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original article

Association between leisure-time physical activity and long-term medication use in adults from a low socioeconomic region

Associação entre prática de atividade física no tempo de lazer e medicação permanente em adultos de uma região de baixo nível socioeconômico

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Abstract – Few studies have investigated the association between leisure-time physical activity and long-term medication use in Brazilian populations, especially those of low socioeconomic status. The objective of this study was to analyze the association between the need for long-term medication and leisure-time physical activity in adults from the Ermelino Matarazzo district, a low-income region in São Paulo, Brazil. A population-based cross-sectional study was conducted in 2007 and involved 890 subjects aged 18 years or older. Data regarding the need for long-term medication and types of medications used were collected using a questionnaire. Leisure-time physical activity was measured using the long version of the International Physical Activity Questionnaire. Descriptive analysis, chi-square test, and simple and multiple binary and multinomial logistic regression analysis were used. Among the subjects studied, 29.2% reported the need for long-term medication and 10% required at least two different types of medications. After adjustment for gender, age, education level and Body Mass Index, subjects who did not perform at least 150 min/week of leisure-time physical activity presented 2.78 (95% confidence interval - 95%CI: 1.45; 5.30) and 4.69 (95%CI: 1.90; 11.53) times the odds of requiring long-term medication and two or more types of medications rather than none, respectively, than those who did. Broader discussion of the interaction between medication, leisure-time physical activity and social and economic aspects is needed to reduce inequalities and to improve the health of individuals of low socioeconomic status.

Key words: Motor activity; Healthy behavior; Socioeconomic factors; Drug therapy; Health status.

Resumo – *Poucos trabalhos estudaram a associação entre prática de atividade física no tempo de lazer e medicação permanente em brasileiros, especialmente, de baixo nível socioeconômico. O objetivo do estudo foi analisar a associação entre necessidade de medicação permanente e prática de atividade física no tempo de lazer em adultos do distrito de Ermelino Matarazzo, região de baixo nível socioeconômico do município de São Paulo, SP. Estudo transversal de base populacional, realizado em 2007, com 890 pessoas com 18 anos ou mais de idade. Dados sobre necessidade de medicação permanente e tipos de medicamentos foram coletados por questionário. Informações sobre a atividade física de lazer foram obtidas por meio do International Physical Activity Questionnaire (IPAQ), versão longa. Análise descritiva, teste do qui-quadrado e regressões logísticas binárias e multinomiais, simples e múltiplas, foram utilizadas. Observou-se que 29,2% relataram necessitar de medicação permanente e 10% necessitavam dois ou mais tipos diferentes de medicamentos. Após ajustes para sexo, idade, escolaridade e índice de massa corporal, pessoas que não realizavam, pelo menos, 150 min/sem de atividade física no lazer apresentaram odds 2,78 (intervalo de confiança de 95% - IC95%: 1,45; 5,30) e 4,69 (IC95%: 1,90; 11,53) vezes daqueles que realizavam ao menos esse volume de necessitar medicação permanente e de necessitar dois ou mais tipos de medicamentos do que nenhum, respectivamente. Reflexão mais ampla sobre a interação entre medicação, prática de atividade física no lazer e aspectos sociais e econômicos deve ser feita a fim de reduzir desigualdades e melhorar a saúde de pessoas com menores níveis socioeconômicos.*

Palavras-chave: *Atividade motora; Comportamento saudável; Fatores socioeconômicos; Medicamentos; Nível de saúde.*

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INTRODUCTION

There is no doubt that the advances in pharmacological therapy had an important impact on the reduction in morbidity and the increase in longevity throughout the 20th century and at the beginning of the 21st century. On the other hand, although Brazil is one of the few countries where citizens are entitled to free access to different essential medicines, studies have shown that the prevalence of medication use in the country is higher than that desired across all population strata[1]. This scenario is a matter of concern especially among individuals of low socioeconomic status, since expenses with medicines account for most of their private health expenditure. Furthermore, medication spending as a share of total expenditure on health is inversely proportional to income[2]. This scenario tends to increase health inequalities, with consequent health and even greater socioeconomic risks for poorer families[3].

On the other hand, some studies suggest that an increase in physical activity levels of the population can reduce medication use and spending[4-6]. In this respect, physical activity in the leisure domain may be particularly interesting. In addition to its physiological benefits (which are largely independent of the domain itself), leisure-time physical activity can influence health status in other manners, since it is related to pleasure and physical, social and psychological well-being and is not a compulsory activity. However, in Brazil few studies have investigated the association of physical activity with medication use[7,8]. Even fewer data are available for lower socioeconomic strata, which are more vulnerable to health problems and could benefit more markedly from programs encouraging physical activity[9] and promoting health[10].

Therefore, the objective of the present study was to evaluate the association between the need for long-term medication and leisure-time physical activity in adults from the Ermelino Matarazzo district, a low-income region in the municipality of São Paulo, Brazil.

METHODOLOGICAL PROCEDURES

A population-based, cross-sectional study was conducted in 2007 in the Ermelino Matarazzo district, Eastern part of the municipality of São Paulo, the most populated part of the city, with more than 30% of the 11 million inhabitants of São Paulo living in this region. The Ermelino Matarazzo district has about 114,000 inhabitants and a population density of 13,059 inhabitants per km^2 (<http://www.prefeitura.sp.gov.br/cidade/secretarias/subprefeituras/subprefeituras/dados_demograficos/index.php?p=12758>). This region grew in a disorderly fashion between the 1960s and 1970s and today faces various social problems. While the Human Development Index (HDI) of São Paulo is 0.841, the mean HDI of the Eastern districts is 0.790 and the Ermelino Matarazzo district occupies the 72nd position considering the HDI of the 96 districts of the city.

The sample of this study consisted of subjects participating in the study entitled "Physical activity and its relationship with the environment in the adult population of the Ermelino Matarazzo district, Eastern part of the municipality of São Paulo". This study was a home-based epidemiological survey involving a representative sample of adults living for at least 6 months in the Ermelino Matarazzo district.

In view of the objectives of the study (*i.e.*, to evaluate the association of environmental variables with leisure-time and transport-related physical activity), the sample size was calculated separately for adults (18 to 59 years) and older adults (≥60 years) considering the following parameters: 15% of subjects of the municipality who did not perform 150 min/week of physical activity in the leisure and transport domains (data obtained from the ISA-Capital survey[11]); a sampling error of 5 percent points for adults and of 6.5 percent points for older adults; 95% confidence interval (95%CI), and a design effect of 2.6 (estimated based on the ISA-Capital survey[11]). Thus, at least 510 adults and 300 older adults (a total of 810 subjects) would be necessary.

The sampling process consisted of three phases. First, 35 out of 143 census sectors existing in the district were selected at random, which were proportionally distributed according to the average education level of the head of the household. Next, households were randomly selected among the selected sectors at a number proportional to the size of each census sector. Finally, the adults and older adults of each selected household were randomly selected and 890 interviews were performed. Further details of the sampling process have been published elsewhere[12,13].

All subjects responded to a questionnaire applied by face-to-face interview. The interview procedures were standardized and the interviewers had been trained previously. Before answering the questionnaire, the subject was informed about the objectives of the study, the voluntary participation, and confidentiality of the data. All subjects who decided to participate in the study signed a free informed consent form.

In this study, the need for long-term medication (yes; no) and the number of the different types of long-term medications required (0; 1; ≥2) were used as dependent variables. A long-term medication was defined as a medication that the subject needed to use continuously for an indeterminate period of time. The following questions specifically elaborated for this survey were used to obtain this information: 1) "Do you need to take medicines on a long-term basis?"; 2) "Which types of medications do you need to take on a long-term basis?". The second question was only applied if the subject answered "yes" to the first question. A list of seven types of long-term medications (analgesics, anti-inflammatory agents, antibiotics, antihypertensive drugs, hypoglycemics, anorexigens, and tranquilizers) was used and, if necessary, other types were identified.

Two independent variables related to leisure-time physical activity were used. Data were collected using the long version of the International Physical Activity Questionnaire (IPAQ), which was adapted for application

to the adult population of Ermelino Matarazzo[12,13]. Leisure-time physical activity was divided into walking, moderate, and vigorous activities. For data collection, the subjects were asked whether they performed at least one type of physical activity during their leisure time, as well as the daily time and weekly frequency of each activity. The minutes of vigorous physical activity were multiplied by two. The sum of times of activities (min/week) defined the total leisure-time physical activity of each subject. On the basis of these data, two dichotomous variables were created and used as the independent variables: 1) leisure-time physical inactivity (yes; no), and 2) leisure-time physical activity (<150 min/week; ≥150 min/week).

The following variables were included for adjusted analysis: gender; age in years (18 – 39; 40 – 59; ≥60); education level in years (0 – 4; 5 – 8; 9 – 11; ≥12), and Body Mass Index (BMI) in kg/m^2 (<25.0; 25.0 – 29.9; ≥30.0).

Double entry of the collected data was performed. For analysis, weighting factors were assigned based on the age group and sample fraction of the census sectors, estimated from the 2000 Census Data of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística - IBGE). Absolute and relative frequencies and their 95%CI were used for descriptive statistics. For inferential statistics, the chi-square value was first calculated. Next, simple and multiple binary (need for long-term medication) and multinomial (number of different types of long-term medication) logistic regressions were performed and the results were expressed as odds ratios (OR) and 95%CI. For multiple analyses, adjustment variables were entered concomitantly in a single block (all variables presented $p<0.001$ upon bivariate analysis with the dependent variables). The data were analyzed with the SPSS 15.0 statistical package (SPSS Inc., USA) using the options of the complex samples module.

The study was approved by the Ethics Committee of the University of São Paulo School of Public Health (Faculdade de Saúde Pública da Universidade de São Paulo) (Protocol No. 1488, 12/04/2006).

RESULTS

A total of 890 subjects, including 505 adults (87.4%) and 385 older adults (12.6%), were interviewed. There was a predominance of women (55.2%), subjects with up to 8 years of schooling (46.2%), and subjects without excess weight (51.4%). With respect to leisure-time physical activity, most subjects were physically inactive (68.7%). Only 16% performed at least 150 min/week of leisure-time physical activity. Approximately one in three subjects reported to require long-term medication (Table 1). Of these, 34% (95%CI: 26.9%; 41.9%) required two or more different types of long-term medications.

The odds of need for long-term medication among physically inactive subjects was 1.84 times (95%CI: 1.16; 2.90) of those who performed some physical activity in this domain. However, there was no evidence of association after adjustment for gender, age, education level and BMI (Table 2).

A stronger association was observed when physical activity of at least 150 min/week was analyzed. The odds of requiring long-term medication among those who did not reach this threshold was 2.78 times (95%CI: 1.45; 5.30) of those who did. This association was independent of demographic characteristics and BMI (OR=2.49; 95%CI: 1.20; 5.15) (Table 2).

Table 1. Demographic characteristics, Body Mass Index, leisure-time physical activity and need for long-term medication of adults from the Ermelino Matarazzo district, São Paulo, Brazil (2007).

Variable	n	%*	95%CI*
Gender			
Male	368	44.8	40.0; 49.6
Female	522	55.2	50.4; 60.0
Age group (years)			
18 – 39	302	52.0	47.0; 57.0
40 – 59	203	35.4	30.9; 40.2
≥60	385	12.6	10.5; 15.0
Education level (years)			
0 – 4	387	27.7	23.2; 32.7
5 – 8	155	18.5	15.9; 21.4
9 – 11	252	39.3	35.0; 43.9
≥12	95	14.5	11.5; 18.0
Body Mass Index (kg/m^2)			
<25.0	386	51.4	47.5; 55.2
25.0 – 29.9	282	33.0	29.3; 36.8
≥30.0	140	15.6	12.5; 19.5
Leisure-time physical inactivity			
Yes	621	68.7	62.0; 74.6
No	269	31.3	25.4; 38.0
LTPA (min/week)			
<150	756	84.0	78.7; 88.2
≥150	134	16.0	11.8; 21.3
Need for long-term medication			
Yes	394	29.2	25.2; 33.7
No	496	70.8	66.3; 74.8
No. of different types of long-term medications			
0	503	71.4	67.0; 75.5
1	224	18.6	15.2; 22.6
≥2	163	10.0	7.7; 12.8

* Weighted values. LTPA: leisure-time physical activity.

Table 2. Prevalence and crude and adjusted odds ratios for long-term medication need of adults according to leisure-time physical activity. Ermelino Matarazzo district, São Paulo, Brazil (2007).

Variable	Long-term medication need				
	n	%*	p†	OR_{crude} (95%CI)	$OR_{adj.}$ (95%CI)§
Leisure-time physical inactivity					
Yes	289	33.0	0.01	1.84 (1.16; 2.90)	1.37 (0.85; 2.22)
No	105	21.1		1.00	1.00
LTPA (min/week)					
<150	346	32.0	0.002	2.78 (1.45; 5.30)	2.49 (1.20; 5.15)
≥150	48	14.5		1.00	1.00

* Weighted values. † Chi-square test. § Adjusted for gender, age, education level, and Body Mass Index. LTPA: leisure-time physical activity.

Bivariate analysis of the number of different types of long-term medication also indicated a higher odds of requiring at least one type of medication compared to none among physically inactive subjects (compared to those performing some physical activity) and among those not performing at least 150 min/week of leisure-time physical activity (compared to those who did) (Tables 3 and 4). However, after adjustment, this association only remained significant considering practice of at least 150 min/week of leisure-time physical activity. Subjects who did not achieve this threshold presented an odds of requiring two or more types of medications 4.69 times (95%CI: 1.90; 11.53) of those who did (Table 4).

Table 3. Prevalence of the number of different types of long-term medications required by adults according to physical activity. Ermelino Matarazzo district, São Paulo, Brazil (2007).

Variable	No. of types of long-term medications						p†
	0		1		≥ 2		
	n	%*	n	%*	n	%*	
Leisure-time physical inactivity							
Yes	337	68.0	160	21.0	124	11.1	0.03
No	166	79.0	64	13.5	39	7.5	
LTPA (min/week)							
<150	416	68.7	191	20.1	149	11.2	0.002
≥150	87	85.6	33	10.9	14	3.5	

* Weighted values. † Chi-square test. LTPA: leisure-time physical activity.

Table 4. Crude and adjusted odds ratios for the number of different types of long-term medications required by adults according to physical activity. Ermelino Matarazzo district, São Paulo, Brazil (2007).

Variable	OR_{crude} (95%CI)		$OR_{adjusted}$ (95%CI)*	
	0 vs. 1	0 vs. ≥2	0 vs. 1	0 vs. ≥2
Leisure-time physical inactivity				
Yes	1.81 (1.04; 3.14)	1.72 (0.95; 3.10)	1.34 (0.76; 2.36)	1.25 (0.62; 2.48)
No	1.00	1.00	1.00	1.00
LTPA (min/week)				
<150	2.31 (1.17; 4.54)	3.96 (1.58; 9.95)	2.00 (0.97; 4.15)	4.69 (1.90; 11.53)
≥150	1.00	1.00	1.00	1.00

* Adjusted for gender, age, education level, and Body Mass Index. Multinomial logistic regression. Reference category: no type of medication. LTPA: leisure-time physical activity.

DISCUSSION

The objective of this study was to evaluate the association between the need for long-term medication and leisure-time physical activity in adults from a low-income region. It was observed that subjects who did not perform at least 150 min/week of leisure-time physical activity presented higher odds of requiring long-term medication and two or more types of medications than none, irrespective of sociodemographic factors and BMI. However, no evidence of association was observed considering leisure-time physical inactivity.

To our knowledge, there are only two other Brazilian studies that investigated the association between physical activity and medication

use, having this as outcome. However, none of these studies exclusively evaluated leisure-time physical activity[7,8]. The first, a population-based cross-sectional study, was conducted in Pelotas, Rio Grande do Sul, and included 3,182 adults[7]. Physical activity was evaluated by the short version of IPAQ considering all domains, and the subjects were asked about the number of medicines used in the last 15 days. The authors observed an inverse association between physical activity level and the number of medicines used. In addition, the probability of medication use was 14% higher among subjects who did not perform 150 min/week of physical activity, irrespective of demographic and socioeconomic factors, BMI, and health perception. However, no difference was observed in the strength of the association between physically inactive subjects and those performing less than 150 min/week of physical activity.

Another cross-sectional study was conducted in São Caetano do Sul, São Paulo[8]. In that study, 271 older women participating in physical activity community programs were evaluated. Pedometers were used and the medical records were reviewed to obtain data regarding long-term medication use. The authors also observed an inverse association between the number of steps and the number of prescribed long-term medicines. In addition, the probability of medication use was 47% higher among older women taking fewer than 6,000 steps/day when compared to those taking more than 8,500 steps/day, even after adjustment for demographic, socioeconomic, anthropometric (BMI, waist circumference, and waist-hip ratio) and lifestyle (alcohol consumption, smoking, and sitting time) factors, as well as health problems (diabetes, hypertension, falls, and fractures due to falls in the last year). Again, the probability did not differ between older women in the intermediate category (6,000 to 8,500 steps/day) and those taking fewer than 6,000 steps/day. However, caution is needed in the interpretation of these data, since all interviewed persons had a participation rate in the physical activity community program of at least 75% in the 6 months prior to data collection, a fact that may cause bias in the estimate of the association between physical activity and medication use if the results were extrapolated to population level.

In the present study, subjects who did not perform 150 min/week of leisure-time physical activity presented higher odds of requiring long-term medication and two or more types of medicines than none when compared to those who performed at least this volume of physical activity. On the other hand, no evidence of such association was found when physical inactivity was analyzed. These results agree with those reported in other studies conducted in Brazil[7,8], although these studies used different data regarding medication use and considered different physical activity domains. In addition, there were differences in the adjustment variables used. Nevertheless, the evidence so far provided by national studies permits to raise the hypothesis that a certain level of physical activity seems to be necessary to reduce the use of medicines. However, caution is required and further studies that permit to prevent reverse causality bias are needed.

Studies on this topic conducted in other countries are also limited and the results are contradictory. A US cross-sectional study involving 32,683 adult women and 8,112 adult men demonstrated an inverse association between weekly walking distance and medication use for arterial hypertension, type 2 diabetes and hypercholesterolemia, irrespective of age, BMI, smoking, and diet. The same was observed when walking intensity was considered[14]. On the other hand, a Swedish study including 4,200 adult women[15] and a Norwegian study including 21,647 adolescents and adults[16] (both population-based, cross-sectional studies using data collected by self-report), found no evidence of association between leisure-time physical activity and medication use after adjustment for demographic, socioeconomic, lifestyle, and health factors. These divergences in the results may in part be explained by differences in how leisure-time physical activity was estimated (data on walking in the US study and use of a Likert scale in the Scandinavian surveys), in the characteristics of the samples (for example, the Norwegian study involved adolescents older than 12 years), and in cultural aspects that differentiate the relationship that Americans and Scandinavians have with medications use and leisure-time physical activity.

To our knowledge, this is the first study focusing on this topic in subjects of low socioeconomic region. It should be noted that, despite the increase in health service coverage and the reduction in social disparities, important health inequalities are still common in Brazil[17]. Although the national public health system is responsible for most of the total medication expenditure, especially for poor people, a population-based study conducted in Florianópolis, Santa Catarina, showed that 3.1% of the richest people allocate more than 15% of their income to the purchase of medicines, whereas this frequency is 9.6% among the poorest[3]. In agreement with this result, a systematic review demonstrated that the financial impact of the purchase of medicines on the household budget is greater among low-income people[2].

With respect to leisure-time physical activity, this scenario is not different. People of lower socioeconomic status generally have less time, fewer support networks, and less diverse and high-quality places for physical activity[9]. Therefore, the investigation of the interaction between medication use, leisure-time physical activity and socioeconomic status permits a broader and integrated discussion of health promotion and reducing inequalities.

This study has some limitations. The cross-sectional design of the study does not permit to establish causal relationships and a possible reverse causality bias cannot be ruled out. In addition, the sample size was calculated considering the primary objective of the original survey, a fact that may influence the estimates of association and their confidence intervals, as well as the number of adjustment variables that can be used. Nevertheless, the results obtained are similar to those reported in other Brazilian studies and provide important data on this topic. The evidence obtained so far indicates the need for longitudinal studies that permit to analyze temporal aspects, as well as studies that has this topic as theirs main research question and

that can deal with a larger number of adjustment variables (*e.g.*, physical activity in other domains).

It should be taken into consideration that medication use is not only defined by pathological and pharmacological factors, but also comprises cultural, social and behavioral issues. As a consequence, more active individuals may present behavioral and social patterns that also influence the probability of the need for medicines[7]. In view of the data collection methods used, memory bias regarding medication need and physical activity may have also influences the associations observed. However, currently the analysis of physical activity in its different domains in epidemiological studies is only possible using questionnaires.

On the other hand, on the basis of what was detected in the literature, two original aspects of the study can be emphasized: this was the first study to analyze the relationship between leisure-time physical activity and long-term medication use in the Brazilian population, and to investigate this topic in individuals of low socioeconomic status.

In conclusion, the need for long-term medication use and the need for at least two different types of medications are associated with the lack of performing 150 min/week or more of leisure-time physical activity in adults from a low-income region, irrespective of gender, age, education level, and BMI. In view of the health inequalities seen in Brazil, future studies investigating the association between medication use and physical activity should consider socioeconomic differences. Finally, the present results support evidence on this important topic and suggest the possibility to reduce the use of long-term medications through physical activity, with an important positive impact on public health.

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