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# Perception of the environment and leisure-time physical activity in the elderly

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## ABSTRACT

**OBJECTIVE:** To analyze the association between leisure-time physical activity and perception of the environment in the elderly.

**METHODS:** Cross-sectional study performed with 385 elderly individuals aged 60 years or older, living in the district of Ermelino Matarazzo, in the city of São Paulo, Southeastern Brazil, in 2007. The long version of the International Physical Activity Questionnaire, in addition to specific questions for the study, was used to assess leisure-time physical activity. Assessment of the environment was performed using a perception scale adapted from the Neighborhood Environment Walkability Scale. For statistical analysis, multiple logistic regression models were stratified by sex and controlled by level of education. The cut-off point of 150 minutes of physical activity per week was used to classify individuals who were active during leisure time.

**RESULTS:** The proportion of elderly individuals active during leisure time was 15.2% (19.1% and 12.5% for men and women, respectively). Presence of sports courts (OR=2.95), banks (OR=3.82) and health clinics (OR=3.60), good perception of safety during the day (OR=4.21) and invitation from friends to exercise (OR=3.13) were associated with leisure-time physical activity in men. Presence of churches or religious temples (OR=5.73), gyms (OR=2.49) and squares (OR=3.63) were associated with leisure-time physical activity in women.

**CONCLUSIONS:** Programs to promote physical activities for the elderly population must consider the variables associated with public and private structures (gyms, squares, sports courts, health clinics and banks), places where there are social gatherings (churches), social support (invitation from friends to exercise) and perception of safety.

**DESCRIPTORS:** Aged. Motor Activity. Environment.

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## INTRODUCTION

The practice of physical activities is one of the key strategies to prevent non-communicable chronic diseases such as osteoporosis, type 2 diabetes mellitus, arterial hypertension, coronary artery disease and obesity.<sup>a</sup> Physical activity enables the elderly to have the opportunity for a more active and independent life, contributing to the maintenance of autonomy and better quality of life.<sup>5</sup> However, studies show that the proportion of active elderly individuals is still low, especially during leisure time.<sup>11,20</sup>

Although several socio-demographic factors such as gender, age, income, level of education, smoking and social support can influence the practice of physical activity in the elderly population during leisure time,<sup>6,13,23</sup> these variables do not fully explain this practice.

Especially from the 1990s onwards, American, Australian and European studies have shown that the (natural, constructed and social) environment is associated with leisure-time physical activity in the elderly.<sup>2,8,10,14,16</sup> However, in countries with average income such as Brazil, there are no studies linking the perception of environment and this practice in the elderly population.

The present study aimed to analyze the association between the practice of leisure-time physical activities and perception of the environment in the elderly.

## METHODS

A home-based cross-sectional study was performed with a representative sample of elderly individuals living in the district of Ermelino Matarazzo, in the city of São Paulo, Southeastern Brazil. This study was part of a broader research project<sup>b</sup> on the influence of individual and environmental factors on the level of leisure-time and commuting physical activity, performed in 2007.

The district of Ermelino Matarazzo has approximately 114,593 inhabitants and a population density of 12,807.85 inhabitants per km<sup>2</sup>. It is situated in the eastern region of São Paulo, considered the most populated of this city.

According to the last census conducted by the *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics) in 2000, Ermelino Matarazzo is comprised of 143 census tracts. The

sampling process was performed by cluster in three stages: census tract (when 35 of the 143 census tracts available were selected), random selection of households in the census tracts selected (the number of households selected was proportional to the size of each census tract) and random selection of an elderly individual in the household selected.

To select individuals in the household, the Kish method<sup>15</sup> was used, as it defines random tables according to the total number of residents. One table defined which individual should be interviewed, based on the number of elderly residents in the household. A total of eight different tables were used so that the selections could maintain randomness. In this way, elderly residents in the households were ordered according to age, in a decreasing order (from oldest to youngest). Individuals selected should be older than 60 years of age and have lived for at least six months at their address. Elderly individuals who had diseases or problems that affected leisure-time physical activity in the week preceding the interview or who had mental disorders that prevented them from answering the questionnaire by themselves were excluded from this study.

The following algebraic expression for the estimation of proportions was used to calculate the sample size:<sup>15</sup>

$$n_0 = \frac{P \cdot (1 - P)}{(d/z)^2} \cdot deff$$

Where:

- P: proportion of individuals to be estimated. Based on data from the City of São Paulo Health Survey, conducted in the city of São Paulo,<sup>7</sup> the value of 0.15 was adopted as 85% of individuals were found not to have reached the recommendations of at least 150 minutes of leisure-time or commuting physical activity in this city;
- z= 1.96: value in the reduced normal curve corresponding to the 95% confidence level;
- d= 0.065: sampling error allowed;
- deff=2.6: estimated design effect, based on City of São Paulo Health Survey data.

Thus, the minimum sample size was calculated to be 300 individuals.

<sup>a</sup> World Health Organization. Integrated prevention of noncommunicable diseases: draft global strategy on diet, physical activity and health. Geneva; 2003. (EB113/44 Add.1)

<sup>b</sup> Research "Atividade física e sua relação com o ambiente na população adulta do distrito de Ermelino Matarazzo da Zona Leste do município de São Paulo", supported by Fundação de Amparo à Pesquisa do Estado de São Paulo and Conselho Nacional de Desenvolvimento Científico e Tecnológico.

A total of 2,309 households were visited, of which 1,985 were successfully found. Out of 1,985 households, 1,455 did not have elderly residents. After exclusion of losses, refusals, and exclusions, the rate of response was 72.6%. In the end, 385 elderly individuals were included in the study.

The long version of the International Physical Activity Questionnaire (IPAQ), used in the City of São Paulo Health Survey<sup>7</sup> and whose validation and reproducibility have been described by Craig et al,<sup>4</sup> was applied to measure leisure-time physical activity. Questions about the following topics were added: types of moderate and vigorous physical activity practiced, place of main practice of (moderate and vigorous) physical activity, the form and length of transportation up to the place of main practice, and the existence or not of a physical education professional following the practice of physical activity.

Physically active individuals were considered to be those performing at least 150 minutes of leisure-time physical activity per week; less than ten minutes per week meant the individual was considered inactive; and those who performed at least ten minutes, but less than 150 minutes per week, were considered insufficiently active.

The Brazilian version of the Neighborhood Environment Walkability Scale<sup>21</sup> (NEWS), validated by Malavasi et al,<sup>18</sup> was used to assess the perception of environment. This scale underwent changes for better understanding by elderly individuals studied. The adapted final version of NEWS was discussed by specialists from the environmental and physical activity fields and comprised of 38 questions. The first part of the questionnaire was structured so that individuals answered how long it would take them to walk from their homes to different business, service or leisure locations in the district where they lived (parks, squares, places for walking, gyms, clubs, sports courts, soccer fields, bus stops, train stations, health clinics, drugstores, churches or religious temples, bakeries, banks, bars, free markets, grocery stores, markets and supermarkets). The second part of the questionnaire was comprised of questions about the environmental structures close to the elderly individuals' homes, such as the presence and quality of sidewalks and green areas; whether the streets were flat or not; places where there was piled-up garbage and open-air sewage near homes; whether or not traffic made it difficult to walk or ride a bicycle; whether or not there were crosswalks near homes; whether or not drivers usually respected pedestrians on crosswalks; whether or not there was pollution caused by smoke near homes; whether or not the streets close to homes were well-lit at night; whether or not elderly individuals considered it safe to walk around their homes during the day and at night; whether or not they received invitations from friends, neighbors or relatives to walk, ride

a bicycle or exercise in the neighborhood; whether or not the (cold, rainy or hot) weather made it difficult to walk, ride a bicycle or exercise in the neighborhood; and whether or not they had a dog and walked their dog. Elderly individuals were instructed to consider places they could reach in up to ten minutes on foot as close to their homes.

The modified scale from the original NEWS and the majority of responses were standardized as dichotomic scales based on pre-tests conducted before collection and involving discussions with researchers. However, no validation and reproducibility processes were performed.

All study variables were analyzed in a descriptive way using absolute and relative frequency, for women and men separately. The  $\chi^2$  test was performed to verify possible differences among levels of leisure-time physical activity, according to sex.

Bivariate regression analyses were conducted between leisure-time physical activities (dependent variable) and environmental variables (independent variables). Associations that showed  $p < 0.20$  were selected to prepare the multiple model.

Independent variables were organized in an increasing order, according to the level of significance, and the forward selection strategy was used in the model construction to create multiple logistic regression models, where each dependent variable was individually added and its permanence in or removal from the models depended on its statistical significance. The variable level of education was used as adjustment and added to the final model.

Sampling weights (complex sample) were used and all analyses were made with the SPSS software, version 15.0.

The study was approved by the Research Ethics Committee of *Faculdade de Saúde Pública da USP* (São Paulo University School of Public Health). All participants who performed a physical assessment received explanatory materials on preventive tests; guidance on Alzheimer's disease, quality of sleep, practice of physical activity and most suitable places to exercise; guidance on a healthy diet; and a booklet on elderly rights.

## RESULTS

Of all the 385 elderly individuals interviewed, the majority were women (60.5%); aged between 60 and 74 years (57.1%); white (55.5%); single, divorced or widowed (54.2%); who did not work (78.4%); non-smokers (86.6%); and who had studied until the third grade of primary school (47.6%).

**Table 1.** Classification of levels of leisure-time physical activity in the elderly population. Municipality of São Paulo, Southeastern Brazil, 2007.

Leisure- time physical activity	Men			Women			Total		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Inactive <sup>a</sup>	100	64.6	55.1;73.0	169	72.5	63.1;80.2	269	69.3	62.2;77.5
Insufficiently active <sup>b</sup>	23	16.3	10.6;24.2	37	15.0	11.0;20.3	60	15.6	12.2;19.8
Active <sup>c</sup>	29	19.1	12.2;28.8	27	12.5	7.1;20.9	56	15.1	10.1;22.2
Total	152	100.0		233	100.0		385	100.0	

<sup>a</sup> Less than 10 minutes of physical activity a week.

<sup>b</sup> Between 10 and 149 minutes of physical activity a week.

<sup>c</sup> 150 minutes or more of physical activity a week.

Both sexes showed proportions lower than 20% of active individuals during leisure time, with men showing a higher proportion of physically active individuals in relation to women ( $p < 0.041$ ). Women showed a higher proportion (72.5% vs. 64.5%) of physically inactive individuals ( $p < 0.05$ ). As regards the proportion of people classified as insufficiently active, there was no significant difference between women and men (Table 1).

Of all elderly individuals classified as physically active during leisure time, 87.7% of men and 63% of women practiced walking, followed by general gymnastics, Tai Chi and cycling (Figure).

Of all the 38 environmental variables, 13 were selected ( $p < 0.2$ ) for the analysis of multiple logistic regression in both sexes (Table 2).

Among men, six variables remained in the multiple model: good perception of safety during the day, presence of sports courts, length of walk to a health clinic of up to ten minutes, invitation from friends to exercise and presence of gyms close to home. After inclusion of the "level of education" variable, elderly individuals who had a good perception of safety during the day were four times more likely to be active during leisure time; those who had a sports court close to home were three times more likely to be active during leisure time; those who lived less than a ten-minute walk from a bank were five times more likely to be active during leisure time; those who lived less than a ten-minute walk from a health clinic were four times more likely to be active during leisure time and those who were invited by friends to exercise were three times more likely to be active during leisure time (Table 3).

Among women, three variables remained in the model: walks of up to ten minutes to a church or religious temple, presence of squares and presence of gyms. After inclusion of the "level of education" variable, elderly women who lived less than a ten-minute walk from a church or religious temple were almost six times more likely to be active during leisure time; those who lived near squares were four times more likely to

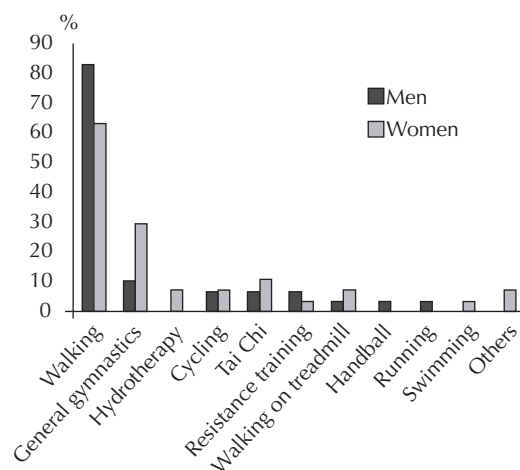
be active during leisure time; and those who lived near gyms were two times more likely to be active during leisure time (Table 4).

## DISCUSSION

There are few studies on this topic in the international literature and none in Brazil. The present study was the first to verify the association between environmental variables and leisure-time physical activity in elderly Brazilians.

Good perception of safety, presence of squares and gyms, living less than a ten-minute walk from a bank or health clinic and being invited by friends to exercise were associated with leisure-time physical activity in men, whereas living less than a ten-minute walk from a church and the presence of squares and gyms were associated with physical activity in women.

The proportion of active elderly individuals during leisure time found in the present study differs from



**Figure.** Categories of physical activity practiced by elderly during leisure time. Municipality of São Paulo, Southeastern Brazil, 2007.

**Table 2.** Association between variables of perception of environment and recommended practice of physical activity during leisure time in the elderly. Municipality of São Paulo, Southeastern Brazil, 2007.

Environmental variables	OR	95% CI	p
<b>Men*</b>			
Safety during the day	3.56	1.54;2.86	0.004
Presence of sports courts	2.27	1.07;4.85	0.035
Length of walk to a bank <sup>a</sup>	2.83	1.07;7.46	0.037
Walking a pet dog	2.60	0.98;6.89	0.055
Length of walk to a health clinic <sup>a</sup>	2.01	0.98;4.11	0.056
Presence of soccer fields	2.31	0.92;5.84	0.074
Invitation from friends to exercise	2.88	0.83;10.04	0.094
Presence of gyms	1.82	0.88;3.76	0.104
Length of walk to a gym*	1.82	0.87;3.80	0.110
Length of walk to a place suitable for walking*	1.98	0.84;4.64	0.114
Presence of crosswalks	1.82	0.78;4.24	0.160
Presence of grocery stores	3.02	0.62;14.70	0.165
Invitation from relatives to exercise	2.35	0.66;8.36	0.182
<b>Women*</b>			
Length of walk to a church <sup>a</sup>	6.08	1.53;24.16	0.012
Presence of squares	4.28	1.39;13.19	0.013
Presence of gym	2.51	1.18;5.35	0.018
Drivers respect crosswalks	10.04	1.30;77.32	0.028
Length of walk to a bank <sup>a</sup>	3.35	1.10;10.14	0.034
Length of walk to a grocery store <sup>a</sup>	2.48	0.86;7.15	0.089
Presence of green areas	2.09	0.88;4.97	0.094
Length of walk to a bar <sup>a</sup>	2.72	0.78;9.48	0.114
Length of walk to a square <sup>a</sup>	2.10	0.73;6.02	0.161
Presence of bars	2.67	0.64;11.12	0.170
Length of walk to a free market <sup>a</sup>	3.10	0.58;16.49	0.177
Length of walk to a gym <sup>a</sup>	1.83	0.73;4.54	0.188
Presence of flat streets	3.03	0.57;16.18	0.188

\* p&lt;0.20

<sup>a</sup> Walking for up to ten minutes.

other national results. Monteiro et al,<sup>19</sup> while analyzing 1,810 elderly individuals living in Southeastern and Northeastern Brazil and considering 150 minutes of physical activity per week as the criterion to classify those physically active, found proportions of only 7.3% and 6.3% of physically active individuals in men and women, respectively, nearly half the values found in the present study. On the other hand, Zaitune et al,<sup>26</sup> in a study performed (N= 426) in the city of Campinas, Southeastern Brazil, found a proportion of elderly individuals practicing leisure-time physical activity of 29.3%. Although the value is higher than that found in the present study, authors did not adopt the criterion of 150 minutes of physical activity per week as the cut-off point for classification. Florindo et al<sup>6</sup> studied 326 men in the greater São Paulo area, aged

50 years or older, and found a prevalence of 6.1% for any type of practice, frequency and time of physical activity in the last 12 months.

The type of physical activity most practiced by the elderly individuals in the present study in both sexes was walking, followed by general gymnastics, cycling and Tai Chi. This result was similar to that found by Monteiro et al<sup>19</sup> and walking was the activity most practiced by elderly men (84.6%) and women (80.0%). Hughes et al,<sup>11</sup> in a recent study published in the United States with a sample of 5,589 elderly individuals, showed that 34% of those who were active practiced walking during leisure time and this was the first physical activity option of this sample.

**Table 3.** Final multiple logistic regression model of recommended practice of leisure-time physical activity in elderly men. Municipality of São Paulo, Southeastern Brazil, 2007. (n=152)

Variable	Multiple model			Final model <sup>a</sup>		
	OR	95% CI	p	OR	95% CI	p
Good perception of safety during the day	4.51	1.26;16.15	0.022	4.21	1.29;13.79	0.019
Presence of sports courts	3.00	1.23;7.29	0.017	2.95	1.23;7.09	0.017
Length of walk to a bank of up to ten minutes	3.88	1.29;11.70	0.018	3.82	1.26;11.62	0.020
Length of walk to a health clinic of up to ten minutes	3.43	1.54;7.64	0.004	3.60	1.50;8.61	0.005
Invitation from friends to exercise	2.90	1.04;8.06	0.042	3.13	1.26;7.74	0.015
Presence of gyms	2.63	0.86;8.08	0.088	2.50	0.84;7.45	0.096

<sup>a</sup> Adjusted for level of education

Good perception of safety associated with leisure-time physical activity was found in different international studies. Guiles-Corti & Donovan<sup>9</sup> found a significant association between good perception of safety and recommended level of leisure-time physical activity in 1,803 Australian adults (OR=1.49, 95% CI: 1.14;1.95). Boehmer et al<sup>2</sup> observed that Americans who reported not feeling safe near their homes were 191% more likely to be inactive during leisure time than those who reported feeling safe near their homes (OR=2.91, 95% CI: 1.86;4.55). Although both studies showed a significant association between good perception of safety and leisure-time physical activity, they had adults and elderly individuals analyzed together as part of the sample. Only the study published by Lim & Taylor<sup>17</sup> (2005) analyzed elderly individuals exclusively (n=8,881) and, differently from the present study, there was no significant association between good perception of safety and the recommended levels of leisure-time physical activity (OR=0.94, 95% CI: 0.85;1.03). In the case of the district of Ermelino Matarazzo, an area involving social and structural inequalities, safety becomes a relevant factor for any tasks performed by elderly individuals, including the practice of leisure-time physical activities.

A total of four environmental structures constructed showed positive association with leisure-time physical activity in men: presence of sports courts and gyms in the district, walking for up to ten minutes to a health clinic and bank. Sports courts, gyms and health clinics

are suitable structures for the practice of leisure-time physical activity. Certain basic health units promote physical activity programs for users. In a study performed by Sallis et al,<sup>22</sup> it was observed that individuals who lived in districts with greater availability of places suitable for physical activity had a better chance of being involved with the practice of physical activities more than three times a week. Brownson et al<sup>3</sup> analyzed 1,818 adult and elderly Americans and showed that those who reported the presence of gyms in their district were 94% (OR=1.94, 95% CI: 1.45;2.60) more likely to be physically active during leisure time.

Huston et al<sup>12</sup> studied 1,796 adults and elderly individuals from seven different American cities and concluded that having access to places for physical activity such as parks, clubs and gyms around their homes or even in the workplace, schools, and community centers outside the district increased their chances of performing some type of leisure-time physical activity (OR=2.23, 95% CI:1.44;3.44) and achieving the recommendations of 150 minutes of moderate physical activity or 60 minutes of vigorous leisure-time physical activity (OR=2.15, 95% CI:1.23;3.77), compared to those who did not have the same access.

In contrast, while analyzing 1,209 adults and elderly individuals, Garcia Bengoechea et al<sup>8</sup> showed that men who agreed with the following statement, "I have easy access to places where I can exercise", were more likely to be physically active during leisure time (OR=1.82, 95% CI:1.00;3.31).

**Table 4.** Final multiple logistic regression model of recommended practice of leisure-time physical activity in elderly women. Municipality of São Paulo, Southeastern Brazil, 2007. (n=233)

Variable	Multiple model			Final model <sup>a</sup>		
	OR	95% CI	p	OR	95% CI	p
Length of walk to a church or religious temple of up to ten minutes	7.78	1.98;30.67	0.005	5.73	1.43;22.90	0.015
Presence of squares	5.41	2.11;13.83	0.001	3.63	1.33;9.88	0.013
Presence of gyms	3.66	1.45;9.20	0.007	2.49	1.10;5.62	0.029

<sup>a</sup> Adjusted for level of education

As regards banks, the present study assessed this structure in an individual way, differently from other studies, where banks were assessed as part of a set of other variables that can be associated with aspects that promote the practice of physical activity in the elderly. In this sense, the result of the present study could be an indication that close proximity to business and service structures, such as banks, can facilitate elderly individuals' routine tasks, in addition to its being associated with the presence of other aspects that promote the practice of leisure-time physical activities.

As for the influence of churches or religious temples on physical activity, only two studies by Wilbur et al<sup>24,25</sup> conducted this type of analysis and did not find significant results. In the case of the district of Ermelino Matarazzo, elderly women involved with religious activities were probably more likely to be active as they participated in activities developed in the religious institutions themselves, especially with the organization in groups.

The "invitation from friends to exercise" variable was significantly associated with leisure-time physical activity in men, a result similar to that found by Ball et al<sup>1</sup> in 3,392 adult and elderly Australians. Individuals who did not have company to exercise were 31% less likely to walk during leisure time.<sup>1</sup>

In terms of study limitations, the cross-sectional design does not enable the establishment of a relationship of

cause and effect, once the community environment may undergo constant changes that can influence both the perception of the environment and the association with physical activity in the elderly.

As regards the instrument to assess physical activity, only questions about the length of practice of leisure-time physical activity, time of practice and follow-up by a physical education professional were added, without modifications to the original questions of the long version of the IPAQ used in São Paulo.<sup>7</sup> Thus, this change does not interfere in the quality of information associated with the total amount of physical activity practiced. In addition, the choice for the long version of the IPAQ is justified in that the study was interested in assessing different contexts of physical activity separately (commuting, leisure time, household and occupational), an analysis that would not have been possible if the short version of the instrument had been used.

In conclusion, the present study showed that the set of specific structures of the community environment – such as the presence of churches or religious temples, squares, gyms, banks or basic health units, in addition to a good perception of safety and invitation from friends to exercise – are associated with the practice of leisure-time physical activity and must be considered when planning programs to promote physical activities for the elderly population.

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