The prevalence of physical activity and its associated effects among students in the São Paulo public school network, Brazil

Prevalência de atividade física e fatores associados
em escolares da rede pública estadual de São Paulo, Brasil

Leonardo José Silva [1]

Victor Keihan Rodrigues Matsudo [2]

Douglas Roque Andrade [3]

Mário Azevedo [4]

Gerson Luis de Moraes Ferrari [2]

Luis Carlos Oliveira [2]

Timóteo Leandro Araújo [2]

Sandra Marcela Mahecha Matsudo [2]

[1] Instituto Israelita de Responsabilidade Social do Hospital Israelita Albert Einstein. Av. Albert Einsten 627/701, Morumbi. 05652-900 São Paulo SP Brasil. ljs.leonardo@gmail.com
[2] Centro de Estudos do Laboratório de Aptidão Física de São Caetano do Sul. R. Heloisa Pamplona 269/31, Bairro Fundação. 09520-320 São Caetano do Sul SP Brasil.
[3] Escolas de Artes, Ciências e Humanidades de São Paulo. Universidade de São Paulo. São Paulo SP Brasil.
[4] Escola Superior de Educação Física, Universidade Federal de Pelotas. Pelotas RS Brasil.

Abstract *The current study evaluated physical activity (PA) level and its associated effects among students in the public network of São Paulo, Brazil. A cross-sectional study was taken using a representative sample of students in São Paulo public school system. International Physical Activity Questionnaire determined PA level. Students who reported at least 300 minutes/week of PA were considered active. The independente variables were: gender, age, body mass index, education, region, recognition of the Agita São Paulo program. The prevalence of regular PA was 71.7%. Males (PR = 1.09, 95% CIs = 1.04 -1.15) at least 17 years old (PR = 1.16, 95% CIs 1.09-1.24) in their 3rd year of high school (PR = 1.20, 95% CIs = 1.12-1.29) who resided in the Midwest region (PR = 1.27, 95% CIs 1.16-1.38) were most likely to be active. Males at least 17 years old in their 3rd year of high school who lived in the Midwest and recognized the Agita São Paulo/Agita Galera program had higher levels of PA. São Paulo students presented a high level of PA. Moreover, males older than 17 years, attending their 3rd year of high school, who lived in the Midwest region, and recognized the* Agita São Paulo/Agita Galera *program were the most likely to be more active.*

Key words *Motor activity, Epidemiology, Public health, Adolescent*

Resumo *O presente estudo avaliou nível de atividade física (AF) e seus efeitos associados entre estudantes da rede pública de São Paulo. Um estudo transversal foi feito usando uma amostra representativa de estudantes da rede pública de ensino de São Paulo. Foi utilizado o International Physical Activity Questionnaire para determinar o nível AF. Estudantes que relataram pelo menos 300 minutos/semana de AF, foram considerados ativos. As variáveis independentes foram: sexo, idade, índice de massa corporal, educação, região e o conhecimento do programa Agita São Paulo. A prevalência de AF regular foi de 71,7%. Os meninos (RP = 1,09, IC95% = 1,04 -1,15), 17 anos de idade (RP = 1,16, 95% IC 1,09-1,24), terceiro ano do ensino médio (RP = 1,20, IC95% = 1,12-1,29) e aqueles que residiam na região do Centro-Oeste (RP = 1,27, IC95% 1,16-1,38) tinham maior probabilidade de ser ativos. Meninos de 17 anos de idade, no terceiro ano do ensino médio, que residiam no Centro-Oeste e reconhecia o programa Agita São Paulo/Agita Galera tinham níveis mais elevados de AF. Alunos de São Paulo apresentaram um elevado nível de AF. Meninos com idade superior a 17 anos, do 3º ano do ensino médio, que residiam na região Centro-Oeste, e reconhecia o programa Agita São Paulo/Agita Galera foram mais propensos a ser mais ativos.*

Palavras-chave *Atividade física, Epidemiologia, Saúde pública, Adolescente*

Introduction

The relationship between physical activity and health has been well established in the literature[1]. However, abundant evidence has also shown that physical inactivity is common among the population, including children and adolescents[2].

In addition to not enjoying the benefits of physical activity in the short term, sedentary children and adolescents have an increased chance of becoming sedentary adults. Even more troubling, physical activity and participation in physical education courses have decreased over time among adolescents in developed countries[3].

A high prevalence of physical inactivity has been estimated among adolescents in Brazil. A recent review[4] found this prevalence to range from 39.0% to 93.5%. This large variability is due to the different measurements and cutoff points used in studies to classify physical activity levels. In Brazil, there are few population-based studies school of physical activity adolescents[5,6].

Interventions to increase physical activity have been recently implemented in Brazil[7,8]. The Agita São Paulo program is a pioneering initiative in this country[9]. Implemented in 1996, this program has increased (at the state level in particular) people's knowledge regarding the biological, psychological, and social health benefits of physical activity and people's involvement in moderate to vigorous physical activity[10]. One of the Agita São Paulo's initiatives is the Agita Galera Program[11], which aims to promote awareness and physical activity at school among school-age children.

The Agita Galera concept is highly audacious because it aims to affect the entire public school system of São Paulo. According to official data of the Board of Education of São Paulo (Secretaria da Educação do Estado de São Paulo), this school system is currently the largest in Brazil with 5,300 schools, 230,000 teachers, 59,000 staff, and more than 4 million students[12].

The current study evaluated physical activity level and its associated effects among students from elementary and middle schools in the public network of São Paulo, Brazil.

Methods

This school-based cross-sectional study was conducted in the state of São Paulo. The sample was selected across multiple stages:

a) Random selection occurred within each macro-region of the municipalities (i.e., each administrative region), stratified by size: small municipalities (up to 30,000 inhabitants), medium (30,001 to 199,999 inhabitants), and large (greater than or equal to 200,000 inhabitants). A municipality was selected from each stratum; if the selected area did not have a municipality within its stratum, then two cities were selected from the stratum of the most representative size.

b) Schools were randomly selected in each municipality (minimum = 2; maximum = 17).

c) Students from the 5th and 8th grades as well as the 3rd year of high school were selected from each school (minimum = 3; maximum = 150).

The data were collected between February and May 2011. Trained interviewers approached individuals in the classroom at all schools. To aid in the understanding of the instrument, especially with regard to the intensity of physical activity, flash cards were used with typical physical activities.

The short version of the International Physical Activity Questionnaire (IPAQ) was used to measure physical activity level[6,13,14]. The IPAQ was developed by an international group of experts to estimate physical activity patterns of populations from different countries and sociocultural contexts[14]. The questionnaire is validated for Brazilian adolescents and the IPAQ have acceptable measurement properties for monitoring levels of habitual physical activity in adolescents[6].

Young adolescents reported their frequencies and durations of walking and other physical activities of moderate to vigorous intensity over the previous week[6]. The content validity of IPAQ is high, because frequency, intensity, and duration of physical activity are assessed, as well as sedentary behavior, which is an emerging concern[6,14] A physical activity score was created by multiplying the weekly frequency and duration of each physical activity session reported. Individuals with a physical activity score of at least 300 minutes/week were considered active based on the current recommendations for physical activity among adolescents[15,16]. The independent variables were as follows:

a) Gender (male or female);

b) Age (in years, categorized into three groups: 10-14, 15-16, and > 17 years);

c) Body mass index (BMI) was derived from weight and height (kg/m²), and BMI z-score calculated based on reference data from the World

Health Organization (WHO), classified into four groups: low weight, normal, overweight, and obese[17];

d) Education (grade at interview date: 5th grade, 8th grade, or 3rd year of high school);

e) Region (17 regions according to the division proposed by the Government of São Paulo: Midwest, Mid-east, South-southeast, the Sea Coastal Regions, and Metropolitan Areas);

f) Recognition of the Agita São Paulo program logo and the "Meiorito" mascot from a card with images;

g) The ability to associate the logo and mascot with physical activity, healthy eating, or overall health. For the purposes of the analyses, those who associated the logo or mascot with something other than the above characteristics were grouped with those who reported that they did not know the logo or mascot.

The Ethics Committee of the Faculty of Medical Sciences at Santa Casa de São Paulo (Comitê de Ética da Faculdade de Ciências Médicas da Santa Casa de São Paulo) approved this study. Those responsible signed the Terms of Consent pursuant to Resolution 196/96 of the National Health Council before the interviews.

Descriptive analyses were conducted to obtain absolute numbers and proportions with respective confidence intervals for categorical data. Bivariate analyses between physical activity level and the independent variables were conducted using the chi-square test for heterogeneity (categorical variables) and the linear trend test (ordinal variables). Adjusted analyses for possible confounds were performed using a Poisson regression with robust adjustment for variance. The variables were selected "after the fact", thereby respecting the levels of the pre-established hierarchical model[18]. Variables with $p < 0.20$ were retained in the final model. The level of significance employed was $p < 0.05$. All analyses were weighted by the representativeness of the municipalities and regions and conducted using Stata version 10.0.

Results

The final sample was composed of 51 municipalities in São Paulo, totaling 154 schools and 2,555 students from the 5th and 8th grades of elementary school as well as the 3rd year of high school in the São Paulo state public school network. Approximately 4% of schools refused to participate in the study; thus, new schools of the same size were randomly selected within each municipality. As shown in Table 1, the students were predominantly female (56.1%), aged between 10 and 13 years, and has a normal BMI (69.2%).

The prevalence of physically active students ($\geq$ 300 minutes/week) in the state was 71.7% (95% CI 70.0-73.4). Table 2 displays the association between physical activity and the independent variables. Young males aged at least 17 years old and in their 3rd year of high school were significantly more active than other participants. Region 5, which includes the capital and the metropolitan area, had the lowest prevalence of physical activity.

Table 3 displays the raw and adjusted analyses of the association between physical activity and the independent variables. The adjusted analyses showed the same associated factors as the raw analyses. Young males were 9% more active than females. Third year high school students were significantly more active compared with students in the 5th grade with a prevalence ratio of 1.20 (95% CIs = 1.12 to 1.29).

Table 1. The sample demographics of São Paulo public education students in 2008 (N = 2,555).

Variables	N	%
Gender		
Male	1,122	43.9
Female	1,433	56.1
Age (complete years)		
10-13	1,069	41.8
14-16	706	27.6
$\geq$ 17	780	30.6
Grade		
5th year of elementary school	774	30.3
8th year of elementary school	787	30.8
3rd year of high school	994	38.9
BMI*		
Low weight	334	13.1
Normal	1768	69.2
Overweight	159	6.2
Obese	228	8.9
Region		
Midwest	476	18.6
Mideast	597	23.4
South-southeast	478	18.7
Coastal regions	400	15.7
Metropolitan region	604	23.6

* Number of missing data: 66; BMI: body mass index.

Table 2. The prevalence of physical activity (≥300 minutes/week) among students in São Paulo public education.

Variables	%	p-value
Gender		< 0.001
Male	75.7	
Female	68.7	
Age (complete years)		< 0.001[t]
10-13	65.7	
14-16	74.9	
≥ 17	76.8	
Grade		< 0.001t
5th year of elementary school	63.3	
8th year of elementary school	74.1	
3rd year of high school	76.4	
Region		< 0.001
Midwest	79.3	
Mideast	77.4	
South-southeast	69.6	
Coastal regions	69.5	
Metropolitan region	63.2	
BMI[*]		0.104
Low weight	67.0	
Normal	72.6	
Overweight	76.0	
Obese	73.0	

[t] Linear trend test; BMI: body mass index.

There were no significant differences (p > 0.05) among the region for any of the physical activity (walking, moderate and vigorous physical activity) (Table 4).

Table 5 displays the student recognition of the logo and mascot of the Agita São Paulo program: The program logo and mascot were recognized by 39.3% and 44.1% of respondents, respectively.

Students who recognized the program logo were significantly more active than those who did not (76.9% vs. 68.4%, p < 0.001). Students who correctly identified the logo and mascot of Agita São Paulo were significantly more active compared with those who did not correctly do so. Analyses adjusted for gender, age, grade, and region confirmed the results of the raw analyses, except for the "identifies the program mascot correctly" variable, which was not significant (p = 0.487; Figure 1).

Discussion

The aim of this study was evaluated physical activity level and its associated effects among stu-

dents in the public network of São Paulo, Brazil. We showed that prevalence of physically active students (≥ 300 minutes/week) in the state was 71.7%. Young males were 9% more active than females. Third year high school students were significantly more active compared with students in the 5th grade. Students who recognized the program logo were significantly more active than those who did not and students who correctly identified the logo and mascot of Agita São Paulo were significantly more active compared with those who did not correctly do so, independent of gender, age, grade, BMI, and region confirmed the results of the raw analyses, except for the "identifies the program mascot correctly" variable, which was not significant.

Although the literature constantly reports technological advances in the methods used to evaluate physical activity in youths, this activity remains challenging[19,20]. A correlation does not exist between data collected via questionnaires and direct methods such as accelerometry with regard to physical activity level. Nevertheless, evidence shows that when individuals are categorized into physical activity groups, these methods can be moderately to highly concordant[19].

A majority of the youths in our sample (71.7%; 95% CIs = 70.0% to 73.4%) met the physical activity recommendations. Male aged at least 17 years old in their 3rd year of high school from the Midwest region of the state were most likely to be active. The high prevalence of youths who met these recommendations is a surprising finding.

An instrument commonly used in epidemiological surveys[21,22] was employed in the present study. Recent studies that have used similar physical activity measures and cutoffs found data that conflicted with those presented here; specifically, they reported high estimates of physical inactivity among adolescents (ranging from 39.2% to 69.8%)[5,21-23].

A sample of high school students who attended public schools in São Paulo showed a low prevalence of physical activity (37.5%). Of the adolescents who met the recommendation, 47% practiced structured physical activities in city clubs. The same study found that the prevalence of physical activity (≥ 300 minutes/week) was significantly higher in boys than girls (50.3% versus 25.9%)[5].

In the present study, boys had significantly higher mean values for physical activity than girls. Our findings agree with recent studies that boys accumulate more physical activity than

Table 3. The raw and adjusted analyses of the associations between physical activity and demographics, education, and BMI among students of the São Paulo state public education network.

Variables	Raw analysis		Adjusted analysis	
	PR (CI95%)	p-value	PR (CI95%)	p-value
Gender		< 0.001		< 0.001[a]
Male	1.10 (1.04 -1.16)		1.09 (1.04 -1.15)	
Female	1.0		1.0	
Age (complete years)		< 0.001t		< 0.001[b t]
10-13	1.0		1.0	
14-16	1.14 (1.06 -1.22)		1.14 (1.06 -1.21)	
≥ 17	1.17 (1.10-1.25)		1.16 (1.09-1.24)	
Grade		< 0.001t		< 0.001[b t]
5th year of elementary school	1.0		1.0	
8th year of elementary school	1.17 (1.09 – 1.26)		1.17 (1.09 – 1.26)	
3rd year of high school	1.21 (1.12 -1.29)		1.20 (1.12 -1.29)	
Region		< 0.001		< 0.001[c]
Midwest	1.26 (1.15 – 1.37)		1.27 (1.16 – 1.38)	
Mideast	1.23 (1.12 – 1.34)		1.24 (1.13 – 1.35)	
South-southeast	1.10 (1.00 – 1.22)		1.11 (1.01 – 1.23)	
Coastal regions	1.10 (1.00 – 1.21)		1.09 (0.99 – 1.20)	
Metropolitan region	1.0		1.0	
BMI*		0.421		0.250[d]
Low weight	1.0		1.0	
Normal	1.06 (0.98 – 1.14)		1.07 (1.00 – 1.19)	
Overweight	1.09 (0.97 – 1.22)		1.12 (0.99 – 1.26)	
Obese	1.05 (0.94 – 1.18)		1.05 (0.94 – 1.17)	

[a] Adjusted for age; [b] Adjusted for gender; [c] Adjusted for gender, age, and grade; [d] Adjusted for gender, age, grade, and macro-region; Linear trend test.

Table 4. Physical activity indicators (minutes/week) by region in São Paulo public education.

Region	Walking minutes/week (SD)	Moderate physical activity minutes/week (SD)	Vigorous physical activity minutes/week (SD)
Midwest	223 (346)	310 (455)	190 (370)
Mideast	288 (506)	318 (437)	196 (346)
South-southeast	223 (338)	311 (440)	211 (398)
Coastal regions	192 (298)	410 (494)	214 (332)
Metropolitan region	276 (401)	412 (479)	288 (398)

SD: standard deviation.

girls[24-26]. To describe the physical activity practiced among Brazilian adolescents, data from the National Survey of Student Health (Pesquisa Nacional de Saúde do Escolar [PeNSE])[24] were collected from all the Brazilian state capitols and the Federal District in 2009. These data revealed an active youth prevalence of 46% in São Paulo. This study also observed that the proportion of active boys was higher than that of girls.

Evidence from developed countries has shown that involvement in physical activity during adolescence is declining, even during physical education classes[3]. Data from the Youth Risk Behavior Surveillance System (YRBSS) that sampled participation in high school physical education in the US from 1991 to 2004 revealed that approximately 55% of students were enrolled in these classes, but only 28% attended them each

Table 5. Recognition of the Agita São Paulo program among students (N = 2,555) in the São Paulo state public education network.

Variables
Recognizes the "Agita" logo
No
Yes
Associates the "Agita" logo with physical activity, sport, leisure, or health
No[a]
Yes
Recognizes the program mascot
No
Yes
Associates the program mascot with physical activity, sport, leisure, or health
No[b]
Yes

[P] Analyses weighted by region; [a] Individuals who reported not recognizing the Agita logo and those who did not associate the logo with physical activity, healthy eating, or health in general; [b] Individuals who reported not recognizing the program mascot and those who did not associate the program mascot with physical activity, healthy eating, or health in general.

day. In 2011, 53.3% of US students were enrolled in physical education classes, and only 23% attended these classes every day[27].

A systematic review of the interventions conducted in Latin America showed that school interventions effectively promote physical activity[28]. However, the strategies aimed at greater student involvement primarily within schools remain a global challenge. In São Paulo, the 1997 implementation of the Agita Galera Program (Active Community Day) in the public school system involved various discussions of the importance of physical activity. These discussions have included the sensitization of teachers in the public education network, publicity via printed media, the preparation and distribution of informational handouts, and encouraging schools to promote specific and permanent actions related to physical activity, among others.

A study of public high school students in São Paulo examined the prevalence of physical inactivity with regard to knowledge of the Agita São Paulo/Agita Galera program and found that a lack of knowledge increased the likelihood of inactivity by 29% (PR = 1.2; 95% CIs = 1.16-1.38)[5].

Our study revealed that individuals who reported recognizing the program logo were significantly more active than those who did not

(76.9% vs. 68.4%, p < 0.001). Several hypotheses might explain the high prevalence of the student physical activity detected in this study. These data might indicate that the Agita São Paulo/Agita Galera program positively influences the physical activity levels of students in the public education network of São Paulo. This supposition is reinforced by the fact that the event has occurred annually since 1997.

To the best of our knowledge, national studies have not analyzed the temporal trends of student physical activity. A study of adults from southern Brazil used the same physical activity evaluation and found an increase of 11% in adult in activity (150-minutes/week) from 2002 to 2007[24]. Data from the Brazilian monitoring system Vigitel revealed a modest increase in the proportion of adults who practiced a minimum of 150 min/week of physical activity during their leisure time nationwide (14.9% in 2006; 15.5% in 2007; and 16.4% in 2008)[29]. However, these data are not directly comparable because they used different physical activity domains to classify their sample.

Furthermore, São Paulo has officially commemorated World Physical Activity Day (April 6) since 2002. On this day, several cities in the state promote large events that target the need to incorporate physical activity into one's daily life. For example, in 2002, 888 events were held across 175 municipalities. In 2008, more than 2,030 events were held. In addition, the Brazilian Ministry of Health has funded city projects that encourage physical activity since 2006. Of the 35 municipalities of São Paulo given the award in 2006, 54% were partners of the Agita São Paulo program.

Recognition of the Agita logo has increased in recent years. In 2002, 37% of the state's population was aware of Agita; in 2008, this statistic increased to 60%. To date, 49% of the state's population has become aware of the primary message of the program[30].

We stress that students who recognized the program's logo were significantly more active than those who did not (76.9% vs. 68.4%, p < 0.001; Figure 1). In addition, the data collection and interviews were conducted between February and March, far removed from August when the Agita Galera events are held. Thus, the program likely is sustainable and permanent among public school students. Therefore, the results presented in our study and current scientific evidence suggest that the engagement of adolescents in physical activities stimulated by health promotion programs at school or not could contribute
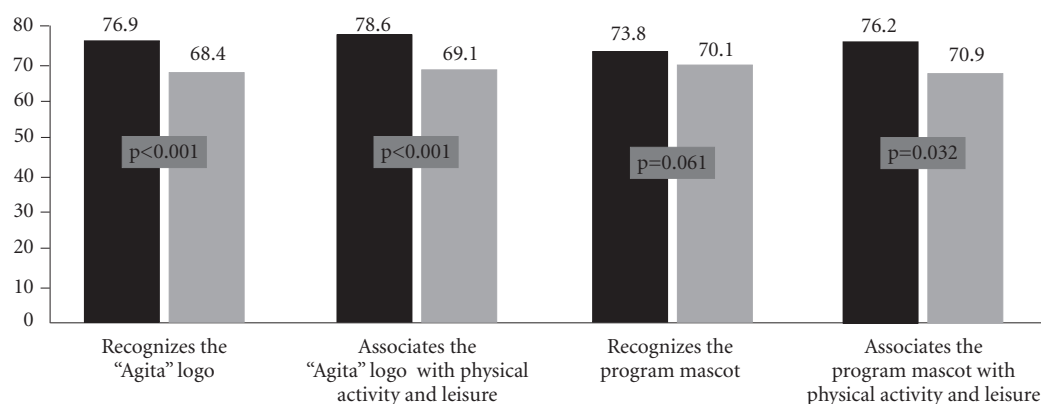
Figure 1. The prevalence of physical activity* (≥ 300 minutes/week) by the recognition of the Agita São Paulo program among students of the São Paulo public education network.

* Adjusted for gender, age, grade, BMI and macro-region.

to the reduction of physical inactivity, probably because it raises awareness of the importance and benefits for health and also due to the greater involvement of adolescents in these activities. In that sense, the action of schools and governmental agencies seems to be an interesting manner to create and implement intervention programs that assist to prevent physical inactivity.

Some limitations of the present study need to be acknowledged. The short version of IPAQ also has some limitations. The main limitation is that we were unable to differentiate domains of physical activity (leisure time, occupational, housework, and commuting). In a country like Brazil most previous research has used questionnaires (IPAQ) indirect measures of physical activity for adolescents[6]. Questionnaires, like IPAQ, represent the most accessible instrument for the usual physical activity evaluation, above all in epidemiological nature studies due to the easiness of being applied to large groups, low cost and for allowing collecting information with relation to the type and context in which they are performed, what does not occur to other measurement resources. In the present study, only high school students from state's public schools who attended school in the mornings were assessed. Thus, other segments that are part of the educational system, such as private, city's public or technical schools and other school hours (afternoon or evening classes) were not assessed. Accordingly, our inferences are related only to the group studied. The results shown in the present study may serve as the basis for future investigations in areas with specific environmental and social characteristics in the state of São Paulo, providing data for comparisons with both studies involving young populations from other regions in Brazil and youths from other countries.

Conclusion

The present findings indicate that students in São Paulo have a high level of physical activity. Moreover, males older than 17 years attending their 3rd year of high school who lived in the Midwest region and recognized the Agita São Paulo/Agita Galera program were the most likely to report physical activity. At least some of our findings directly or indirectly reflect the positive effect of the Agita São Paulo/Agita Galera program on the activity level of students in São Paulo, Brazil.

Collaborations

Acknowledgements

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