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original article

Practice of walking, moderate and vigorous physical activity and associated factors in adolescents from a state capital of southern Brazil

Prática de caminhada, atividade física moderada e vigorosa e fatores associados em adolescentes de uma capital do sul do Brasil

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Abstract – Physical inactivity is considered a major cause of morbidity and mortality worldwide. The aim of this study was to analyze the association of socio demographic factors, weight status, body adiposity and sedentary behavior with the practice of walking and moderate and vigorous physical activity in adolescents. This cross-sectional study included 631 adolescents (413 girls) aged 14-17 years. A self-administered questionnaire was used to collect data. Boys showed longer time of practice of walking and vigorous activity than girls. Adolescents of high economic level were more involved in vigorous activities. Overweight girls and adolescents showed, respectively, 98 and 138 minutes/week less of practice of walking when compared to boys and normal-weight adolescents. Adolescents with high body adiposity had 100 minutes/week more of practice of walking in relation to adolescents with normal adiposity. In relation to vigorous activity, girls showed 198 minutes/week less when compared to boys. The association of factors investigated in this study with the practice of physical activity in adolescents varies according to the type and intensity of the activity performed.

Key words: Adolescents; Physical activity; Public health.

Resumo – *A inatividade física é considerada uma das principais causas de morbimortalidade no mundo. O objetivo do presente estudo foi analisar a associação de fatores sociodemográficos, status do peso, adiposidade corporal e comportamento sedentário com a prática de caminhada, atividade física moderada e vigorosa em adolescentes. Estudo transversal conduzido em 631 adolescentes (413 moças) de 14 a 17 anos de idade. Um questionário auto administrado foi utilizado para coletar as informações. Os rapazes apresentaram maior tempo de prática de caminhada e atividade vigorosa em comparação às moças. Os adolescentes de nível econômico médio tiveram maior participação em atividades vigorosas. As moças e os adolescentes com sobrepeso apresentaram, respectivamente, 98 e 138 minutos/semana a menos de prática de caminhada quando comparados aos rapazes e aos adolescentes de peso normal. Adolescentes com adiposidade elevada apresentaram 100 minutos/semana a mais de prática de caminhada em relação aos seus pares com adiposidade normal. Quanto às atividades vigorosas, as moças apresentaram menos 198 minutos/semana quando comparadas aos rapazes. A associação dos fatores investigados neste estudo com a prática de atividades físicas varia de acordo com o tipo e intensidade de atividade física realizada.*

Palavras-chave: *Adolescentes; Atividade física; Saúde pública.*

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INTRODUCTION

Technological progress contributes to the improvement of people's quality of life, but also leads to the appearance of numerous cardiovascular and metabolic diseases that entail a series of risks to health[1]. The reduction of the amount of physical activity and the adoption of sedentary habits have been considered a public health problem, being the fourth leading cause of mortality worldwide as a result of sedentary lifestyle[2].

Evidence shows that individuals who spend long time sitting or with insufficient levels of physical activity have greater risk of morbidity and mortality[3-6]. In addition, physical inactivity has substantially increased the relative incidence of coronary artery disease, acute myocardial infarction, hypertension, colon and breast cancer, type 2 diabetes mellitus and osteoporosis[7].

The practice of physical activity, regardless of type and intensity, brings benefits to health[8]. Study conducted with runners and walking practitioners, whose objective was to verify the effect of different exercise types and intensity on cardiovascular risk factors, revealed that both groups showed a reduction in the risk of arterial hypertension, hypercholesterolemia, diabetes mellitus and coronary artery disease, i.e. both moderate (walking) and vigorous intensity (running) produced similar reductions in the risk of cardiovascular diseases[9]. Results found by Jeon et al.[10] showed that the adherence to recommendations to participate in moderate-intensity physical activities such as walking can substantially reduce the risk of type 2 diabetes mellitus.

In Brazil, several studies have been conducted with the aim of assessing the level of habitual physical activity and associated factors in adolescents[11]. The study of Barufaldi et al.[11] found that the prevalence of physical inactivity in Brazilian adolescents ranged from 2 to 80% for boys and from 14 to 91% for girls. In addition, it was observed that the studies included in the meta-analysis[11] used the total amount of physical activity (walking+moderate+vigorous) to classify individuals as active or inactive/insufficiently active. In the literature surveyed, there was only one study that investigated in isolation each type and intensity of physical activity 12, which found that girls spent more time in the practice of walking and vigorous activities compared to boys. In addition, older adolescents (14-16 years) had higher participation in walking than their younger peers (11-13 years), and positive association between economic class and time spent in moderate physical activities was observed[12].

In this sense, there is need for more studies that investigate the factors associated with different exercise type and intensity (walking and moderate and vigorous physical activities) in Brazilian adolescents, which may indicate specific factors in each exercise type and intensity. Thus, the aim of the present study was to analyze the association of socio demographic factors, anthropometric indicators and sedentary behavior with the practice of walking, moderate and vigorous physical activity in adolescents from southern Brazil.

METHODOLOGICAL PROCEDURES

This cross-sectional study was conducted in the second half of 2007 in the city of Florianopolis, Santa Catarina, Brazil. The study was approved by the Human Research Ethics Committee at Federal University of Santa Catarina (Protocol number 372/2006) and all subjects who participated in the survey presented the free and informed consent form signed by parents/guardians. Florianopolis, capital of the state of Santa Catarina, is located in southern Brazil and has approximately 420,000 habitants[13], being considered one of Brazilian capitals with the highest human development index (HDI= 0.875)[14].

Sample selection

The process of sample selection included public schools and was determined in two stages, stratified by geographic region and the cluster of classes. In the first stage, the city of Florianopolis-SC was divided into five regions: Central, Continental, Eastern, Northern and Southern regions. The largest schools in terms of number of students from each region were selected, and in each school, classes were randomly selected to achieve sufficient representativeness of the geographic area. In the second stage, all adolescents who were present in the classroom on the day of data collection were invited to participate in the study.

Sample size was determined using procedures suggested by Luiz and Magnanini[15] from a finite population, with prevalence of 50% (unknown data and/or largest possible sample size), confidence level of 95% (CI95%), acceptable error of four percentage points, and addition of 10% for possible losses and refusals. Thus, 631 students had to be evaluated. Due to the characteristics of the sampling process, involving all individuals belonging to conglomerates, 892 adolescents were included in the sample.

The inclusion criteria were: to be enrolled in state schools, to be in classroom on the day of data collection and to be up to 18 years old. The exclusion criteria were: be younger than 14 years and older than 18 years; not presenting the Clear and Free Consent Form signed by parents (younger than 18 years old) or by themselves (18 years old); and not answering all the questions in the questionnaire.

Variables

Information about socio demographic (gender, age and economic level) and anthropometric data (body mass, height and skinfold thickness regions of triceps and subscapular), physical activity (walking, moderate and vigorous activities) and sedentary behavior (time spent in front of TV, computer and videogame) were collected.

The economic level of adolescents was assessed using the questionnaire of the Brazilian Association of Research Companies[16], which uses a scoring system that divides the Brazilian population into some economic strata (A1, A2, B1, B2, C, D, E) according to the purchasing power of individuals and families and the educational level of the family head. Economic

strata were grouped and (A1+A2+B1+B2) was considered high and (C +D) medium level. As a result of the reduced number of school children with low economic level (D), this was grouped in the medium category.

To assess the weight status, body mass and height measures were collected, according to standard procedures[17], and body mass index (BMI) was calculated. The international cut-off points for BMI of adolescents were considered, according to age and gender[18-19]. This variable was dichotomized into normal weight (low weight+normal) and overweight (overweight+obesity). Inadequate body composition was estimated by the ranking of the sum of two skinfolds (triceps+subscapular - Σ2SK) according to criteria of the American Alliance for Health, Physical Education, Recreation and Dance[20]. In this study, Σ2DC was defined as "inadequate" and "adequate".

Sedentary behavior was verified by the time spent in front of TV, videogame and computer. Sedentary behavior was considered as time longer than or equal to 4h/day of TV, computer and/or videogame, according to previously studies[21].

Information about physical activity level among adolescents was collected by using the International Physical Activity Questionnaire (IPAQ), short version. This instrument was validated and deemed appropriate to be applied in Brazilian adolescents[22]. In the present study, different types and intensity of physical activity were used (walking, moderate and vigorous physical activity).

Statistical Analysis

Descriptive analysis was conducted (mean, standard deviation and frequency distribution) to characterize the study variables. For the inferential statistics, the Mann-Whitney U test was used to determine differences in mean time spent per week in physical activity (walking, moderate and vigorous). Moreover, simple and multivariate linear regression analysis was used to investigate possible associations of types and intensity of physical activity and sociodemographic variables, nutritional status, body fatness and sedentary behavior, with confidence level of 95%. Analyses were carried out using Statistical Package for Social Sciences (SPSS), version 20.0.

RESULTS

The present study excluded 261 adolescents for not answering all the questions of the instrument. Thus, the sample consisted of 631 adolescents with mean age of 15.9 years (standard deviation= 0.91) and 63.5% were female. Table 1 shows the average weekly practice of walking, moderate and vigorous physical activity in relation to gender, age, economic level, BMI and sum of two skin folds. According to results, it is possible to observe that male adolescents had higher practice in walking ($p= 0.014$) and vigorous physical activity ($p< 0.001$) in relation to female adolescents. In addition, adolescents of high economic level showed higher average practice of vigorous physical activity in comparison to those of medium economic level ($p< 0.001$).

Table 1. Average weekly minutes of practice of walking, moderate and vigorous physical activity according to the independent variables.Florianopolis, SC, Brazil.

Variables	Walking (min/week)	Moderate (min/ week)	Vigorous (min/ week)
	Mean (sd)	Mean (sd)	Mean (sd)
Gender			
Male	316.1 (458.2)*	380.7 (564.6)	410.3 (653.9)*
Female	221.6 (317.7)	386.4 (484.0)	181.9 (312.2)
Age			
14-15	241.9 (437.0)	427.0 (581.7)	296.9 (543.2)
16-17	263.3 (342.1)	363.3 (475.3)	248.9 (442.2)
Economic level			
Medium	212.3 (218.6)	332.2 (413.1)	169.3 (247.4)*
High	275.0 (427.4)	407.0 (551.6)	306.9 (545.2)
BMI			
Normal	264.3 (392.7)	383.5 (523.4)	248.2 (427.5)
Overweight	200.1 (246.4)	389.9 (452.0)	380.0 (731.4)
Σ2SK			
Adequate	250.4 (345.9)	389.3 (537.7)	274.0 (499.2)
Inadequate	274.4 (466.3)	368.3 (431.3)	236.5 (407.0)
Sedentary behavior			
<4h	227.0 (225.9)	402.0 (456.3)	214.2 (322.1)
>4h	263.0 (406.2)	379.9 (528.1)	277.8 (510.0)

* p<.05 (Mann-Whitney test: comparison between categories of the independent variables for each type and intensity of physical activity); sd: standard deviation; BMI: body mass index; Σ2SK: sum of two skinfolds triceps and subscapular.

Table 2 shows the factors associated with the practice of walking among adolescents. The crude analysis showed that females have fewer minutes of walking /week than males and adolescents of high economic level exhibited more minutes of walking /week than students of medium economic level. In the adjusted analysis, girls presented, approximately, 98 minutes less of walking /week than boys; overweight school children had 244 minutes less of walking /week than their normal-weight peers and students with inadequate Σ2SK had 100 minutes more of walking/week when compared to those with adequate Σ2SK.

Table 3 shows the factors associated with the practice of moderate physical activity in adolescents. Both in crude and adjusted analyses, no association was found between practice of moderate physical activity and independent variables (p>0.05).

Table 4 shows the factors associated with practice of vigorous physical activity in adolescents. In the crude analysis, variables gender, economic level and BMI were associated with practice of vigorous physical activity. In the adjusted analysis, girls presented, approximately, 198 minutes/week less of vigorous physical activity than boys. On the other hand, adolescents with high economic level and overweight subjects practiced, respectively, 89 minutes/week and 197 minutes/week more of vigorous physical activity when compared to those of medium economic level and those with normal BMI, respectively.

Table 2. Values of the stepwise multiple linear regression between walking and sociodemographic, anthropometric and sedentary behavior of adolescents. Florianopolis, SC, Brazil.

	B (crude)	95%CI	p value	B (adjusted)	95%CI	p value
Gender						
Male	1.0			1.0		
Female	-94.5	-154.5; -34.5	<0.01	-98.4	-160.1; -36.6	<0.01
Age						
14-15	1.0			1.0		
16-17	21.4	-40.0; 82.8	0.49	22.0	-39.4; 83.3	0.48
Economic level						
Medium	1.0			1.0		
High	62.7	-0.4; 125.8	0.05	45.1	-18.9; 109.2	0.17
BMI						
Normal	1.0			1.0		
Overweight	-64.3	-150.9; 22.3	0.15	-138.0	-243.7; -32.3	0.01
Σ2SK						
Adequate	1.0			1.0		
Inadequate	24.0	-44.6; 92.5	0.49	99.6	15.1; 184.1	0.02
Sedentary behavior						
<4h	1.0			1.0		
>4h	36.2	-36.7; 109.1	0.98	27.3	-45.5; 100.0	0.46

B: beta; CI: confidence interval; BMI: body mass index; Σ2SK: sum of two skin folds triceps and subscapular.

Table 3. Values of the stepwise multiple linear regression between moderate physical activity and socio demographic, anthropometric and sedentary behavior of adolescents. Florianopolis, SC, Brazil.

	B (crude)	95%CI	p value	B (adjusted)	95%CI	p value
Gender						
Male	1.0			1.0		
Female	5.7	-76.7; 88.1	0.89	25.0	-60.1; 110.1	0.60
Age						
14-15	1.0			1.0		
16-17	74.7	-11.4; 160.8	0.09	-61.7	-146.3; 22.9	0.15
Economic level						
Medium	1.0			1.0		
High	74.7	-11.4; 160.8	0.09	77.7	-10.6; 166.0	0.08
BMI						
Normal	1.0			1.0		
Overweight	6.4	-111.8; 124.6	0.92	23.1	-122.6; 168.7	0.76
Σ2SK						
Adequate	1.0			1.0		
Inadequate	-21.0	-114.4; 72.5	0.66	-29.9	-146.3; 86.6	0.62
Sedentary behavior						
<4h	1.0			1.0		
>4h	-22.1	-121.5; 77.3	0.66	-34.5	-134.8; 65.8	0.50

B: beta; CI: confidence interval; BMI: body mass index; Σ2SK: sum of two skin folds triceps and subscapular.

Table 4. Values of the stepwise multiple linear regression between vigorous physical activity and socio demographic, anthropometric and sedentary behavior of adolescents. Florianopolis, SC. Brazil.

	B (crude)	95%CI	p value	B (adjusted)	95%CI	p value
Gender						
Male	1.0			1,0		
Female	-228.4	-303.0; -153.7	<0.01	-198.0	-274.5; -121.4	<0.01
Age						
14-15	1.0			1.0		
16-17	-48.0	-125.8; 29.9	0.23	-22.0	-98.1; 54.1	0.57
Economic level						
Medium	1.0			1.0		
High	137.6	58.0; 217.3	0.01	88.7	9.3; 168.1	0.03
BMI						
Normal	1.0			1.0		
Overweight	131.8	22.2; 241.4	0.02	196.9	65.9; 327.9	<0.01
Σ2SK						
Adequate	1.0			1.0		
Inadequate	-37.5	-124.5; 49.5	0.40	-96.9	-201.6; 7.8	0.07
Sedentary behavior						
<4h	1.0			1.0		
>4h	63.6	-28.9; 156.0	0.18	47.7	-42.5; 137.9	0.30

B: beta; CI: confidence interval; BMI: body mass index; Σ2SK: sum of two skin folds triceps and subscapular.

DISCUSSION

The main result of this study refers to the fact that girls and overweight adolescents practice lower amounts of walking when compared to their male and normal-weight peers. In addition, those with inadequate Σ2SK walk more than adolescents with adequate Σ2SK. In relation to vigorous activity, adolescents with high economic level and overweight perform higher amounts of this activity and girls perform smaller amounts of vigorous physical activity.

Girls performed smaller amounts of walking and vigorous physical activity when compared to boys. These results corroborate the study conducted with Thai adolescents[23] that showed that the levels of moderate and vigorous physical activity were significantly higher in boys than in girls. On the other hand, a survey carried out with Brazilian adolescents indicated that girls exhibited greater weekly time of walking and vigorous physical activity when compared to boys[12]. Ethnographic research conducted with adolescents revealed that boys receive more social and family support for the achievement of physical activities when compared to girls[24].

Overweight adolescents in the present study performed lower amounts of walking but performed greater amount of vigorous physical activity when compared to those with normal weight. Barbosa Filho et al.[12] found that weight status is not associated with the practice of walking and moderate and vigorous physical activity in adolescents in a Brazilian city. Studies have revealed association between these two variables; however, it is noteworthy that they have used analysis of habitual physical activity. No other study

investigating type and intensity of physical activity has been found in literature, which makes data discussion difficult. However, it could be inferred that due to their greater amount of body fat, overweight adolescents have increased perceived effort during the performance of physical activity and get tired faster, considering vigorous activity rather than moderate activity.

Adolescents with inappropriate Σ2SK walk more than those with appropriate Σ2SK. A possible explanation for these findings is related to the fact that adolescents who exhibit greater amount of body fat choose physical activities of lower intensity, and, in many cases, by getting tired faster.

It was observed that overweight adolescents exhibited less weekly time of walking and more vigorous activities compared to their normal-weight peers. On the other hand, it was found that adolescents with inappropriate Σ2SK showed greater weekly time of walking. Participation in physical activities of vigorous intensity is important for overweight subjects and those with excess body fat, considering that high levels of physical activity during childhood and adolescence, particularly of vigorous activity, are associated with lower amount of total and central adiposity in this age and in adulthood [26]. These findings suggest that the practice of physical activity among overweight children and adolescents can have several positive effects on health, including lower levels of body fat [26].

Adolescents of higher economic level showed greater weekly time of practice of vigorous physical activity than adolescents of medium economic level. Studies with Thai[27], American and Mexican[28] adolescents found different results, in which high economic level was a risk factor for the practice of vigorous physical activity. In Brazilian adolescents, it was observed that the highest economic class had higher average practice of moderate physical activity when compared to those from less privileged economic classes (low and medium). These findings can be explained by the fact that adolescents of higher economic class have greater access to sports organizations (clubs, associations, gyms) and consequently participate in activities with higher intensity, such as organized sport practices[29].

The main distinguishing feature of the present study is related to the analysis of the types and intensities of physical activity (walking, moderate and vigorous physical activity), given that the majority of studies in literature investigated the total amount of physical activity and frequently using only the active and inactive/insufficiently active classification. Among limitations, the following can be highlighted: the present study was carried out with high school adolescents from public schools of the city of Florianopolis, which requires the extrapolation of these results to other types of education (private and federal). In addition, due to its cross-sectional design, it is not possible to check reverse causality between variables investigated.

CONCLUSIONS

According to results of the present study, it was concluded that the association of socio demographic factors, nutritional status, body adiposity and

sedentary behavior with the practice of physical activity in adolescents varies according to exercise type and intensity. In this sense, the results found may be used in the projection of interventions at school with guidelines of practice of physical activity with different intensities, as well as the deployment of public policies for the promotion of physical activity for adolescents. Therefore, presenting practical knowledge on the amount of physical activity related to the frequency and intensity can be an initial step in raising awareness about the importance of regular practice of physical activity. Thus, Physical Education teachers, in particular, should make students aware of the benefits of regular practice of physical activity and encourage them to reach the recommended amounts of physical activity (60 minutes/day or on most days of the week).

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