
Yes		48.3	30.6	25.3;35.9
Existence of hills that limit the pathway	1,654			
No		56.5	32.0	27.0;37.0
Yes		43.5	26.7	22.7;30.7
Existence of accumulation of garbage on the streets	1,653			
No		84.1	30.3	26.4;34.2
Yes		15.9	26.6	20.5;32.7
Existence of open sewer	1,653			
No		88.3	30.4	26.6;34.2
Yes		11.7	24.4	17.1;31.6
Difficulty in walking or riding a bicycle due to the traffic	1,636			
No		63.0	30.2	25.8;34.6
Yes		37.0	29.7	24.9;34.5
Existence of pedestrian tracks	1,647			
No		37.6	26.1	21.2;31.0
Yes		62.4	32.0	27.7;36.4
Existence of pollution smoke	1,652			
No		89.0	29.3	25.3;33.2
Yes		11.0	33.5	26.2;40.8
Existence of public lighting in the streets at night	1,649			
No		9.6	28.9	20.9;37.0
Yes		90.4	29.8	26.0;33.6

To be continued

Table 2 continuation

Variable	n	%	Prevalence LTPA	95%CI
Sensation of safety during the day	1,643			
No		22.5	25.1	20.8;29.5
Yes		77.5	31.3	27.2;35.4
Sensation of safety during the night	1,630			
No		66.9	30.3	26.5;34.0
Yes		33.1	29.3	23.4;35.2
Invitation from friends or neighbors to practice physical activities	1,639			
No		74.5	28.2	24.6;31.7
Yes		25.5	34.9	29.2;40.6
Invitation from relatives to practice physical activities	1,639			
No		71.0	27.7	24.4;30.9
Yes		29.4	35.3	28.2;42.4
Existence of bike lanes, pedestrian paths and trails of easy access	1,637			
No		73.8	26.9	23.8;30.0
Yes		26.2	38.7	31.5;5.9
Existence of parks, squares, walking paths, sports courts of easy access	1,641			
No		63.7	29.2	24.3;34.0
Yes		36.3	31.3	26.3;36.2
Occurrence of sports events in the neighborhood	1,637			
No		79.4	28.9	24.7;33.1
Yes		20.6	33.5	27.4;39.7
The weather (cold, rain, heat) limits the practice of physical activities[a]	1,607			
No		49.2	27.1	22.5;31.7
Yes		50.8	33.3	28.4;38.2

LTPA: leisure-time physical activity
[a] Variable with the highest number of ignored observations = 49.

sidewalks and streets as an environment that facilitates physical activity, as well as the relevance of researching and intervening in the characteristics of urban spaces that favor leisure activities.[9,14,20]

This research showed that proximity to leisure structures, like bike lanes, pedestrian paths or trails was significantly associated with higher level of leisure-time physical activity, in agreement with the literature.[8,14,15] These urban spaces that offer easy-to-access leisure

structures for the practice of physical activity can also play an important role in the active behavior patterns of the elderly population.

Previous studies[14,15] have identified positive associations between accessibility to leisure structures, like parks, green areas, trails and bike lanes, as well as the quality of these environments in the neighborhood, with active behavior. On the other hand, Booth et al[8] (2000) have confirmed that the structural limitations in the environment represent obstacles to the practice of physical activity, verifying that older adults who do not live close to leisure structures and spaces tend to be less physically active.

The positive role played by social support in the elderly individuals' practice of physical activity has been observed in other studies.[3,17,21] According to these researchers, physical activity becomes more pleasant when one has company, and social support acts intrinsically by means of the incentive and of partnerships between friends and neighbors, and extrinsically, motivating other people to exercise in the neighborhood's environment.
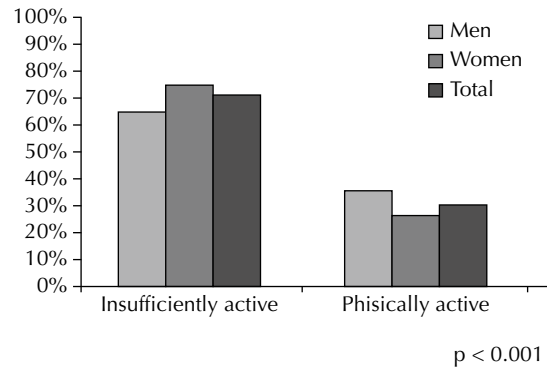

Figure. Prevalence of leisure-time physical activity in elderly individuals. Florianópolis, Southern Brazil, 2009-2010.

Elderly people in the present study who reported that the weather is a barrier to the practice of physical activities presented higher prevalence of the outcome. It is possible that active elderly individuals expose themselves more frequently to adverse weather conditions and thus reported this fact as a barrier, but not an impediment to the practice of physical

Tabela 3. Crude and adjusted prevalence ratios of the association between leisure-time physical activity and environment perception variables among elderly individuals. Florianópolis, Southern Brazil, 2009-2010.

Variable	Crude analysis		Adjusted analysis[a]	
	PR (95%CI)	p	PR (95%CI)	p
Existence of sidewalks		<0.001[b]	1.22 (0.97; 1.53)	0.09
No	1			
Yes	1.48 (1.20;1.84)			
Existence of green areas		0.74		
No	1			
Yes	1.03 (0.85;1.26)			
Existence of flat streets		0.54		
No	1			
Yes	1.06 (0.87;1.30)		1	
Existence of hills that limit the pathway		0.07[b]	0.89 (0.74; 1.08)	0.22
No	1			
Yes	0.84 (0.69;1.01)			
Existence of accumulation of garbage on the streets		0.29		
No	1			
Yes	0.88 (0.69;1.12)		1	
Existence of open sewer		0.15[b]	0.81 (0.61; 1.07)	0.13
No	1			
Yes	0.80 (0.59;1.08)			
Difficulty in walking or riding a bicycle due to the traffic		0.86		
No	1			
Yes	0.98 (0.82;1.18)		1	
Existence of pedestrian tracks		0.05[b]	0.99 (0.80; 1.23)	0.96
No	1		1	
Yes	1.23 (1.00;1.50)		0,99 (0,80;1,23)	

To be continued

Table 3 continuation

Variable	Crude analysis		Adjusted analysis[a]	
	PR (95%CI)	p	PR (95%CI)	p
Existence of pollution smoke		0.28		
Não	1			
Sim	1.15 (0.89;1.47)			
Existence of public lighting in the streets at night		0.834		
No	1			
Yes	1.03 (0.78;1.36)			
Sensation of safety during the day		0.02[b]		0.23
No	1		1	
Yes	1.24 (1.04;1.49)		1.11 (0.94;1.31)	
Sensation of safety during the night		0.75		
No	1			
Yes	0.97 (0.80;1.18)			
Invitation from friends or neighbors to practice physical activities		0.006[b]		0.008[c]
No	1		1	
Yes	1.24 (1.07;1.44)		1.26 (1.03;1.43)	
Invitation from relatives to practice physical activities		0.02[b]		0.15
No	1		1	
Yes	1.27 (1.04;1.56)		1.15 (0.95;1.34)	
Existence of bike lanes, pedestrian paths and trails of easy access		<0.001[b]		0.02[c]
No	1		1	
Yes	1.44 (1.19;1.73)		1.25 (1.03;1.43)	
Existence of parks, squares, walking paths, sports courts of easy access		0.54		
No	1			
Yes	1.73 (0.86;1.34)			
Occurrence of sports events in the neighborhood		0.19[b]		0.86
No	1		1	
Yes	1.16 (0.93;1.45)		1.02 (0.84;1.23)	
The weather (cold, rain, heat) limits the practice of physical activities		0.04[b]		0.02[c]
No	1		1	
Yes	1.23 (1.01;1.51)		1.26 (1.05. 1.52)	

[a] Adjusted by sex, age group, level of schooling, income and functional capacity.
[b] Variables included in the multivariable analysis.
[c] Variables that remained in the final model.

activity. Furthermore, Florianópolis has well-defined seasons, with a pleasant average annual temperature, which may not represent an obstacle to the practice of physical activity.

Conversely, a recent systematic review of the theme[24] has shown that the weather has a significant impact on this outcome and that bad or extreme weather is recognized as a barrier to the practice of physical activity.

Some methodological limitations of the present study should be considered, mainly the cross-sectional design, which does not allow to define causality relations between leisure-time physical activity and the environment factors. Objective information on the environment was not collected, only information about individual perception. However, this form of questioning has been widely used in studies of this nature with the aim of observing information reported by the elderly based on the perceptions of the environment in which they are inserted. Moreover, the physical activity assessment instrument that was employed (IPAQ) is recommended to individuals aged 18-64 years, although it has been validated and frequently applied to populations of Brazilian elderly people.[1,5,6,21]

Among the positive points, it is possible to mention that the study was carried out in a large and representative

sample of older adults of a Brazilian capital city. Also, it reproduced the population structure of the municipality[d] according to gender and age group and ensured the extrapolation of the results to the population as a whole. Another positive point was the high return rate in all income strata, which contributed to the study's internal validity, reducing the odds of occurrence of systematic errors.

Ascertaining that adequate environments to the practice of leisure-time physical activity in the neighborhoods contribute to an active behavior represents an important finding that may subsidize urban planning and public health policies. These policies include the design of interventions in the construction and maintenance of public leisure spaces, as well as social support, by means of group activities.

In view of the relevance of this theme, it is suggested that longitudinal studies are conducted aiming at a better understanding of the environmental factors, by means of objective information and of elderly people's individual perception, as well as their relation to the practice of physical activity during leisure time and in other contexts.

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REFERENCES

1. Alves JGB, Siqueira FV, Figueiroa JN, Facchini LA, Silveira DS, Piccini RX, et al. Prevalência de adultos e idosos insuficientemente ativos moradores em áreas de unidades básicas de saúde com e sem Programa Saúde da Família em Pernambuco, Brasil. *Cad Saude Publica*. 2010;26(3):543-56. DOI:10.1590/S0102-311X2010000300012

2. Ashe MC, Miller WC, Eng JJ, Noreau L. Older adults, chronic disease and leisure-time physical activity. *Gerontology*. 2009;55(1):64-72. DOI:10.1159/000141518

3. Ball K, Bauman A, Leslie E, Owen N. Perceived environmental aesthetics and convenience and company are associated with walking for exercise among Australian adults. *Prev Med*. 2001;33(5):434-40. DOI:10.1006/pmed.2001.0912

4. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol*. 2003;3:21. DOI:10.1186/1471-2288-3-21

5. Benedetti TRB, Mazo GZ, Barros MVG. Aplicação do Questionário Internacional de Atividades Físicas para avaliação do nível de atividades físicas de mulheres idosas: validade concorrente e reprodutibilidade teste-reteste. *Rev Bras Cienc Mov*. 2004;12(1):25-34.

6. Benedetti TRB, Borges LJ, Petroski EL, Gonçalves LHT. Atividade física e estado de saúde mental de idosos. *Rev Saude Publica*. 2008;42(2):302-7. DOI:10.1590/S0034-89102008005000007

7. Berke EM, Koepsell TD, Moudon AV, Hoskins RE, Larson EB. Association of the built environment with physical activity and obesity in older persons. *Am J Public Health*. 2007;97(3):486-92. DOI:10.2105/AJPH.2006.085837

8. Booth ML, Owen N, Bauman A, Clavisi O, Leslie E. Social-Cognitive and Perceived Environment Influences Associated with Physical Activity in Older Australians.

Prev Med. 2000;31(1):15-22. DOI:10.1006/pmed.2000.0661

9. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health*. 2001; 91(12):1995-2003. DOI:10.2105/AJPH.91.12.1995

10. Brucki SM, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. *Arq Neuropsiquiatr*. 2003;61(3B):777-81. DOI: 10.1590/S0004-282X2003000500014

11. Gallagher NA, Gretebeck KA, Robinson JC, Torres ER, Murphy SL, Martyn KK. Neighborhood factors relevant for walking in older, urban, African American adults. *J Aging Phys Act. 2010*;18(1):99-115.

12. Gregg EW, Cauley JA, Stone K, Thompson TJ, Bauer DC, Cummings SR, et al. Relationship of changes in physical activity and mortality among older women. *JAMA*. 2003;289(18):2379-86.DOI: 10.1001/jama.289.18.2379

13. Hughes JP, McDowell MA, Brody DJ. Leisure-time physical activity among US adults 60 or more years of age: results from NHANES 1999-2004. *J Phys Act Health*. 2008;5(3):347-58.

14. Huston SL, Evenson KR, Bors P, Gizlice Z. Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *Am J Health Promot*. 2003;18(1):58-69. DOI:10.4278/0890-1171-18.1.58

15. Li F, Harmer PA, Cardinal BJ, Bosworth M, Acock A, Johnson-Shelton D, et al. Built environment, adiposity, and physical activity in adults aged 50-75. *Am J Prev Med*. 2008; 35(1):38-46.

16. Malavasi LM, Duarte MFS, Both J, Reis RS. Escala de Mobilidade Ativa no Ambiente Comunitário News Brasil: tradução e reprodutibilidade. *Rev Bras Cineantropom Desempenho Hum*. 2007;9(4):339-50.

17. Mathews AE, Laditka SB, Laditka JN, Wilcox S, Corwin SJ, Liu R, et al. Older adults' perceived physical activity enablers and barriers: a multicultural perspective. *J Aging Phys Act.* 2010;18(2):119-40.

18. Nelson ME, Rejeski JW, Blair SN, Duncan PW, Judge JO, King AC, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc.* 2007;39(8):1435-45. DOI:10.1249/mss.0b013e3180616aa2

19. Rosa TEC, Benício MHD, Latorre MRDO, Ramos LR. Fatores determinantes da capacidade funcional entre idosos. *Rev Saude Publica.* 2003;37(1):40-8. DOI:10.1590/S0034-89102003000100008

20. Sallis JF, Bowles HR, Bauman A, Ainsworth BE, Bull FC, Craig CL, et al. Neighborhood Environments and Physical Activity Among Adults in 11 Countries. *Am J Prev Med.* 2009;36(6):484-90. DOI:10.1016/j.amepre.2009.01.031

21. Salvador PE, Florindo AA, Reis RS, Costa, EF. Percepção do ambiente e prática de atividade física no lazer entre idosos. *Rev Saude Publica.* 2009;43(6):972-80. DOI:10.1590/S0034-89102009005000082

22. Sawatzky R, Liu-Ambrose T, Miller WC, Marra CA. Physical activity as a mediator of the impact of chronic conditions on quality of life in older adults. *Health Qual Life Outcomes.* 2007;5:68.

23. Strath S, Isaacs R, Greenwald MJ. Operationalizing environmental indicators for physical activity in older adults. *J Aging Phys Act.* 2007;15(4):412-24.

24. Tucker P, Gilliland J. The effect of season and weather on physical activity: a systematic review. *Public Health.* 2007;121(12):909-22. DOI:10.1016/j.puhe.2007.04.009

25. Zaitune MPA, Barros MBA, César CLG, Carandina L, Goldbaum M. Fatores associados ao sedentarismo no lazer em idosos, Campinas, São Paulo, Brasil. *Cad Saude Publica.* 2007;23(6):1329-38. DOI:10.1590/S0102-311X2007000600008