Epidemiology of leisure-time physical activity: a population-based study in southern Brazil

Epidemiologia da atividade física no lazer: um estudo de base populacional no sul do Brasil

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Abstract

We aimed to measure the prevalence of physical inactivity (PI) during leisure time and to identify variables associated with it in a southern Brazilian adult population. A population-based cross-sectional study was carried out, covering a multiple-stage sample of 1,968 subjects aged 20-69 years. Weekly participation in leisure-time physical activity was addressed. For each activity, energy expenditure was calculated using data on duration, metabolic equivalent, and body weight. Energy expenditures of individual activities were summed to give a weekly total. PI was defined as fewer than 1,000 kilocalories per week. The prevalence of PI was 80.7% (95%CI: 78.9-82.4). After adjusted analyses, the following variables were positively associated with the outcome: female gender, age, living with a partner, and smoking. Schooling and economic status were inversely associated with PI. Chronically undernourished individuals were significantly more likely to be inactive. We found no differences according to skin color or alcohol consumption. In conclusion, the prevalence of PI in this adult population was higher than in populations from developed countries, but the associated variables were similar.

Exercise; Risk Factors; Adults; Life Style

Introduction

In recent decades, an economic transition has contributed to changes in the epidemiological profile of disease, with a reduction in infectious diseases and an increase in lifestyle-related illnesses [1]. Sedentary lifestyle is a risk factor for several chronic diseases, such as coronary heart disease [2], breast cancer [3], prostate cancer [4] and depression [5], and for all-cause mortality [6].

The intensity and frequency of activities can influence the magnitude of their effect on chronic diseases. However, even light and moderate activities are associated, for example, with a lower risk of coronary heart disease in women [7], and moderate activities reduce all-cause mortality in men [6]. Despite this evidence for the benefits of an active lifestyle for health, high percentages of many populations are not sufficiently active to obtain such health benefits [8,9,10].

The amount of data available in developing countries (or those undergoing nutritional transition) is less abundant. In Brazil, Monteiro et al. [11] evaluated leisure-time physical activity in two Brazilian regions (Southeast and Northeast), and only 3.3% of the interviewees had performed at least 30 minutes of activity on five or more days of the week. Hallal et al. [12] and Matsudo et al. [13] addressed all physical activity (associated with leisure time, occupation, housework, and transportation), and both found an inactivity prevalence of some 40.0%. Barros &

Nahas [14] evaluated leisure-time activity in a sample of industrial workers, and the prevalence of inactivity was 68.1%.

This study aimed to measure the prevalence of leisure-time physical inactivity and associated variables in a southern Brazilian adult population.

Methods

Pelotas is a city of approximately 320,000 inhabitants in the extreme South of Brazil. A cross-sectional study was conducted in the adult population (20-69 years), investigating several health-related variables, including leisure-time physical activity.

The sample size calculation used the following parameters: 95% confidence interval; 80.0% power; independent variable prevalence ranging from 5.0 to 50.0%; relative risk of 2.0; 70.0% estimated prevalence of leisure-time inactivity; 10.0% excess for non-response; and 15.0% excess for adjusted analyses. Although these calculations predicted a sample of approximately 900 individuals, the final sample included 1,968 subjects, because this study (as mentioned above) was part of a larger health survey in the same population.

The sample was selected in multiple stages. At first, all 281 census tracts in the city were listed, and 40 were systematically selected for the study. Next, 30 households were systematically selected in each chosen census tract. All residents in the selected households aged 20-69 years were eligible for the study.

Fieldwork was conducted from December 1999 to March 2000. A standardized pre-tested questionnaire was applied using face-to-face interviews. Interviewers were university students who underwent comprehensive training, including standardization of weight and height measurements. Interviewers were blind to the study objectives and hypotheses.

The physical activity questionnaire addressed several leisure-time activities practiced in each week of the previous month. For each activity, information concerning duration (minutes) and frequency was collected. For each activity, energy expenditure was calculated from the metabolic equivalent [15], duration of the activity, and body weight. Total weekly leisure-time energy expenditure was obtained by summing the values for the individual activities. Physical inactivity in leisure time was defined as weekly energy expenditure below 1,000kcal, in accordance with moderate physical activity guidelines [16].

The independent variables were: gender, age, skin color (divided into white, black, or mixed-race, as observed by the interviewer), partner status (living with or without a partner), schooling (in complete years), socioeconomic status (divided into five categories according to the classification of the Brazilian National Association of Research Institutes, ANEP, which considers both household assets and paternal education, and where A is the highest group), body mass index (BMI, categorized as: chronic energy deficiency < 18.5kg/m^2; underweight 18.5-19.9kg/m^2; normal 20.0-24.9kg/m^2; overweight 25.0-29.9kg/m^2; obesity ≥ 30kg/m^2) [17,18], smoking (never smoked, former smoker, light/moderate smoker, or heavy smoker), and alcohol consumption (never, < 30g/day, or ≥ 30g/day). Since subjective classification of skin color could lead to inconsistency, interviewers received standardized training on this issue.

The questionnaire and guidelines were tested in a pilot study in a census tract not included in the final sample. Weight was measured with a portable scale, calibrated weekly (Uniscale, UNICEF, Copenhagen). Height was measured with a locally made anthropometer with a precision of 0.1cm.

A quality control exercise was conducted in 10.0% of the sample, randomly selected. Double data entry was used in order to decrease errors. Poisson regression models following a hierarchical approach [19] were used for the adjusted analyses. The hierarchical model was divided into three levels, incorporating the following variables: (1) gender, age, and skin color; (2) schooling, socioeconomic level, and partner status; and (3) BMI, smoking, and alcohol consumption. The association between each variable and the outcome was controlled for the variables in its same level or above in the hierarchical model [19]. Poisson rather than logistic regression was selected because in initial analyses the outcome was found to be common, and the odds ratio provided by the logistic model would seriously overestimate the actual prevalence ratios [20].

The Institutional Review Board/Ethics Committee of the Federal University in Pelotas approved the project. Informed consent was obtained from each participant.

Results

In the selected households, 2,177 eligible individuals were located, of whom 1,968 (90.4%) agreed to answer the questionnaire. Seven subjects were unable to provide adequate informa-

tion on physical activity and were classified as missing values. Therefore, analyses were undertaken using 1,961 subjects.

Table 1 shows a description of the sample. Mean age was 41.6 (SD 13.6) years. Thirty percent of the sample had a monthly family income below US$ 60. Mean schooling was 7.8 years (SD 4.4), and 17.0% had some university education. Approximately 5.0% each of the sample belonged to socioeconomic classes A and E (highest and lowest, respectively). Approximately 30.0% were current smokers, 14.0% reported high alcohol consumption, 20.0% were obese, and 3.0% presented chronic calorie deficiencies.

Table 2 shows detailed data on leisure-time physical activity patterns. Prevalence of physical inactivity was 80.6% (95%CI: 78.9-82.4). Distribution was positively skewed. The average was 698 (SD 1792) kcal per week. More than half of the sample (58.6%) scored zero kcal per week in leisure-time physical activity.

Table 3 shows the crude prevalence of physical inactivity in relation to the independent variables, and also the crude prevalence ratios and respective 95% confidence intervals. Women, those living with a partner, smokers, and those underweight or with chronic energy deficiency had a significant higher prevalence of inactivity. Also in the crude analysis, age was positively associated with low leisure-time physical activity, while schooling, economic level, and alcohol consumption were inversely related to the outcome. This analysis showed no differences in terms of skin color.

Table 4 presents the adjusted analysis using Poisson regression. The effects of gender, age, skin color, partner status, schooling, socioeconomic level, and smoking remained the same in the adjusted analysis. Alcohol consumption failed to remain significant after controlling for the variables in its level and in higher levels in the hierarchical model. There was a negative relationship between BMI and inactivity. Individuals with low BMI were more likely to be inactive, and those overweight and obese were more active.

All analyses were repeated separately for men and women. Although the prevalence of inactivity was higher in men than women, the variables associated with inactivity were similar for both sexes, and therefore these results are not shown.

Table 1

Description of the sample in terms of demographic, socioeconomic, anthropometric, and behavioral variables. Pelotas, Rio Grande do Sul, Brazil, 2003.

Variable	Number	%
Gender		
Male	846	43.0
Female	1,122	57.0
Age (years)		
20-24	261	13.3
25-34	409	20.8
35-44	481	24.4
45-54	409	20.8
55-69	407	20.7
Skin color		
White	1,634	83.0
Mixed	159	8.1
Black	175	8.9
Partner status		
Living with a partner	1,205	61.2
Living without a partner	763	38.8
Schooling (years of formal education)		
0	88	4.5
1-4	424	21.5
5-8	631	32.0
9-11	491	25.0
≥ 12	334	17.0
Socioeconomic level*		
A	110	5.6
B	500	23.6
C	726	37.1
D	529	27.1
E	89	4.6
Smoking status		
Never smoked	945	48.0
Former smoker	423	21.5
Light/moderate smoker (≤ 20 cigarettes/day)	319	16.2
Heavy smoker (> 20 cigarettes/day)	281	14.3
Daily alcohol consumption (ethanol, g/day)		
0	411	21.0
≤ 30	1,273	65.1
> 30	271	13.9
Body mass index (kg/m²)		
Chronic energy deficiency (< 18.5)	56	2.9
Underweight (18.5-19.9)	83	4.3
Normal (20.0-24.9)	768	39.7
Overweight (25.0-29.9)	653	33.7
Obesity (≥ 30.0)	376	19.4

* Classification of the Brazilian National Institute of Research, where A is the highest group.

Discussion

This study found a high prevalence of leisure-time inactivity and a number of demographic, socioeconomic, and behavioral factors associ-

Table 2

Description of leisure-time physical activity (PA) patterns. Pelotas, Rio Grande do Sul, Brazil, 2003.

Parameter	Value
Weekly energy expenditure in leisure time PA (kcal/week)	
0-500	71.2%
501-1,000	9.4%
1,000-1,999	9.9%
≥ 2,000	9.4%
Average (SD) weekly energy expenditure in leisure time PA	698.2kcal/week (1,792.8)
Percentiles of weekly energy expenditure in leisure time PA	
5th	0.0kcal/week
25th	0.0kcal/week
50th	0.0kcal/week
75th	665.5kcal/week
95th	3,395.8kcal/week
Skewness	5.8
Kurtosis	49.2

ated with it. Such information is important for campaigns to promote physical activity.

The prevalence of individuals classified as insufficiently active to obtain health benefits (80.6%) was higher than observed in Australia (67.7%) [8], the United States (68.0%) [9], and industrial workers in the Brazilian State of Santa Catarina (68.1%) [14]. This difference probably stems in part from between-population differences in the time available for leisure-time activity. Our study may differ from that in Santa Catarina [14] because the latter only investigated workers, whereas our sample was representative of the whole population and included elderly people and those unable to work. These categories may be less able to undertake leisure-time activities and hence increase the prevalence of inactivity in our sample.

We observed marked differences in socioeconomic status. Our study showed a lack of leisure-time physical activity in the lowest socioeconomic groups, similar to several studies in developed countries [10,21,22]. Our finding is consistent with the hypothesis that higher-income individuals are more likely (whether due to greater motivation or access to resources) to follow preventive programs and health-promoting behavior. Participation in leisure-time activities is reduced among lower-income individuals. On the other hand, their participation in vigorous work-related activities may be higher than for higher-income individuals, as suggested recently [12].

In our study men were more active than women during their leisure time. Similar results have been widely reported [8,10,14,23,24,25]. However, when total physical activity was analyzed, no gender differences were found [12,13].

The positive association between activity level and age is consistent with the literature [8,21,26], showing a gradual decline in physical activity with increasing age. Retirement has been proposed as a possible explanation [27].

The relationship between physical activity and partner status has rarely been explored in the literature. An Australian study [8] found that parents with dependent children had lower activity levels than non-parents, single adults, or parents with no dependent children. Both studies indicate that household composition may influence physical activity, but this issue requires further investigation.

Various studies have linked low physical activity to obesity [28,29]. Obesity develops when energy expenditure is lower than energy intake, and reduced physical activity is assumed to be an important etiological factor. However, cross-sectional studies have not always found such an association [10,12]. In the present study, overweight individuals had a significantly lower prevalence of low leisure-time activity than normal-weight individuals, and the same trend was observed in the obese, although the effect did not reach significance. Exercise is recommended for management of excess weight, and our findings may reflect the tendency of such individuals to follow this advice.

However, at the other end of the weight spectrum, underweight or chronically energy-deficient individuals had a higher prevalence of low activity (the effect was statistically significant in energy-deficient individuals). This could imply that poor nutritional status in this population is due to inadequate energy intake rather than high-energy expenditure. For example, low energy intake is often associated with low physical activity [30]. Another possible explanation is that undernourished individuals have high physical activity levels at work (for example, as reported in malnourished Bangladeshi mothers) [31]. Thus their inactivity in leisure time may be counterbalanced by activities elsewhere. Alternatively, the lower activity levels of those with low BMI may be due to poorer health, as reported in Ethiopia [32]. These explanations would have differing implications for public health campaigns. The prevalence of inactivity in marginally nourished populations therefore merits further research.

Table 3

Prevalence of physical inactivity (PI) in leisure time and crude prevalence ratios (PR) for each independent variable in relation to the outcome. Pelotas, Rio Grande do Sul, Brazil, 2003.

Variable	% PI	PR (95%CI)	p-value
Gender			< 0.001*
Male	69.1	1.00	
Female	89.4	1.29 (1.23-1.36)	
Age (years)			< 0.001**
20-24	64.1	1.00	
25-34	76.1	1.19 (1.07-1.32)	
35-44	85.2	1.33 (1.20-1.47)	
45-54	82.9	1.29 (1.17-1.43)	
55-69	88.2	1.38 (1.25-1.52)	
Skin color			0.430*
White	80.3	1.00	
Mixed	81.1	1.01 (0.93-1.09)	
Black	84.0	1.05 (0.98-1.12)	
Partner status			0.020*
Living with a partner	82.4	1.06 (1.01-1.11)	
Living without a partner	78.0	1.00	
Schooling (years of formal education)			< 0.001**
0	93.2	1.38 (1.26-1.52)	
1-4	87.9	1.30 (1.20-1.42)	
5-8	82.6	1.22 (1.13-1.33)	
9-11	78.6	1.16 (1.07-1.27)	
≥ 12	67.5	1.00	
Socioeconomic level* **			
A	64.6	1.00	< 0.001**
B	78.5	1.22 (1.05-1.41)	
C	79.4	1.23 (1.07-1.42)	
D	85.8	1.33 (1.15-1.53)	
E	92.1	1.43 (1.23-1.66)	
Smoking status			0.010*
Never smoked	78.9	1.00	
Former smoker	80.2	1.02 (0.96-1.08)	
Light/moderate smoker (≤ 20 cigarettes/day)	82.7	1.05 (0.99-1.11)	
Heavy smoker (> 20 cigarettes/day)	85.0	1.08 (1.02-1.14)	
Daily alcohol consumption (ethanol, g/day)			< 0.001**
0	86.6	1.00	
≤ 30	79.8	0.92 (0.88-0.97)	
> 30	75.1	0.87 (0.80-0.94)	
Body mass index (kg/m²)			0.880**
Chronic energy deficiency (< 18.5)	92.9	1.17 (1.08-1.27)	0.001*
Underweight (18.5-19.9)	84.3	1.07 (0.96-1.18)	
Normal (20.0-24.9)	79.2	1.00	
Overweight (25.0-29.9)	77.9	0.98 (0.93-1.04)	
Obesity (≥ 30.0)	84.6	1.07 (1.01-1.13)	

* Wald test for heterogeneity of proportions;
** Wald test for trend;
*** Classification of the Brazilian National Institute of Research, where A is the highest group.

Table 4

Variables associated with physical inactivity (PI) in leisure time, with adjusted prevalence ratios (PR) and confidence intervals (CI). Pelotas, Rio Grande do Sul, Brazil, 2003.

Level*	Variable	PR (95%CI)	p-value
1	**Gender**		< 0.001**
	Male	1.00	
	Female	1.27 (1.21-1.34)	
1	**Age (years)**		< 0.001***
	20-24	1.00	
	25-34	1.14 (1.03-1.26)	
	35-44	1.27 (1.16-1.40)	
	45-54	1.25 (1.13-1.37)	
	55-69	1.32 (1.20-1.45)	
1	**Skin color**		0.470**
	White	1.00	
	Mixed	1.04 (0.96-1.12)	
	Black	1.03 (0.96-1.10)	
2	**Partner status**		
	Living with a partner	1.06 (1.02-1.11)	0.007**
	Living without a partner	1.00	
2	**Schooling (years of formal education)**		0.005***
	0	1.14 (1.03-1.27)	
	1-4	1.16 (1.06-1.27)	
	5-8	1.15 (1.05-1.25)	
	9-11	1.13 (1.03-1.23)	
	≥ 12	1.00	
2	**Socioeconomic level****		0.001***
	A	1.00	
	B	1.16 (1.01-1.33)	
	C	1.15 (1.00-1.32)	
	D	1.20 (1.04-1.39)	
	E	1.32 (1.13-1.54)	
3	**Smoking status**		0.010**
	Never smoked	1.00	
	Former smoker	1.03 (0.98-1.09)	
	Light/moderate smoker (≤ 20 cigarettes/day)	1.04 (0.98-1.10)	
	Heavy smoker (> 20 cigarettes/day)	1.11 (1.05-1.18)	
3	**Daily alcohol consumption (ethanol, g/day)**		0.570***
	0	1.00	
	≤ 30	1.01 (0.93-1.10)	
	> 30	0.98 (0.90-1.08)	
3	**Body mass index (kg/m2)**		0.040***
	Chronic energy deficiency (< 18.5)	1.15 (1.06-1.25)	< 0.001**
	Underweight (18.5-19.9)	1.07 (0.97-1.17)	
	Normal (20.0-24.9)	1.00	
	Overweight (25.0-29.9)	0.94 (0.90-0.99)	
	Obesity (≥ 30.0)	0.96 (0.91-1.02)	

* Level of the variable in the hierarchical model;
** Wald test for heterogeneity of proportions;
*** Wald test for trend;
**** Classification of the Brazilian National Institute of Research, where A is the highest group.
Note: The effect of each variable on PI is adjusted for variables in its same level or above in the hierarchical model with p-value < 0.20.

The main limitation of this study is that it focused only on leisure-time activity and did not include activity during transportation, work, or housework. Individuals who are inactive during leisure time may be more active in other contexts. For example, a Russian study [33] concluded that lack of information on transportation physical activities led to a 67.0% overestimate in the proportion of low physical activity. Furthermore, the proportion of time available for leisure may differ between subsections of the population, and it is possible that the lower activity of women compared to men may reflect differential contributions from housework. However, our results can be compared to those of other studies in Brazil [11,14] and elsewhere [8,9] focusing on the same variable. A new standardized questionnaire has recently been developed to assess total daily activity level more comprehensively [34]. One should note that our data were gathered between 1999 and 2000, and due to the fact that Brazil is undergoing a rapid epidemiological transition, physical activity patterns found in our study may be changing rapidly. Therefore, similar studies are required to evaluate temporal trends.

Nevertheless, as developing countries undergo nutritional transition and the associated industrialization, activities during leisure time will make an increasingly important contribution to total activity. The high prevalence of inactivity we observed in leisure time among this largely urban population is therefore a concern.

In conclusion, levels of leisure-time physical activity in Pelotas, Brazil, were low, and the prevalence of inactivity was associated with various socio-demographic variables, largely consistent with the literature. Contrary to most other reports, inactivity was not more common in the obese than in the undernourished. Our study focused on individual determinants of inactivity, but we were unable to take differential access to recreational facilities into account. These issues need to be addressed simultaneously in health promotion programs.

Resumo

O objetivo deste estudo foi avaliar a prevalência de inatividade física (IF) no lazer e fatores associados, em uma população adulta (20-69 anos), residente no sul do Brasil. Um estudo transversal de base populacional foi conduzido, com amostragem em múltiplos estágios. A prática semanal de atividade física foi avaliada. Para cada atividade, o gasto energético foi calculado usando dados de duração, equivalentes metabólicos e peso corporal. Os gastos energéticos das atividades foram somados para calcular-se um gasto semanal total. IF foi definida como gasto semanal inferior a 1.000kcal/semana. A prevalência de IF foi de 80,7% (IC95%: 78,9-82,4). Após análise ajustada, as seguintes variáveis se associaram positivamente com IF: sexo feminino, idade, viver com companheiro e tabagismo. Escolaridade e nível econômico se associaram inversamente com IF. Indivíduos com índice de massa corporal baixo (< 18,5kg/m²) apresentaram prevalência significativamente maior de IF. Não foram encontradas diferenças estatisticamente significativas de acordo com a cor da pele e consumo de álcool. A prevalência de IF nesta população adulta foi maior do que em populações de países desenvolvidos, mas as variáveis associadas foram similares.

Exercício; Fatores de Risco; Adultos; Estilo de Vida

Contributors

J. S. Dias-da-Costa coordinated the drafting of the research instrument and supervised the field work. P. C. Hallal headed the data analysis process and controlled the data quality. J. C. K. Wells led the drafting of the article. T. Daltoé supervised the field work. S. C. Fuchs oriented the overall research process and led the elaboration of the study hypotheses and objectives. A. M. B. Menezes coordinated the field work organization. M. T. A. Olinto supervised the field work and elaborated the research instrument.

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