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Compliance With Vigorous Physical Activity Guidelines in Brazilian Adults: Prevalence and Correlates

Pedro Curi Hallal and Fernando Vinholes Siqueira

Background: Physical inactivity is now a public health priority because of the high rates of inactivity observed worldwide. Achievement of physical activity guidelines could be attained with vigorous, moderate, or both activities combined. Our aim was to explore the prevalence and correlates of compliance with vigorous physical activity guidelines (CVAG). *Methods*: Cross-sectional population-based survey in Pelotas, a southern Brazilian city, including 3182 adults (≥ 20 years). The short version of the International Physical Activity Questionnaire was applied by face-to-face interviews. CVAG was defined as at least 60 min/wk of vigorous activity. *Results*: Only 29% of the subjects achieved the vigorous activity threshold. Women, older adults, individuals with low BMI (< 18.5 kg/m^2) or obese (≥ 30 kg/m^2) were less likely to present CVAG. Compliance with moderate activity guidelines was associated with a higher likelihood of CVAG. *Conclusions*: Concurrent promotion of moderate and vigorous physical activities is warranted in terms of public health.

Key Words*:* exercise, epidemiology, sedentarism, physical inactivity

Physical inactivity (PI) is now a global concern[1] because: (1) PI is an independent risk factor for several chronic diseases;[1] (2) PI prevalence is high both in developed[2,3,4] and developing countries;[5,6] (3) PI prevalence is increasing;[3] (4) counseling to engage in more exercise seems ineffective in increasing physical activity levels in the long term.[7] Therefore, it is extremely important to understand more fully community physical activity patterns, including the frequency and determinants of sedentary behavior.

Current recommendations[1,8] state that individuals should perform at least 150 min/wk of moderate or 60 min/wk of vigorous physical activities. Although most studies used to evaluate only activities performed in leisure time, compliance with current guidelines might be attained regardless of the context in which the activities were carried out. Evaluation of leisure time physical activity alone has been shown to lead to bias[9] particularly in developing countries,[6] where an important proportion of the total physical activity occurs at work, transportation, or household chores.

The authors are with the Postgraduate Program in Epidemiology, Federal University of Pelotas, 96030-002, Pelotas, RS, Brazil.

Compliance with current physical activity guidelines could be achieved by participation in moderate activities, vigorous activities, or both combined. Few studies, however, have distinguished between moderate and vigorous activities. A recent study[10] showed that compliance with moderate activity guidelines was not associated with compliance with vigorous activity guidelines (CVAG) in Australia. Participation in recommended levels of recreational walking was directly associated with CVAG, however.

To the best of our knowledge, no data on this issue are available outside developed countries. This article aims to estimate the prevalence of CVAG and its correlates in a population-based sample of Brazilian adults.

Material and Methods

Pelotas is a city in extreme southern Brazil with 320,000 inhabitants. The main economic activities are agriculture, commerce, and education. A population-based study was carried out in the first half of 2002; the target population included individuals ≥ 20 years of age. A multistage sampling protocol was used to select a representative sample of households in the city. Details of the sampling strategy are available elsewhere.[6]

With a sample of 2350 individuals, it would be possible to estimate the prevalence of CVAG of 30% with a margin of error of 2.5 percentage points, a confidence level of 95%, and excess of 100% for the design effect. This sample size would also be large enough to detect relative risks of 1.5 or above with a power of 80% or greater for independent variables which affect over 10% of the sample.

Physical activity was measured with the short version of the International Physical Activity Questionnaire (IPAQ). The questionnaire investigates the frequency and duration of walking, moderate, and vigorous physical activities in the 7 days prior to the interview. Activities were computed independently of the context in which they were carried out; only activities performed for 10 minutes or more were computed. IPAQ defines moderate activities as those which produce a moderate increase in respiration rate, heart rate, and sweating. Vigorous activities are defined in IPAQ as those producing vigorous increases in the same variables. CVAG was defined as at least 60 min/wk of participation in vigorous-intensity physical activity, while compliance with moderate activities guidelines was defined as at least 150 min/wk of participation in moderate-intensity physical activity (including fast and moderately fast walking). These definitions are in accordance with current physical activity guidelines.[1,8]

The independent variables included were: sex, age, socioeconomic level (evaluated using the Brazilian Criterion of Economic Classification, which considers paternal education and household assets, and where A is the wealthiest group), schooling level (years of formal education), body mass index (BMI, calculated using self-reported weight and height; categorized into 4 categories: low (< 18.49 kg/m^2), normal (18.5 to 24.9 kg/m^2), overweight (25 to 29.9 kg/m^2), obese (≥ 30 kg/m^2), self-reported health status (excellent, very good, good, average, poor) and compliance with moderate activity guidelines (as described previously).

After descriptive and crude analyses, a multivariable Poisson regression model was carried out to calculate adjusted prevalence ratios and respective 95% confidence intervals. The multivariable analysis followed a hierarchical approach;[11]

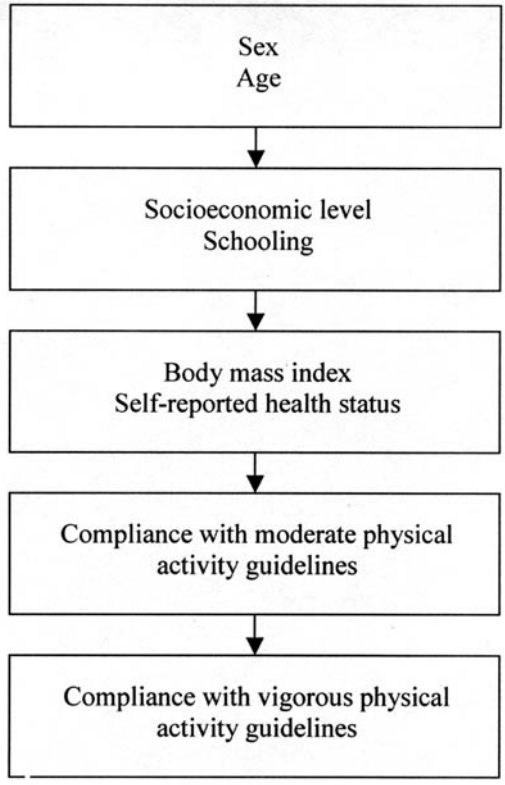

Figure 1 — Hierarchical model used to guide the multivariable analysis of the correlates of compliance with vigorous physical activity guidelines

therefore, the effect of each independent variable on the outcome is adjusted for other variables in the same level or above in the hierarchical model (Figure 1). All analyses took into account the clustering of the sample.

The project was approved by the Ethics in Research Committee of the Faculty of Medicine of the Federal University of Pelotas. Informed consents were obtained from each subject.

Results

The nonresponse rate was 6.4%; analyses were carried out using a maximum of 3157 subjects. The design effect associated with the vigorous physical activity score was 1.93. The average time spent in vigorous-intensity physical activity was 168 min/wk (SD = 519). The 5th, 25th, and 50th percentiles were zero. The 75th and 95th percentiles were, respectively, 90 and 900 min/wk. Skewness of the vigorous activity score was 5.1 and kurtosis was 34.3, indicating extreme asymmetry. CVAG was attained by 29.2% of the individuals.

Table 1 shows a description of the sample in terms of demographic, socioeconomic, behavioral, and anthropometric independent variables. The average age was 44.0 years (SD =16.3). The average length of schooling was 7.4 years of formal education (SD = 4.3). The prevalence of obesity was 14.3% using the BMI ≥ 30 kg/m^2 cut off.

Table 1 Description of the Sample in Terms of Demographic, Socioeconomic, Behavioral, and Anthropometric Variables

Variable	*n*	%
Sex		
Male	1374	43.2%
Female	1808	56.8%
Age (yr)		
20-29	719	22.6%
30-39	680	21.4%
40-49	667	21.0%
50-59	533	16.8%
60-69	307	9.6%
≥ 70	276	8.6%
Socioeconomic level ANEP[a]		
A (wealthiest)	147	4.6%
B	600	18.9%
C	1270	40.1%
D	1026	32.4%
E	127	4.0%
Schooling (yrs of formal education)		
0	223	7.0%
1-4	656	20.7%
5-8	1067	33.5%
9-11	780	24.6%
≥ 12	451	14.2%
Body mass index		
Underweight (< 18.5 kg/m^2)	83	2.7%
Normal (18.5-24.9 kg/m^2)	1459	47.9%
Overweight (25.0-29.9 kg/m^2)	1068	35.1%
Obesity (≥ 30 kg/m^2)	437	14.3%
Self-reported health status		
Excellent	300	9.5%
Very good	480	15.2%
Good	1494	47.1%
Average	767	24.2%
Poor	125	4.0%

[a]Brazilian Criterion of Economic Classification

Table 2 shows the results of the crude and multivariable analyses of the correlates of CVAG. Men were twice as likely to achieve CVAG than women. CVAG was inversely related to age, but this was the result of a lower percentage of CVAG in the older subjects. Individuals without schooling were less likely to present CVAG in the crude analysis, but the differences were minimized in the multivariable analysis, caused by the confounding effect of age. Socioeconomic level was not associated with CVAG. Individuals in the extreme groups of BMI (underweight or obesity) were less likely to present CVAG. Self-reported health status was directly related to CVAG in the crude, but not in the multivariable, analysis.

Compliance with moderate activity guidelines was achieved by 34.5% of the subjects. Table 3 shows that 48.3% of the individuals did not achieve any of the recommendations, compared with 12.1% who achieved both guidelines. Compliance with moderate physical activity guidelines was associated with a higher percentage of CVAG both in the crude (prevalence ratio: 1.33, $P < 0.001$) and adjusted analysis (prevalence ratio: 1.46, $P < 0.001$).

Discussion

Less than 30% of the subjects achieved the threshold for health benefits as a result of vigorous physical activity practice. The equivalent percentage for moderate physical activities was 35%. Approximately half of the individuals did not achieve any of the recommendations. Women, the elderly, and underweight or obese subjects were less likely to present CVAG. Individuals engaged in moderate activities were more likely to present CVAG.

The positive association between age and CVAG should be interpreted with caution. The trend is not detectable until age 70, but after that, CVAG is lower than in other age groups. The IPAQ, however, was originally designed for subjects up to age 69. Therefore, there are two possible explanations for this association: (1) elderly individuals are not responding to the questionnaire satisfactorily, and their physical activity level is underestimated; (2) there is a real decrease in CVAG after age70, which is comparable with a recent study[12] indicating that retirement is related to a decreased level of physical activity.

The short version of the IPAQ questionnaire addresses all domains of physical activity practice (leisure time, occupation, transportation, and housework).[13] It does not, however, distinguish between each of these. Therefore, our study shows only that participation in moderate activities increases the likelihood of CVAG, but we are not able to explore this issue stratified by domains. In a recent Australian study,[10] walking for transportation was not related to CVAG, but recreational walking increased the likelihood of CVAG.

Some aspects of the IPAQ method need to be discussed. At first, we opted to use face-to-face interviews rather than telephone or self-completed methods; in developing countries, this strategy increases the response rate and subjects understand the questions more fully. A recent paper[13] tested the reliability and validity of the IPAQ both in developed and developing countries, concluding that: (1) reliability was good; (2) validity is at least comparable to other questionnaires; and (3) the short and long versions provide comparable results. The statistical analysis of the paper above has been criticized, however.[14]

Table 2 Crude and Multivariable Analyses of the Correlates of Compliance with Vigorous Physical Activity Guidelines (CVAG)

			Crude analysis		Multivariable analysis	
Level	Variable	% CVAG	PR (CI = 95%)	P	PR (CI = 95%)	P
1	Sex			< 0.001[b]		< 0.001[b]
	Male	40.8%	2.00 (1.78, 2.25)			
	Female	20.4%	1.00		1.95 (1.73, 2.19)	1.00
1	Age (yr)			< 0.001[c]		< 0.001[c]
	20-29	33.0%	3.32 (2.07, 5.33)		3.09 (1.93, 4.95)	
	30-39	34.6%	3.48 (2.17, 5.60)		3.25 (2.01, 5.24)	
	40-49	32.1%	3.23 (2.03, 5.14)		3.07 (1.93, 4.88)	
	50-59	27.9%	2.81 (1.78, 4.45)		2.73 (1.73, 4.31)	
	60-69	20.9%	2.10 (1.31, 3.37)		2.04 (1.28, 3.24)	
	≥ 70	9.9%	1.00		1.00	
2	Socioeconomic level ANEP[a]			0.29[b]		0.21[b]
	A (wealthiest)	34.3%	1.12 (0.79, 1.57)	0.33[c]	0.99 (0.65, 1.51)	0.26[c]
	B	25.8%	0.84 (0.66, 1.07)		0.77 (0.58, 1.01)	
	C	29.0%	0.94 (0.75, 1.18)		0.86 (0.67, 1.09)	
	D	30.6%	1.00 (0.78, 1.27)		0.91 (0.71, 1.17)	
	E	30.7%	1.00		1.00	

(*continued*)

Table 2 (*continued*)

Level	Variable	% CVAG	Crude analysis		Multivariable analysis	
			PR (CI = 95%)	P	PR (CI = 95%)	P
2	Schooling (yrs of formal education)			0.005[b]		0.08[b]
	0	15.2%	1.00	0.05[c]	1.00	0.43[c]
	1-4	29.0%	1.90 (1.23, 2.96)		1.55 (1.00, 2.38)	
	5-8	32.5%	2.14 (1.41, 3.25)		1.52 (0.99, 2.33)	
	9-11	28.7%	1.89 (1.23, 2.90)		1.27 (0.82, 1.97)	
	≥ 12	29.3%	1.93 (1.24, 2.99)		1.37 (0.88, 2.12)	
3	Body mass index			< 0.001[b]		0.002[b]
	Underweight (>18.5 kg/m^2)	14.5%	0.45 (0.27, 0.76)		0.52 (0.31, 0.88)	
	Normal (18.5-24.9 kg/m^2)	31.9%	1.00		1.00	
	Overweight (25.0-29.9 kg/m^2)	30.5%	0.96 (0.85, 1.07)		0.94 (0.84, 1.06)	
	Obesity (≥ 30 kg/m^2)	23.6%	0.74 (0.62, 0.88)		0.81 (0.68, 0.96)	
3	Self-reported health status			< 0.001[b]		0.09[b]
	Excellent	36.3%	1.73 (1.21, 2.48)	< 0.001[c]	1.01 (0.66, 1.53)	0.10[c]
	Very good	35.1%	1.67 (1.15, 2.43)		1.07 (0.70, 1.64)	
	Good	29.0%	1.38 (1.00, 1.91)		0.89 (0.60, 1.31)	
	Average	24.5%	1.17 (0.84, 1.63)		0.89 (0.60, 1.31)	
	Poor	21.0%	1.00		1.00	

[a]Brazilian Criterion of Economic Classification. [b]Wald test for heterogeneity. [c]Wald test for trend. PR, prevalence ratio; CI, confidence interval.

Table 3 Compliance with Moderate and Vigorous Physical Activity Guidelines Among Brazilian Adults

Compliance with moderate and vigorous activity guidelines			
Yes/Yes	Yes/No	No/Yes	No/No
378 (12.1%)	704 (22.5%)	539 (17.2%)	1512 (48.2%)

In contrast to the Australian study mentioned above,[10] we used a threshold of 60 min/wk rather than 90 min/wk for vigorous activity practice. Our definition is in accordance with current public health recommendations.[1,8] For comparison purposes, we have also used the definitions of the Australian study.[10] Using the threshold of 90 min/wk, the proportion of CVAG was 25.2% rather than 29.2% using the 60 min/wk cut off. The relationship between compliance with moderate activity guidelines and CVAG was also significant using the 90 min/wk threshold. The crude prevalence ratio is 1.43 rather than 1.33, and the adjusted ratio was 1.56 rather than 1.46.

Because the authors of the Australian study[10] used odds ratios and we used prevalence ratios, we have recalculated our estimates to compare the results. Our adjusted odds ratio for those above the threshold of 150 min/week of moderate activity practice is 1.91 ($P < 0.001$) using the 90 min/wk cut off for the outcome. The Australian study[10] reported an equivalent value of 1.38 considering recreational walking alone rather than total moderate activity practice.

In conclusion, participation in recommended levels of vigorous-intensity activities has no compensatory effect on moderate-intensity activities. Therefore, concurrent promotion of moderate and vigorous physical activities is warranted.

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