Physical education in schools, sport activity and total physical activity in adolescents

Educação física escolar, atividade desportiva e atividade física total em adolescentes

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Abstract – Less than half of adolescents reach the recommended 300 minutes per week of physical activity (PA). Physical education classes and sports participation provide opportunities for adolescents to accumulate more time for PA practice; however, little is known about the influence of these variables on the level of total physical activity of adolescents. The aim of this study was to investigate the association between the practice of physical education (PE) in schools and sports activities (SA) with the practice of total PA of adolescents. The study was cross-sectional and involved 467 adolescents of high school (15.8 ± 0.9 years-old) from the city of Rio Claro, in the State of São Paulo. Participants completed the Physical Activity Questionnaire to Older Children (PAQ-C) and questions related to the practice of PE and SA in schools. We performed a logistic regression with p<0.05 using SPSS. Girls had lower prevalence of PA than boys, 9.4% and 26.8%, respectively. Boys who did not participate of PE classes (OR=0.25, 95% CI=0.09-0.66) and SA in schools (OR=0.34, 95% CI=0.12-0.95) were less likely to be active in PA than boys who practiced these activities. The participation in PE classes or engagement in some SA were positively associated with the practice of total PA in boys.

Key words: Adolescents; Physical activity; Physical education.

Resumo – *Menos da metade dos adolescentes atingem a recomendação de 300 minutos por semana de Atividade Física (AF). As aulas de Educação Física e participação de esporte proporcionam oportunidades para os adolescentes acumularem mais tempo para a prática de AF, entretanto, pouco se sabe sobre a influência dessas variáveis no nível de AF total dos adolescentes. O objetivo do estudo foi verificar a associação entre a prática de Educação Física Escolar (EFE) e Atividades Desportivas (AD) com a prática de AF total em adolescentes. O estudo foi transversal e participaram 467 adolescentes do Ensino Médio (15,8 ± 0,9 anos) da cidade de Rio Claro-SP. Os participantes preencheram o Physical Activity Questionnaire to Older Children (PAQ-C) e questões relacionadas com a prática de EFE e AD. Foi realizada a Regressão Logística com p<0,05 através do SPSS. Meninas apresentaram menor prevalência de AF do que os meninos, 9,4% e 26,8% respectivamente. Meninos que não realizaram EFE (RO=0,25; 95% IC= 0,09-0,66) e AD na escola (RO=0,34; 95% IC=0,12-0,95) apresentaram menores chances de serem ativos na AF total do que os meninos que praticaram essas atividades. A participação das aulas de EFE ou a prática de alguma AD foram associadas positivamente com a prática de AF total nos meninos.*

Palavras-chave: *Adolescentes; Atividade física; Educação física.*

INTRODUCTION

The regular practice of physical activity (PA) in adolescence may contribute to a healthy lifestyle both in this period and in adulthood, reducing the incidence of noncommunicable diseases[1-3]. Several diseases in adults are associated with conditions or behaviors that began during youth, including the lack of PA[4].

The enough practice of PA, in adolescence, is associated with the weight loss, the improvement in metabolic parameters, lowering blood pressure and insulin resistance, as well as the psychological well-being, the predisposition to maintain PA during adulthood, the decreased risk for cardiovascular disease and, consequently, an increase in life expectancy[1,2].

Despite this evidence, the prevalence of PA among adolescents is very low. In Brazil, less than half (43.1%) of adolescents reach the recommended 300 minutes per week of PA[5]. One of the main reasons for this low prevalence is due to the fact that adolescents have little opportunity to be active in a safe and independent way, especially in large cities, where the urbanization process is fast[6]. Therefore, physical education (PE) classes and participation in sports activities (SA) that are held inside schools contribute to adolescents accumulate more PA practice time[7,8].

In Brazil, according to the 2010 Census, there are approximately 13 million adolescents between 14 and 17 years-old; 60% of them (8 million) are enrolled in high school[9]. According to Law No. 9.394/96 of December 20th, 1996, the PE in high school is a mandaroty component of the education curriculum.

Thus, the PE and SA are able to reach a large proportion of adolescents, since they spend a large portion of their day at school[10]. It may also influence the level of total physical activity through the activities offered during classes, as well as turning PA into something pleasurable. However, the influence of the PE and SA practices in schools for the level of total PA has not been fully elucidated. So, the aim of this study was to investigate the association between the PE and SA in schools with the practice of total PA in adolescents of the city of Rio Claro, in the State of São Paulo, Brazil.

METHODOLOGICAL PROCEDURES

Place and Population of the study

The study was conducted in the city of Rio Claro, which is located in the administrative region of Campinas (São Paulo, Brazil). The city has 19 high schools; seven of them are private and 12, public ones[11]. The project was approved by the Ethics Committee of the University Estadual Paulista Júlio de Mesquita Filho - Biosciences Institute of Rio Claro, under Protocol Nº. 5927, from the decision of the Research Ethics Committee (REC) Nº. 19 in 2008.

The target population consisted of adolescents (from 14 to 17 years-old) of both gender enrolled in private and public schools of the High School

Network of Rio Claro, in the State of São Paulo. It was established the limit of 17 years, considering that, from the age of 18, many adolescents have already finished high school.

Sample

To establish the sample of the present study, we observed the School Census of the National Institute for Educational Studies and Research[11], conducted in 2007, in which the city of Rio Claro had 7,339 enrollments (5,663 in public schools and 1,676, in private ones). The sampling process was by conglomerate and occurred in two stages. In the first stage, we listed all the private and public schools in Rio Claro (São Paulo), and then we quantified the number of students in each school and listed all classes of all grade schools. After this procedure, there was a raffle among schools. In the second stage, it was conducted a raffle of the classrooms of the selected schools, and all students of the class in the sample were interviewed.

The sample size calculations took into account the sampling error of 5%, with the prevalence of physical activity in 50%. The sample was estimated at 384. As the sampling was performed by conglomerates, the number of individuals was doubled. The final sample was estimated at approximately 768 adolescents.

The average number of students per class was calculated by dividing the enrollments of high school adolescents by the total number of classes (7,426 enrollments / 204 classes), totaling 37 students per class. After that, the number of students to be interviewed (768) was divided by the average number of students per class (37), resulting in 21 classes to be interviewed. At the end of the data collection, 25 classes were questioned, in order to cover any losses and refusals.

Procedures

The pilot study lasted two weeks and was held in a city school that was not included for the sample. It consisted in the final questionnaire testing, the manual and organization of field work.

One questionnaire was completed by adolescents, and the other, by parents or guardians who reside with the adolescent to asses the socioeconomic status. For questions about economic level, we used the questionnaire suggested by the Brazilian Association of Research Firms (BARF) made in 2007[12]. The guidelines, proposed by the BARF grouped people into classes A (high), B, C, D and E (low) according to the estimate of the purchasing power of urban citizens and families.

To measure the level of PA during the adolescent´s leisure time, it was used the PA questionnaire for kids called the *Physical Activity Questionnaire – Children* (PAQ-C)[13]. This questionnaire investigates the level of moderate and intense PA of children and adolescents in the last seven days before completing the questionnaire. It consists of 13 questions about the types of PA practiced last week, the participation in PE classes, activities during recreation and lunch, before and after school, at night, the partici-

pation in SA. Each question has values from 1 to 5, and the final score is obtained by averaging the questions 1 to 7, 9 and 13. The PA classification level is measured by the following scores: a) 1 and 2 – physically inactive; b) 3 to 5 – physically active, based on scores suggested by Crocker et al.[13] and Kowaslki et al.[14], used by Silva and Malina[15].

Kowalski et al.[14] showed that the PAQ-C has internal consistency values between 0.79 and 0.89, and test-retest reliability between 0.75 and 0.82. The validity was investigated by correlating the scores of the PAQ-C compared with the PA level results (r=0.63), with the PA questionnaire of Godin and Shephard (r=0.41), with the Caltrac accelerometer (r=0.39) and a test bank for the assessment of cardiorespiratory fitness (r=0.28).

To verify the practice of PE in schools, it was used a question from the PAQ-C (the participation in PE classes) and another on class attendance. To investigate the practice of sports activities in schools, students answered the following question: a) Do you participate in any school sport, training staff <u>in your school</u>, with a physical education teacher? (Yes and No)

To calculate the Body Mass Index (BMI), all students had their weight and height measured according to the anthropometric standardization of Lohman et al.[16]. The BMI classification was obtained using the procedure suggested by the Center for Disease Control (CDC), that considers the age and gender of adolescents. For this calculation, it was used a spreadsheet available at the CDC website http://apps.nccd.cdc.gov/dnpabmi/.

Data Collection and Management

Data collection was conducted by five interviewers, who participated in a 30 hours training. The directors of the selected schools were invited to attend a meeting with the team executing the project; the aim was to present the importance, objectives and methodology of the study. After obtaining the direction´s consent, the physical education teachers were invited to attend a further meeting on the project's goal, its importance and the questions in the questionnaire. The students included in the study, as well as their parents, were informed about the project and invited to participate by signing an Informed Consent Form (ICF). Questionnaires were self-answered, and the average completion time was 20 minutes. The assessment of weight and height was performed by the interviewers themselves on the same day that the questionnaire was applied. The field work began in February and ended in August of 2009.

Statistical Analysis

The Logistic Regression Analysis was performed to verify which factors are associated with the practice of total PA. We assessed the socioeconomic status and BMI among adolescents, because the study of Adegoke et al.[17] demonstrated an association of these variables with the practice of PA in adolescents.

To make the final model of the adjusted logistic regression, only the variables that had p<0.20[18] remained. The regressions were performed separated by gender, because according to several studies the factors as-

sociated with PA are distinct between the gender[19]. The level of significance was set at p<0.05, and all analyses were performed using SPSS (version 17).

RESULTS

The study had the participation of 15 schools (10 public and 5 private), from a predicted number of 16 (10 public and 6 private). Of these 16, there was refusal of three private schools; two of them were replaced by new private ones. The third was replaced by another private school, however the school also refused to participate in the study. As all schools in Rio Claro (19) were already joining the work, it was decided to select another school that was already participating in the study and, then, a new class was raffled.

883 students were interviewed, and 467 of them showed the Consent Forms that were included among the samples of the present study. Of these 467 students (15.8 ± 0.9 years-old), 254 (54%) are girls (15 ± 0.8 years-old) and 213 (46%) are boys (15.9 ± 0.9 years-old) (Table 1).

Table 1. Characteristics of the 467 adolescents, presented as mean and standard deviation (SD), according to gender (girls and boys)

	Girls	Boys
Variables	Mean ± SD	Mean ± SD
Age (years)	15.8 (0.9)	15.9 (0.9)
Weight (kg)	59.9 (11.0)	65.5 (13.0)
Height (meters)	1.64 (0.1)	1.70 (0.1)
BMI (kg/m^2)	21.8 (4.0)	22.0 (4.1)

The remaining students were classified as "non-responders students" and corresponded to 47% of the sample (416 students). Most students in this group did not have the authorization of the responsible (79.6%; 331 students) after the researchers returned five times to schools in order to collect data. Among other reasons, there are: 5.8% (24 students) transferred, 5.5% (23 students) who are 18 years-old, 2.4% (10 students) dropouts, 2.2% (9 students) did not contribute, 1.5% (6 students) did not have their parents' authorization, and 3% (13) for other reasons.

The prevalence of PA was only 17.38%, and girls had a lower prevalence (9.4%) compared with boys (26.8%). According to the analyses, girls who did not participate in PE classes (OR=0.24, CI=0.08-0.66) and, thus, without a frequency during classes (OR=0.11, 95% IC=0.01-0.94) had a lower prevalence of performing total PA when compared with girls who performed these activities. However, these associations did not remain in the adjusted analysis (Table 2).

According to the adjusted analysis, boys who did not attend PE classes (OR=0.27, 95% IC=0.13-0.57) and did not participate in any sport activity at school (OR=0.28; 95% IC=0.11-0.75) had a lower prevalence of total PA than students who attended PE classes and participated in sport activity at school (Table 3).

Table 2. Odds ratio estimates, unadjusted and adjusted, between total PA practice with individual and economic characteristics, the participation and attendance in physical education classes, and participation in sports activities at school. Girls data (n=254)

Variable	Unadjusted OR (95% IC)	p^a	Adjusted OR (95% IC)	p^b
Age (years)				
14-15	1			
16-17	1.43 (0.59-3.48)	0.43		
BMI (kg/m^2)				
Normal	1		1	
O-O	2.24 (0.89-5.62)	0.08	2.07 (0.75-5.70)	0.16
Economic status				
A1, A2, B1 and B2	1			
C	0.63 (0.23-1.73)	0.37		
D and E	1.21 (0.41-3.60)	0.73		
Participation in PE classes				
Yes	1		1	
No	0.24 (0.08-0.66)	0.06*	0.36 (0.12-1.08)	0.07
Frequency of PE classes (week)				
0	0.11 (0.01-0.94)	0.04*	0.23 (0.02-2.08)	0.19
1	0.62 (0.25-1.53)	0.29	0.67 (0.25-1.78)	0.42
≥ 2	1			
Sport activity at school				
Yes	1		1	
No	0.18 (0.05-0.65)	0.00*	0.40 (0.89-1.85)	0.24

O-O=Overweight-Obesity; OR=Odds Ratio; a=Chi-squared; b=Adjusted Logistic Regression; * statistic significance.

Table 3. Odds ratio estimates, unadjusted and adjusted, between total PA practice with individual and economic characteristics, the participation and attendance in physical education classes, and participation in sports activities at school. Boys data (n=213)

Variable	Unadjusted OR IC(95%)	p^a	Adjusted OR IC(95%)	p^b
Age (years)				
14-15	1			
16-17	0.72 (0.39-1.33)	0.29		
BMI (kg/m^2)				
Normal	1			
O-O	1.23 (0.61-2.49)	0.55		
Economic status				
A1, A2, B1 and B2	1			
C	0.92 (0.45-1.87)	0.82		
D and E	1.55 (0.64-3.75)	0.33		
Participation in PE classes				
Yes	1		1	
No	0.27 (0.13-0.57)	0.01*	0.25 (0.09-0.66)	0.00*
Frequency of PE classes (week)				
0	0.39 (0.14-1.09)	0.07	0.82 (0.36-1.85)	0.64
1	0.78 (0.36-1.69)	0.52	1.14 (0.33-3.98)	0.84
≥ 2	1		1	
Sport activity at school				
Yes	1		1	
No	0.28 (0.11-0.75)	0.01*	0.34 (0.12-0.95)	0.04*

O-O=Overweight-Obesity; OR=Odds Ratio; a=Chi-squared; b=Adjusted Logistic Regression; * statistic significance.

DISCUSSION

The present study aimed to investigate the association of total PA with the practice of PE and participation in SA at school among adolescents in Rio Claro (São Paulo, Brazil). The hypothesis of this study was that the practice of PE and practice of SA are positively associated with the practice of total PA.

The main results were that girls had lower prevalence of total PA than boys, and boys who practiced PE and participated in SA inside school were more likely to be active during leisure time than those adolescents who had not practiced such activities.

Our results show a prevalence of PA of 17.38% among adolescents, being lower among girls (9.4%) compared with boys (26.8%). The lower prevalence of PA in girls complies with the findings of Silva et al.[15] and Smith et al.[20], who also used the PAQ-C questionnaire.

Silva et al.[15] conducted a study with 325 adolescents from public schools, in the city of Rio de Janeiro, and verified that only 6% and 15% of girls and boys, respectively, were classified as active people. In the work of Silva et al.[20], it was showed that, of 774 adolescents living in the city of Aracaju, 10.7% and 24% of girls and boys, respectively, were classified as active.

The National Survey of Student Health (PeNSE, acronym in Portuguese)[21] evaluated data of 618,555 adolescents in the 9th grade of elementary school from all the state capitals and Federal District. It was concluded that 43.1% of adolescents reached the recommendation of 300 minutes per week of physical activity, and the girls (31.1%) had lower prevalence of PA when compared with boys (56.2%). The cohort study conducted by Trilk et al.[22], which evaluated 957 girls in the 6th and 8th grades, found that during the 8th grade girls increased sedentary time and decreased time for the practice of PA.

The adolescents in this study who did not participate in the PE classes had lower chances of performing total PA than those who participated in classes. This result is consistent with the findings of Ceschini et al.[23], which evaluated more than 3,500 students from public schools aged between 14 and 19 years-old in the city of São Paulo. The authors found that students who do not participate in physical education classes at school (OR=1.39; 95% CI=1.29-1.53) were more likely to be inactive (<300 min/wk) than those who participated in PE classes. However, in our study, the effect of participation in PE, after the adjusted analysis, remained only for boys. This may have occurred because the boys have higher participation in PE classes (n=134; 63%) than when compared with girls (n=128; 51%). Furthermore, boys (22%) presented a frequency of two days – or more – in PE classes greater than compared to girls (20%). The higher frequency of the boys´ participation in classes is consistent with the result of PeNSE[20], which found that 50% of boys and 47% of girls attend more than twice the PE classes.

Pate et al.[24] emphasize the importance of school and reinforce the idea that, due to the change in lifestyle of adolescents, in the 21st century, the school needs to renew and expand its role in promoting PA for adolescents. School activities are the only opportunity for a large proportion of

adolescents of engaging in any relevant PA[25]. It is also worth mentioning that, in addition to the numerous benefits of PA in this phase of life, such as the cardiorespiratory and muscular fitness, the bone health and normal values of metabolic biomarkers[26], the active behavior in this stage of life can be transferred to adulthood[27,28].

Our results also showed that adolescents who did not participate in sports activities presented less chances to be active than those who practiced some SA. The importance of practicing activities – inside and outside the school – is recognized by the Ministry of Health[20] and CDC, which sets a goal for 2020 that 90.8% of adolescents, aged between 12 and 17 years-old, get involved in these activities[29]. However, in this study, after the adjusted analysis, only boys remained positively associated with participation in sports activities. This result is consistent with findings by Mandic et al.[8], which evaluated 1,837 adolescents (14 ± 1.2 years-old) from the city of Otago and found that boys spend more time performing SA than girls, and boys that participated in these activities had longer PA than boys who did not perform them. The authors concluded that the participation in SA is able to increase PA levels in adolescents.

A major limitation of the study was the sample loss occurred when students were invited to participate in the survey and lack of information about the sample. This sample loss occurred because they did not return the Consent Form signed by a guardian. Thus, caution is needed when generalizing the results of this study to the adolescent population in the city of Rio Claro due to possible sampling bias. Another limitation of the work refers to the instrument used to evaluate the level of PA in adolescents (PAQ-C). Besides being exposed, as any other questionnaire, to recall bias, it does not allow to identify the precise time (minutes or hours) spent with activities in schools, during transportation and in leisure time. However, the questionnaire is easy to apply, and it can be used in large samples.

CONCLUSION

The present study verified that it is plausible to assume that PE classes and SA, developed inside the school, may increase the total level of PA, especially for boys. Additionally, the prevalence of total PA in adolescents was only 17.38%, and girls presented a lower prevalence.

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