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Health predictors and conditions associated to moderate and vigorous physical activity among adults and elderly from Southern Brazil

Preditores e condições de saúde associados à prática de atividade física moderada e vigorosa em adultos e idosos no sul do Brasil

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ABSTRACT: ***Introduction:*** Regular physical activity (PA) generates several health benefits. This study aimed to analyze the predictors of moderate PA (MPA) and vigorous PA (VPA) separately, as well as some health outcomes related to each intensity. ***Method:*** A population-based, cross-sectional study, with adults and the elderly in the urban area of the city of Rio Grande, RS, Brazil. PA was collected through the leisure section of the International Physical Activity Questionnaire (IPAQ). The cutoff points used for MPA and VPA were, respectively, 150 min/wk and 75 min/wk. The health conditions analyzed were: obesity, stress, hypertension, diabetes, depression and self-perception of health. ***Results:*** A total of 1,290 individuals participated in the study, with a mean age of 46.0 years (SD = 17.3); 14.3% (95%CI 11.7 – 16.8) were classified as active for MPA, and 14.6% (95%CI 12.1 – 17.1) for VPA. Male gender, higher schooling, more favorable perception of the neighborhood and more hours of sleep were associated with higher prevalence of MPA. Males, aged 20 to 39 years, white skin color, absence of smoking, higher schooling and higher index of assets were associated with higher prevalence of VPA. Regarding health outcomes, MPA conferred protection for stress, while VPA was a protective factor for obesity, hypertension, and diabetes. ***Conclusions:*** It was observed that both the predictors and the health outcomes differed according to the intensity of the PA.

Keywords: Leisure activities. Exercise. Risk factors. Chronic disease. Epidemiology.

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RESUMO: ***Introdução:*** A atividade física (AF) regular promove diversos benefícios à saúde. O objetivo deste estudo foi analisar os preditores da AF moderada (AFM) e da AF vigorosa (AFV), separadamente, bem como alguns desfechos de saúde relacionados a cada intensidade. ***Método:*** Estudo transversal, de base populacional, com adultos e idosos da zona urbana do município de Rio Grande (RS), Brasil. A AF foi coletada por meio da seção de lazer do Questionário Internacional de Atividade Física (IPAQ). Os pontos de corte utilizados para AFM e AFV foram, respectivamente, 150 min./sem. e 75 min./sem. As condições de saúde analisadas foram: obesidade, estresse, hipertensão, diabetes, depressão e autopercepção da saúde. ***Resultados:*** Participaram 1.290 indivíduos, com idade média de 46,0 anos (DP = 17,3). Foram classificados como ativos para AFM e AFV 14,3% (IC95% 11,7 – 16,8) e 14,6% (IC95% 12,1 – 17,1), respectivamente. Sexo masculino, maior escolaridade, percepção mais favorável do bairro e mais horas diárias de sono foram associados a maiores prevalências de AFM. Sexo masculino, idade de 20 a 39 anos, cor de pele branca, ausência de tabagismo, maior escolaridade e maior índice de bens foram associados a maiores prevalências de AFV. Com relação aos desfechos de saúde, a AFM conferiu proteção para estresse, enquanto a AFV constituiu fator protetor para obesidade, hipertensão e diabetes. ***Conclusões:*** Verificou-se que tanto os preditores quanto os desfechos de saúde diferiram conforme a intensidade da AF.

Palavras-chave: Atividades de lazer. Exercício. Fatores de risco. Doença crônica. Epidemiologia.

INTRODUCTION

Evidence shows that physical inactivity considerably increases the risk of many adverse health conditions and reduces life expectancy, becoming one of the ten major risk factors for mortality worldwide[1,2] and accounting for 1 to 4% of total global healthcare costs[3]. In addition, studies indicate that regular physical activity (AF) practice generates several health benefits[4] and is one of the main protective behavioral factors for chronic noncommunicable diseases[1].

Even with this evidence, according to the World Health Organization (WHO), 23% of adults aged 18 years or older are insufficiently active, reaching 32% in the Americas[2]. In Brazil, data from the Surveillance System of Risk and Protection Factors for Chronic Diseases by Telephone Inquiry (VIGITEL) of 2016 indicate that the percentage of insufficient practice of PA was 47.5%[5]. Although the benefits of PA practice are well emphasized in the literature[6], the vast majority of studies do not assess the intensity of PA separately, investigating only whether individuals meet the recommendations.

However, since the 1990s, it has been demonstrated that meeting the recommendation of vigorous physical activity (VPA) strengthens the health benefits of PA and also guarantees increased longevity, with a reduction in mortality rates[7]. In this sense, investigation of whether the factors associated with meeting the recommendations for each intensity are the same and if the health effects are also equivalent is justified. Thus, this study aimed to analyze the predictors of moderate physical activity (MPA) and VPA, separately, as well as some health outcomes related to the practice of PA in each intensity, in adults and elderly in southern Brazil.

METHOD

This is a cross-sectional, population-based study that integrates a larger study called Health of the Rio Grande Population, conducted in 2016 with the objective of evaluating health aspects of the population of the city of Rio Grande (RS), Brazil. The research project was submitted and approved by the Research Ethics Committee in the Health Field (CEPAS) of Universidade Federal do Rio Grande (FURG), under protocol number 20/2016.

This study included individuals aged 18 years or older residing in the urban area of Rio Grande, excluding those institutionalized in nursing homes, hospitals and prisons, or who demonstrated any physical and/or mental incapacity to answer the questionnaire. The municipality of Rio Grande is located in the extreme south of Brazil, approximately 350 km from the capital of Rio Grande do Sul, Porto Alegre. According to the 2010 census of the Brazilian Institute of Geography and Statistics (IBGE)[8], its population was 197,228 inhabitants in that year, 96% of them living in the urban area, and the Human Development Index (HDI) was 0.744.

The sample size was calculated considering a 95% confidence interval, 80% power, outcome prevalence of 10%, frequency of exposition between 20 and 60%, and prevalence ratio (PR) of 2.0, obtaining N of 784 individuals. An additional 50% were included for the sampling design effect and 15% for possible confounding factors, resulting in 1,294 individuals. In addition, 10% were added for possible losses and refusals, thus totaling 1,423 individuals.

The sampling process took place in two stages: the first one was the selection of census tracts and the second was the selection of households. For the selection of census tracts, a list was drawn in descending order according to the monthly income of the head of the household, of all households. Thus, the first domicile was drawn and the selection interval was established to identify the sector of which the household was a part, totaling 72 sectors. In these census tracts, the household selection was carried out in a systematic way, proportional to the size of the sector. Thus, 711 households were sampled to contemplate the sample size calculation of 1,423 individuals, as, on average, two residents were expected per household, with an age equal to or greater than 18 years.

PA was evaluated as an outcome of some risk factors and as a predictor of some health conditions. For this, the leisure section of the International Questionnaire of Physical Activity (IPAQ), long version, instrument previously validated in some countries, including Brazil, was used[9]. The practice of PA was surveyed in a typical week, with questions about duration and frequency of walking, moderate intensity activities, and vigorous activities. MPA is characterized by activities that require medium physical effort and make the individual breathe a little faster than normal, such as swimming, pedaling at medium pace, and playing sports for fun; VPA, on the other hand, includes activities that require a lot of physical effort and make the individual breathe much faster than normal, such as running, gymnastics, fast pedaling, and competitive sports.

O cálculo do tempo de atividade física por semana foi obtido por meio da multiplicação da duração (em minutos) pela frequência (em dias), obtendo-se um escore em min./sem. Individuals who practiced 150 min./week of moderate activities (including

walking) were classified as physically active. The cutoff point used for VPA was practicing for at least 75 min./week.

The independent variables were: gender (male/female), age group (18–39/40–59/greater than or equal to 60), skin color (white/other), marital status (not married/married, separated or widower), schooling in years (0–8/9–11/greater than or equal to 12), index of assets in tertiles (from lowest to highest), smoking (non-smoker/ex-smoker/smoker), daily hours of sleep (less than 6 h/day, from 6.0 to 7.9, and greater or equal to 8.0 h/day), daily hours watching television (up to 3.0 h/day and more than 3.0 h/day), self-perception of the neighborhood for the practice of physical activities (less friendly, intermediate, more friendly).

In order to create the variable "index of assets", 11 items were considered among house characteristics and household goods, and a main components analysis was performed[10], in which the first component was extracted, which explained 31% of the variability of all items. The perception of the neighborhood for the practice of PA was evaluated by modified scale of perception of the environment and validated for Brazilian adults[11]. This scale was adapted from the international Neighborhood Environment Walkability Scale questionnaire[12]. Then, the sum of the scale items was performed, those that had negative connotations were inverted, and the sum was divided into tertiles.

The health conditions analyzed were: obesity (body mass index — BMI ≥ 30.0 kg/m^2, calculated from self-reported weight and height); stress (obtained by the Perceived Stress Scale and defined as the highest quartile of the sum of the scale); hypertension and diabetes (obtained by medical diagnosis, self-reported by the individual); nd depression (assessed by the Patient Health Questionnaire — PHQ-9, validated for the Brazilian population)[14]. For the operationalization of the depression score, the algorithmic form of the scale was used[15]. The perception of health was self-reported by the individual and categorized as regular/poor and good/very good/excellent.

Data collection occurred from April to July 2016 in the households of the individuals selected. The questionnaire, with a mean duration of 30 minutes, was applied by previously trained interviewers to those who consented to participate in the study and signed the Informed Consent. Concomitantly with the data collection, quality control was performed in 10% of the sample, through a telephone re-interview containing key questions to identify possible fraud in the application of the instrument. The data collected were doubly entered in EpiData software, version 3.1.

Univariate analysis was used to describe the sample (absolute frequency and relative frequency). For crude and adjusted analysis, Poisson regression was used, with robust adjustment for variance, taking into account the effect of sample design. The measures presented were PR and 95%CI, together with p-value. The multivariate analysis followed a hierarchical model elaborated for the control of possible confounding factors. In this model, demographic variables (gender, age group, skin color and marital status) were placed on the first level; in the second level, socioeconomic variables (education and index of assets); in the third level, behavioral variables (smoking, hours of sleep and daily hours watching television); and on the fourth level, the neighborhood perception variable. Each variable was controlled

for those of the same level or levels above. The level of significance for maintenance of the variables in the adjusted model was 20%, and the level of statistical significance was 5% for two-tailed tests. For the ordinal variables, the p-value of the linear trend test was used.

When analyzing MPA and VPA as possible predictors of some health conditions, Poisson regression was also used, taking into account the effect of the sampling design. In this approach, the adjusted analysis included all variables with p-value < 0.20 in the multivariate analysis described in the previous paragraph. The level of statistical significance remained at 5% for two-tailed tests. Statistical analyzes were performed in the Stata package, version 11.2.

RESULTS

Of the 1,429 subjects eligible for this study, 1,300 answered the questionnaire, generating a response rate of 91%. Of the 129 who did not respond, 99 were refusals (77%) and 30 losses (23%), being more prevalent in men (12%) than in women (6.5%) (p <0.01). There was no difference in the mean age of participants and nonparticipants. The Centro district had a higher non-response rate (20%). Ten subjects did not provide information on MPA and VPA in this study, resulting in N = 1,290 for the analyzes. The effects of design and intraclass correlation coefficient for MPA were 1.68 and 0.023, and for VPA, 1.60 and 0.030, respectively.

The majority of the individuals were females (56.7%), 24% were 60 years old or more, 82.9% had white skin color, 46.2% were not married and 41.8% had up to 8 years of schooling. About a fifth (18%) of the respondents were smokers, 12.5% reported sleeping less than 6 hours a day, and 31.8% were watching more than 3 hours of television daily. Approximately one quarter (23.8%) of the participants were obese and 28.2% had a medical diagnosis of hypertension. Diabetes accounted for 7.0% of the sample and depression, 11.2%. One-third (33.6%) considered their health either regular or poor.

The prevalence of MPA was 14.3% (95%CI 11.7 – 16.8), ranging from 8.7% for the group that slept less than 6 hours per day to 18.3% for the group that perceived their neighborhood as more frendly for practicing PA. In the crude analysis, it was found that males and former smokers had a higher prevalence of MPA in relation to females and smokers, respectively. There was a positive association between schooling, the index of assets and self-perception of the neighborhood with MPA. In the adjusted analysis, the number of hours of sleep per day was positively associated with the outcome and the index of assets lost its association. Males, higher schooling, and more favorable perception of the neighborhood continued to be associated with a higher prevalence of MPA. Skin color, age, marital status and television hours had no association either in the crude analysis or in the adjusted analysis (Table 1).

The prevalence of VPA was 14.6% (95%CI 12.1 – 17.1), The prevalence of VPA was 14.6% (95%CI 12.1 - 17.1), varying from 5.4% for the group with lower schooling to 21.8% for the group with the highest index of assets. In the crude analysis, male, not married, non-smoker individuals, with 6.0 to 7.9 hours of sleep per day and who watched television for up to 3 hours daily, showed a higher prevalence of VPA compared to their peers.

Table 1. Crude and adjusted analysis of moderate physical activity in individuals aged 18 years or older in the urban area of Rio Grande, RS, Brazil, 2016 (N = 1,290).

Variables	MPA	Crude analysis		Adjusted analysis	
	%	PR (95%CI)	p-value	PR (95%CI)	p-value
Gender					
Males	16.1	1.25 (1.01 – 1.25)	0.04	1.26 (1.02 – 1.57)	0.04
Females	12.9	1.00		1.00	
Age group (years)					
18–39	12.9	0.78 (0.57 – 1.08)	0.14*	0.77 (0.56 – 1.07)	0.12*
40–59	14.3	0.87 (0.63 – 1.21)		0.86 (0.62 – 1.20)	
≥ 60	16.5	1.00		1.00	
Skin color					
White	14.6	1.15 (0.76 – 1.73)	0.51	1.14 (0.75 – 1.71)	0.54
Others	12.7	1.00		1.00	
Marital status					
Not married	12.9	0.84 (0.66 – 1.06)	0.15	0.90 (0.67 – 1.20)	0.45
Married, separated, widowed	15.4	1.00		1.00	
Schooling (years)					
0 to 8	9.8	1.00	< 0.01*	1.00	< 0.01*
9 to 11	16.9	1.72 (1.22 – 2.43)		1.96 (1.37 – 2.81)	
≥ 12	18.1	1.84 (1.29 – 2.63)		2.21 (1.52 – 3.21)	
Index of assets (tertiles)					
1 (lower)	10.6	1.00	0.01*	1.00	0.29*
2	14.7	1.39 (0.92 – 2.09)		1.21 (0.79 – 1.86)	
3 (higher)	17.4	1.64 (1.10 – 2.46)		1.24 (0.83 – 1.86)	
Smoking					
Non-smoker	14.7	1.48 (0.96 – 2.28)	0.09	1.39 (0.88 – 2.19)	0.15
Former smoker	16.4	1.66 (1.06 – 2.60)		1.54 (1.00 – 2.36)	
Smoker	9.9	1.00		1.00	
Sleep (hours per day)					
< 6.0	8.7	1.00	0.07*	1.00	0.02*
6.0 a 7.9	14.8	1.70 (0.92 – 3.14)		1.49 (0.81 – 2.75)	
≥ 8.0	15.3	1.76 (0.99 – 3.13)		1.77 (1.01 – 3.12)	
Television (hours per day)					
Up to 3.0	15.4	1.36 (0.98 – 1.88)	0.07	1.26 (0.91 – 1.76)	0.17
> 3.0	11.3	1.00		1.00	
Perception of the neighborhood (tertiles)					
Less friendly	12.0	1.00	0.02*	1.00	0.02*
Intermediate	14.0	1.17 (0.78 – 1.77)		1.11 (0.74 – 1.66)	
More friendly	18.3	1.52 (1.09 – 2.14)		1.50 (1.10 – 2.05)	

MPA: moderate physical activity; PR: prevalence ratio; 95%CI: 95% confidence interval; *linear trend test.

A negative association of VPA with age group was observed, and positive association with schooling, index of assets and self-perception of the neighborhood. In the adjusted analysis, the prevalence of VPA remained higher for males, nonsmokers and smokers, compared to females and former smokers. The age group remained inversely associated with VPA, while schooling and the index of assets were directly associated. Marital status, daily hours of sleep, habit of watching television and self-perception of the neighborhood lost association with the practice of VPA. Skin color (white) had a statistically significant association after adjustments (Table 2).

Table 3 presents the analyzes for health outcomes associated with reaching the recommendations for MPA and VPA. It was verified that the practice of MPA was associated with less occurrence of stress, depression and poor or regular health, and depression lost association after adjusting for possible confounders. In turn, VPA was a protective agent for all outcomes analyzed, remaining with a statistically significant association, after adjustments, for obesity, hypertension, diabetes, and regular or poor health.

DISCUSSION

The present study evaluated compliance with the recommendations of MPA and VPA practice, in the leisure domain, in adults and in elderly residents of a city in Southern Brazil, investigating health predictors and outcomes. It was observed that about 15% of the individuals met the recommendations for the practice of MPA and VPA, respectively. Male subjects with higher schooling were more active at both intensities. Regarding the health outcomes, it was verified that MPA conferred protection for stress, while VPA constituted a protective factor for obesity, hypertension and diabetes.

The prevalence of MPA in this study was lower than that found by the Brazilian VIGITEL survey (37.6%) for individuals aged 18 years or older (N = 54,174)[5]. One likely explanation for this difference is the use of different instruments. A study conducted between 2003 and 2006 with adult males (aged 20-64 years) living in the United States (N = 1,841) found a prevalence of MPA of 28.8%[16]. However, in this study, AF was investigated using an accelerometer, and the leisure domain was not the only one analyzed. On the other hand, the prevalence of VPA was 1.7%[16], but the authors used the same cut-off point of MPA, which would be equivalent to 150 min./week. If the present study used this cutoff point for VPA, the prevalence would decrease to 11.1%.

In a study conducted in the city of Pelotas (RS), in 2002, with individuals aged 20 years or older (N = 3,182), the prevalence of MPA was 34.5%, and 29.2% for VPA[1]. However, in this study, the instrument used was the short version of IPAQ, which does not distinguish the PA domains. In addition, VPA had a cutoff of 60 min./week. If this study used this same cutoff point for VPA, the prevalence would increase by 1.5 percentage points, becoming 16.1%.

Regarding the predictors to meet recommendations for MPA and VPA, it was observed that males had a higher prevalence than females for both intensities. Several

Table 2. Crude and adjusted analysis of vigorous physical activity in individuals aged 18 years or older in the urban area of Rio Grande, RS, Brazil, 2016 (N = 1,290).

Variable	VPA	Crude analysis		Adjusted analysis	
	%	RP (95%CI)	p-value	PR (95%CI)	p-value
Gender					
Males	18.0	1.50 (1.12 – 2.01)	0.01	1.45 (1.09 – 1.94)	0.01
Females	12.0	1.00		1.00	
Age group (years)					
18–39	20.1	2.60 (1.47 – 4.62)	< 0.01*	2.19 (1.21 – 3.97)	< 0.01*
40–59	13.3	1.72 (0.90 – 3.26)		1.60 (0.66 – 2.14)	
≥ 60	7.7	1.00		1.00	
Skin color					
White	15.3	1.41 (0.92 – 2.17)	0.12	1.56 (1.04 – 2.35)	0.03
Others	10.9	1.00		1.00	
Marital status					
Not married	18.7	1.69 (1.26 – 2.27)	< 0.01	1.28 (0.93 – 1.78)	0.13
Married, separated, widowed	11.1	1.00		1.00	
Schooling (years)					
0 to 8	5.4	1.00	< 0.01*	1.00	< 0.01*
9 to 11	16.1	2.99 (1.97 – 4.56)		2.43 (1.52 – 3.90)	
≥ 12	27.1	5.05 (3.27 – 7.80)		3.64 (2.21 – 6.02)	
Index of assets (tertiles)					
1 (lower)	8.1	1.00	< 0.01*	1.00	0.01*
2	14.2	1.75 (1.20 – 2.54)		1.35 (0.94 – 1.93)	
3 (higher)	21.8	2.68 (1.79 – 4.02)		1.73 (1.17 – 2.56)	
Smoking					
Non-smoker	18.1	2.63 (1.74 – 3.99)	< 0.01	1.97 (1.32 – 2.95)	0.01
Former smoker	12.2	1.76 (1.05 – 2.95)		1.82 (1.10 – 2.99)	
Smoker	6.9	1.00		1.00	
Sleep (hours per day)					
< 6.0	8.6	1.00	0.02	1.00	0.18
6.0 a 7.9	17.4	2.01 (1.12 – 3.63)		1.74 (0.96 – 3.14)	
≥ 8.0	13.8	1.60 (0.84 – 3.04)		1.69 (0.89 – 3.24)	
Television (hours per day)					
Up to 3.0	17.1	1.79 (1.24 – 2.57)	< 0.01	1.24 (0.89 – 1.74)	0.20
> 3.0	9.6	1.00		1.00	
Perception of the neighborhood (tertiles)					
Less friendly	12.2	1.00	0.04*	1.00	0.08*
Intermediate	15.4	1.26 (0.90 – 1.79)		1.15 (0.85 – 1.56)	
More friendly	17.9	1.48 (1.01 – 2.16)		1.39 (0.96 – 2.00)	

VPA: vigorous physical activity; PR: prevalence ratio; 95%CI: 95% confidence interval; *linear trend test.

studies[17-19] indicate that men are physically more active than women, being more present in collective and competitive PA, while women practice individual activities that require less physical effort[20]. In addition, men engage in more intense activities such as running, swimming, pedaling, and bodybuilding[21], while women are more likely to walk and do housework[21].

Regarding age groups, younger adults were more likely to meet recommendations for VPA. Similar to this finding, a study conducted in the nearby city of Pelotas (RS) pointed out that individuals with ages between 20 and 39 years practiced more VPA[17]. Other epidemiological studies reinforce this inversely proportional association to the age group[22,23]. It should be pointed out that for MPA, no significant difference was found between the age groups, being slightly higher for the elderly (16.5% versus 12.9% for adults aged 18 to 39 years, p = 0.12).

White skinned individuals practiced more VPA, but this association was lost after adjusting for socioeconomic status (data not shown). This may be explained more by the fact that white-skinned individuals have higher family incomes than by factors such as racial discrimination against brown or black individuals.

Table 3. Association of moderate physical activity and vigorous physical activity with health conditions in individuals aged 18 years or more in the urban area of Rio Grande, RS, Brazil, 2016 (N = 1,290).

Moderate physical activity		Crude analysis		Adjusted analysis*	
Outcome	%	PR (95%CI)	p-value	PR (95%IC)	p-value
Obesity	23.8	0.84 (0.61 – 1.17)	0.30	0.84 (0.61 – 1.18)	0.31
Stress	24.7	0.51 (0.36 – 0.73)	< 0.01	0.63 (0.45 – 0.90)	0.01
Hypertension	28.2	0.85 (0.63 – 1.14)	0.27	0.84 (0.63 – 1.12)	0.23
Diabetes	7.0	0.93 (0.50 – 1.72)	0.81	0.91 (0.51 – 1.63)	0.75
Depression	11.2	0.45 (0.23 – 0.88)	0.02	0.53 (0.26 – 1.09)	0.08
Regular or poor health	33.6	0.63 (0.49 – 0.80)	< 0.01	0.74 (0.58 – 0.96)	0.02
Vigorous physical activity		Crude analysis		Adjusted analysis**	
Outcome	%	PR (95%CI)	p-value	PR (95%IC)	p-value
Obesity	23.8	0.62 (0.42 – 0.91)	0.02	0.66 (0.45 – 0.97)	0.03
Stress	24.7	0.61 (0.44 – 0.83)	< 0.01	0.77 (0.54 – 1.09)	0.14
Hypertension	28.2	0.45 (0.32 – 0.64)	< 0.01	0.65 (0.44 – 0.97)	0.03
Diabetes	7.0	0.20 (0.06 – 0.65)	0.01	0.29 (0.09 – 0.93)	0.04
Depression	11.2	0.34 (0.18 – 0.66)	< 0.01	0.55 (0.27 – 1.10)	0.09
Regular or poor health	33.6	0.40 (0.29 – 0.57)	< 0.01	0.57 (0.40 – 0.81)	< 0.01

PR: prevalence ratio; 95%CI: 95% confidence interval; *adjustment for all variables with p-value < 0.20 in the adjusted analysis of Table 1; **adjustment for all variables with p-value < 0.20 in the adjusted analysis of Table 2.

The higher the educational level, the greater the probability of meeting the recommendations, both for MPA and, mainly, for VPA. This finding is in line with other national and international studies[5,16,23-25]. One hypothesis is that individuals with higher schooling have more access to information, which provides greater knowledge about the benefits of practicing PA. In addition, individuals with higher schooling had higher family income (data not shown), which may favor participation in gyms, sports clubs and other non-free institutions. Even after adjustment for socioeconomic status, schooling remained associated with MPA and VPA, being the strongest predictor for both intensities. The index of assets remained positively associated only with AFV. Other studies[26-29] Other studies demonstrate that leisure PA is more practiced by individuals with a higher socioeconomic status.

It was found that smokers practiced less MPA and VPA than nonsmokers, an outcome found in other studies[30,31]. This finding indicates that nonsmokers (including former smokers) are more likely to take care of their health than those who smoke. Sleep was also positively associated with PA, but remained significant only for MPA. It is assumed that individuals who sleep more also take more care of their health. Another finding worthy of note was the more favorable perception of the neighborhood as a facilitator for MPA practice, but not for VPA. It is believed that favorable neighborhood conditions, such as security, infrastructure and public spaces, are friendly to the practice of mild and moderate activities, especially walking[32-35].

When the health conditions were analyzed, it was verified that VPA conferred greater protective effect against chronic diseases such as obesity, hypertension and diabetes. This finding reinforces the evidence that some PA is better than none at all, and that the higher the intensity of PA, the greater the health benefits[6]. In turn, MPA provided stronger protection for stress. This indicates that to reduce stress levels, it is estimated that no such intense physical effort is required. It is likely that mild to moderate physical activity will also protect against stress and have mental health benefits[36,37]. It is also noteworthy that active individuals, in any of the intensities, perceived their health as better, and this effect was more significant for VPA than for MPA.

As limitations of this study, the cross-sectional design, which is not the most appropriate to establish cause-effect relationships, and the instrument used to measure PA, are mentioned. However, it is believed that the study was not affected by reverse causality, as all the associations found occurred in the expected direction. Nevertheless, if this bias had any influence, the association measures were underestimated. Regarding the instrument, although subjective, IPAQ is one of the most used questionnaires in studies on PA. In addition, objective measures, such as the accelerometer, have the disadvantage of not distinguishing PA domains nor capturing all activities.

One of the positive points of this study was evaluating the intensity of PA (moderate and vigorous) separately, since most studies do not make this distinction, simply classifying individuals as physically active or inactive. The present study also innovates in relation to other studies on this subject because it analyzed both predictors (associated factors) and health outcomes related to the practice of MPA and VPA. Another advantage was working with a

representative sample of the adult and elderly population of a municipality in Southern Brazil, which allows extrapolating the results to other urban centers with similar characteristics.

CONCLUSIONS

The results of this study allowed to identify the groups most likely to practice MPA and VPA: males, with higher schooling levels, and nonsmokers. It was also observed that the health outcomes differed for those who met the recommendations for MPA and VPA. Such findings can be used by health managers to promote the practice of PA among less active groups, as well as to intervene on some diseases and health conditions through the promotion of PA. Longitudinal (cohort and intervention) studies are recommended, stratifying data analyzes by the intensity of PA, since the associated factors and health benefits differ for MPA and VPA.

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