



# Participation in Physical Education classes in Pernambuco: a temporal trend analysis

## Participação nas aulas de Educação Física em Pernambuco: uma análise de tendência temporal

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### ABSTRACT

The aim of the study was to analyze the temporal trend and factors associated with participation in physical education classes in Pernambuco. The temporal trend study was composed of three surveys. A total of 4,207 students were interviewed in 2006, 6,264 in 2011 and 6,002 in 2016, using the "Global School-based Student Health Survey" (GSHS) questionnaire. The outcome was participation in Physical Education classes and the independent variables were sociodemographic information. The bivariate analysis was performed using the chi-square test and the multivariate analysis using binary logistic regression. There was an increase in the prevalence of participation in Physical Education classes (2006: 35%, 2011: 74% and 2016: 81.2%), highlighting the significant increase in males  $\Delta\%$  (2006-2016) = 123.5%. Male, studying full-time and being the son of mothers who studied was associated with greater participation in physical education classes, as well as living in the regions of Agreste, Sertão and Sertão do São Francisco. Despite the increase in participation in Physical Education classes in Pernambuco, the guarantee of this curricular component must be strengthened, considering risk groups in order to increase participation in classes for these groups.

**Keywords:** Temporal trend; Physical education classes; Teenagers; Students; School.

### RESUMO

O objetivo do estudo foi analisar a tendência temporal e fatores associados à participação nas aulas de educação física de estudantes de Pernambuco. Estudo de tendência temporal composto por três levantamentos de abrangência estadual. Foram entrevistados 4.207 estudantes em 2006, 6.264 em 2011 e 6.002 em 2016, por meio do questionário "Global School-based Student Health Survey" (GSHS). O desfecho foi a participação nas aulas de Educação Física e as exposições foram as informações sociodemográficas. A análise bivariada foi realizada mediante teste Qui-quadrado e as análises multivariadas por regressão logística binária. Observou-se um aumento na prevalência de participação nas aulas de Educação Física (2006: 35%, 2011: 74% e 2016: 81,2%) destacando o aumento significativo no sexo masculino  $\Delta\%$  (2006-2016) = 123,5%. Ser do sexo masculino, estudar no período integral e ser filho de mães que estudaram, independente do tempo de estudo foi associado a maior participação nas aulas de educação física, assim como residir nas regiões do Agreste, Sertão e Sertão do São Francisco. Apesar do aumento na participação nas aulas de Educação Física em Pernambuco, a garantia deste componente curricular deve ser fortalecida, levando em consideração os grupos de risco para que aumente a participação nas aulas desses grupos.

**Palavras-chave:** Tendência temporal; Aulas de educação física; Adolescentes; Estudantes; Escola.

## Introduction

Studies carried out over the last few decades and in different countries have indicated the importance of School Physical Education (SPE) classes<sup>1,2</sup>. It is already known that the SPE assumes the responsibility of promoting favorable attitudes towards the formation

of healthy habits<sup>3,4</sup>, as well as the recommendation of 150 minutes of Physical Education (PE) classes a week, which is already a consensus in the literature<sup>5</sup>. However, data from the World-wide Survey of School Physical Education report indicate that 97% of countries have legal bases that guarantee PE classes. Des-

pite legal responsibility, the curriculum component is not implemented according to legal standards in 29% of countries. Non-compliance with regulations is particularly notorious in countries where access to quality education is not guaranteed by the government<sup>6</sup>.

Researchers and experts have indicated some research priorities for the 2016–2030 cycle for adolescent health in low and middle-income countries, listing SPE as one of the most important points to promote physical activity (PA) and health<sup>7</sup>. In Brazil, a systematic review study indicated that participation in SPE classes varied between 29.3% and 75.0% and the most researched associated factors in relation to participation in SPE classes were behavioral variables and PA practice<sup>8</sup>.

Several school-based cross-sectional studies carried out in Northeastern capitals analyzed participation in SPE classes and associated factors. A study with public high school students in Sergipe concluded that participation in SPE classes can be an important factor in reducing physical inactivity<sup>9</sup>. In João Pessoa, another study pointed out that 41.9% of high school students participated in two or more PE classes per week, and participation in PE classes was associated with a higher level of PA and better health perception<sup>10</sup>. In the interior of the state of Pernambuco, the results show the same trend as the aforementioned studies, pointing out that after the implementation of curricular regulations improving the offer of SPE classes and increasing student participation, there was an improvement in health behaviors<sup>11</sup>.

Another important element is the structure of Brazilian schools that allow SPE classes and PA practices, data from the report “Human Development Notebook on Active Schools in Brazil” showed that only 56% of schools in Brazil have SPE teachers. Schools located in rural areas in the North (11.7%) and Northeast (24.8%) are the ones with the lowest percentage of SPE teachers responsible for the component<sup>12</sup>.

Although there are studies that have already investigated the factors associated with the prevalence of participation in SPE classes, assessing secular changes represents a possibility to contribute to discussions about current changes in the basic education curriculum and how they can impact student behavior and society. It is an important moment for studies with this perspective to be developed, in which PE is detached as a mandatory curricular component of high school and the target of criticism that delegitimizes it as a collaborative element of the individual’s integral formation. In this sense, the objective of this study is to analyze the

temporal trend and factors associated with the participation of PE students in Pernambuco.

## Methods

This is a school-based and statewide study of temporal trends based on three cross-sectional surveys, with regular intervals of five years between them. The data from this study are part of a larger project called “Practice of Physical Activities and Health Risk Behaviors in High School Students in the State of Pernambuco – Study of Temporal Trend”. Other information about the methodology has already been detailed in previous publications of the project<sup>13</sup>.

The target population in this study was limited to students enrolled in state public high schools in Pernambuco. The sample selection was done by conglomerate in two stages. In the first stage, the sampling unit was the school, selected by random sampling stratified according to the distribution of schools by size and geographic region; in the second, classes were drawn considering the distribution by shift (day/night) and grade in the schools selected in the previous stage. All students from the drawn classes were invited to participate in the study. The sample was estimated at 6,114, 5,668 and 5,667 students, respectively in 2006, 2011 and 2016. Data were collected using the previously validated “Global School-based Student Health Survey” (GSHS) questionnaire.

The dependent variable was participation in Physical Education classes, investigated through the question “During a typical or normal week, how many Physical Education classes do you participate in?”, with the answer options 0, 1, 2, 3 or more classes. For the analysis, this variable was categorized as “Participates in Physical Education classes”: “no” (0 classes) or “yes” (1, 2, 3 or more classes). In the question used, participation is understood in the sense of presence, that is, the student has the class, even if he does not actively participate in it.

The independent variables were related to demographic information (gender [male/female], age [between 14 and 19 years old], marital status [single/others] and place of residence [urban/rural]); socioeconomic (mother’s education [did not study / ≤ 8 years / > 8 years] and occupational status [yes / no]) and school-related factors (school location by geographic mesoregion [Metropolitan / Zona da Mata / Agreste / Sertão / Sertão do São Francisco], class shift [day/night/part-time/full-time] and grade [1st/2nd/3rd]).

Data analysis was performed using the SPSS program for Windows (version 20). The descriptive analysis essentially included the distribution of frequencies and their respective 95% confidence intervals. The calculation of the delta between the years of the survey was done by subtracting the prevalence of participation in Physical Education classes from the highest year by the lowest year, divided by the prevalence of the lowest year, as shown in the formula below:

$$\Delta = \frac{\% \text{ participation in SPE in the highest year} - \% \text{ participation in SPE in the lowest year}}{\% \text{ participation in SPE in the lowest year}}$$

The chi-square test was used for the temporal trend analysis of participation in PE classes. Analysis were stratified for each sociodemographic variable. Significant changes were those in which  $p$  was less than 0.05. Binary logistic regression was used to assess the association between participation in PE classes and sociodemographic variables in the sample for each period (2006, 2011 and 2016). Only the variables that presented  $p < 0.05$  in the crude analysis data were used in the adjusted models. To be identified as an association factor, a critical value of  $p < 0.05$  was considered, assessed by the Wald test, after adjustment for all variables.

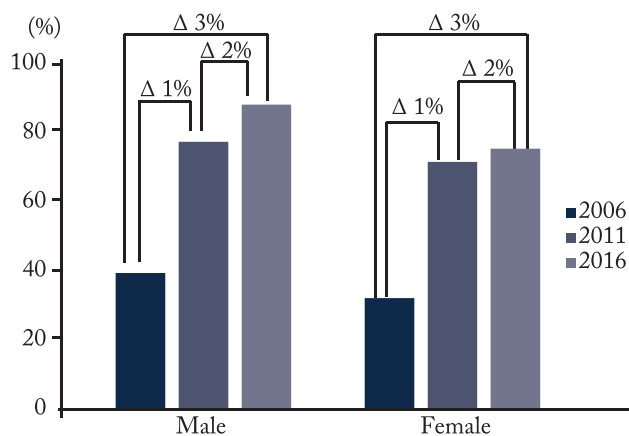
## Results

In the three surveys, there was a pattern in the proportions of some sociodemographic variables. Most adolescents were female, aged between 16 and 17 years old, single, not working and living in urban areas. Most students were enrolled in the daytime period, as well as in the 1st grade of high school, followed by students in the 2nd and 3rd grades. A change over the ten years was verified in maternal education, since in the 2016 survey the percentage of students who reported the mother's level of education greater than 8 years doubled in comparison to the 2006 survey.

The prevalence of participation in PE classes more than doubled between 2011 (74%; 95%CI: 72.9 - 75.1) and 2016 (81.2%; 95%CI: 80.2 - 82.2) in comparison to 2006 (35%; 95%CI: 33.6 - 36.5). In the highlighted gender analysis (Figure 1), a positive trend in participation and a significant difference between the deltas in both genders can be observed.

According to Table 1, after ten years, significant changes were observed in the proportion of students who reported participating in PE classes. It was found

that all categories showed a positive trend in participation in PE classes. When comparing the deltas between 2016 and 2011, despite the magnitude of the differences being smaller, most categories were significant, with the exception of those students who reported living in the rural area (3.3%) and who reported that the mother had no education (2.4%). In these categories there was a difference, but not a significant one.



**Figure 1** – Temporal trend in the prevalence of participation in Physical Education classes.

Legend:  $\Delta 1$  = 2006 a 2011,  $\Delta 2$  = 2011 to 2016,  $\Delta 3$  = 2006 to 2016

In the crude analysis, there was an association in the three surveys regarding gender, age, marital status, mother's education, mesoregion of residence, grade and shift (Table 2). In the adjusted analysis it is possible to observe that in both the 2006 and 2011 surveys, male participants were approximately 50% more likely to participate in SPE classes when compared to females, in the 2016 survey this number increased, with boys being 2.56 (95%CI: 2.17 - 3.02) more likely to participate in classes (Table 3).

Age was associated only in the 2006 survey and place of residence only in the 2011 survey in which students from rural areas were 36% (95%CI: 1.14 - 1.61) more likely to participate in SPE classes than residents of the urban area. The mother's education was associated with participation in SPE classes only in the 2016 survey. Living in different mesoregions was associated with participation in SPE classes in all surveys, as well as the student's shift, in which studying at night was always associated with non-participation in SPE classes (Table 3).

## Discussion

In the period from 2006 to 2016, there was a trend to-

**Table 1** – Time trend of prevalence and differences between the years (delta) of participation in Physical Education classes and of high school students from the public state network of Pernambuco in the 2006, 2011 and 2016 surveys, stratified by sociodemographic factors and factors related to the school.

Variables	Surveys			Delta			Trend
	2006	2011	2016	$\Delta 1$	$\Delta 2$	$\Delta 3$	
Gender							
Male	39.5	77.5	88.3	96.2	13.9	123.5	(+)
Female	32.5	71.7	75.5	120.6	5.3	132.3	(+)
Age							
14 – 16	40.6	75.9	83.5	86.2	10.0	105.7	(+)
17 – 19	31.1	72.3	78.7	132.5	8.9	153.1	(+)
Marital status							
Single	35.4	74.5	81.7	110.5	9.7	130.8	(+)
Others	29.5	69.4	76.8	135.3	10.7	160.3	(+)
Place of residence							
Urban	34.7	72.2	81.0	108.1	12.2	133.4	(+)
Rural	36.8	79.7	82.3	116.6	3.3*	123.6	(+)
Mother's education							
Did not study	32.9	71.1	72.8	116.1	2.4*	121.3	(+)
≤ 8 years	33.9	75.1	81.2	121.5	8.1	139.5	(+)
> 8 years	38.8	75.3	83.2	94.1	10.5	114.4	(+)
Occupational status							
No	37.1	75.1	81.2	102.4	8.1	118.9	(+)
Yes	28.2	70.7	81.0	150.7	14.6	187.2	(+)
Geographic mesoregion							
Metropolitan	32.2	67.9	77.1	110.9	13.5	139.4	(+)
Zona da Mata	33.7	72.4	75.9	114.8	4.8	125.2	(+)
Agreste	40.7	77.4	82.7	90.2	6.8	103.2	(+)
Sertão	43.0	78.0	87.4	81.4	12.1	103.3	(+)
Sertão do São Francisco	29.9	85.5	88.9	186.0	4.0	197.3	(+)
Shift							
Day	45.0	74.8	79.4	66.2	6.1	76.4	(+)
Night	21.7	65.1	69.4	200.0	6.6	219.8	(+)
Part-time*	-	86.3	83.1	-	-	-	-
Full-time*	-	98.4	89.7	-	-	-	-
Grade							
1st grade	37.5	75.6	83.6	101.6	10.6	122.9	(+)
2nd grade	32.8	73.9	79.9	125.3	8.1	143.6	(+)
3rd grade	33.6	72.3	79.6	115.2	10.1	136.9	(+)

\* Non-significant values.

wards increased participation in PE classes, regardless of the population subgroups evaluated. As expected, when analyzing the difference between the deltas there was a significant change in the variables when compa-

ring 2011 with 2006, in which 73.9% of all response categories presented differences above 100%. Being male, studying full-time and being the son of mothers who had studied, regardless of the length of study, was asso-

**Table 2** – Gross logistic regression of sociodemographic variables and participation in Physical Education classes in the years 2006, 2011 and 2016.

Variables	2006 (n = 4.207)		2011 (n = 6.264)		2016 (n = 6.002)	
	OR (IC95%)	P <sup>ℓ</sup>	OR (IC95%)	P <sup>ℓ</sup>	OR (IC95%)	P <sup>ℓ</sup>
<b>Gender</b>						
Male	1.37 (1.21 - 1.56)	<0.001	1.36 (1.21 - 1.53)	<0.001	2.44 (2.12 - 2.82)	<0.001
Female	1		1		1	
<b>Age</b>						
14 – 16	1.51 (1.33 - 1.72)	0.001	1.21 (1.08 - 1.36)	0.001	1.37 (1.21 - 1.56)	<0.001
17 – 19	1		1		1	
<b>Marital status</b>						
Single	1.76 (1.19 - 2.59)	0.005	1.36 (1.05 - 1.75)	0.019	1.65 (1.20 - 2.26)	0.002
Others	1		1		1	
<b>Place of residence</b>						
Urban	1		1		1	
Rural	1.09 (0.94 - 1.28)	0.250	1.51 (1.32 - 1.74)	<0.001	1.09 (0.92 - 1.28)	0.324
<b>Mother's education</b>						
Did not study	1		1		1	
≤ 8 years	1.04 (0.87 - 1.25)	0.645	1.23 (0.99 - 1.52)	0.061	1.61 (1.21 - 2.16)	0.001
> 8 years	1.29 (1.05 - 1.58)	0.014	1.24 (0.99 - 1.55)	0.064	1.86 (1.39 - 2.48)	<0.001
<b>Occupational status</b>						
No	1.51 (1.28 - 1.77)	<0.001	1.25 (1.09 - 1.42)	0.001	1.02 (0.84 - 1.23)	0.868
Yes	1		1		1	
<b>Geographic mesoregion</b>						
Metropolitan	1		1		1	
Zona da Mata	1.07 (0.89 - 1.28)	0.459	1.24 (1.06 - 1.46)	0.007	0.93 (0.78 - 1.12)	0.484
Agreste	1.44 (1.21 - 1.73)	<0.001	1.62 (1.37 - 1.91)	<0.001	1.41 (1.18 - 1.70)	<0.001
Sertão	1.59 (1.31 - 1.93)	<0.001	1.67 (1.41 - 1.98)	<0.001	2.06 (1.67 - 2.54)	<0.001
Sertão do São Francisco	0.90 (0.71 - 1.13)	0.474	2.79 (2.22 - 3.49)	<0.001	2.38 (1.83 - 3.09)	<0.001
<b>Shift</b>						
Day	2.95 (2.57 - 3.39)	<0.001	1	<0.001	1	<0.001
Night	1		0.62 (0.55 - 0.71)	<0.001	0.58 (0.49 - 0.70)	<0.001
Full-time*	-	-	2.27 (1.86 - 2.78)	<0.001	1.66 (1.43 - 1.93)	<0.001
<b>Grade</b>						
1st grade	1.19 (1.01 - 1.39)	0.041	1.19 (1.04 - 1.37)	0.012	1.31 (1.11 - 1.54)	0.001
2nd grade	0.96 (0.81 - 1.15)	0.675	1.09 (0.94 - 1.25)	0.240	1.02 (0.87 - 1.20)	0.827
3rd grade	1		1		1	

\*Includes part-time and full-time students; - Non-existent values, in this survey there were no full-time schools; <sup>ℓ</sup> Values according to binary logistic regression

**Table 3** – Adjusted logistic regression between sociodemographic variables and participation in Physical Education classes in the years 2006, 2011 and 2016.

Variables	2006 (n = 4.207)		2011 (n = 6.264)		2016 (n = 6.002)	
	OR (IC95%)	P <sup>£</sup>	OR (IC95%)	P <sup>£</sup>	OR (IC95%)	P <sup>£</sup>
<b>Gender</b>						
Male	1.53 (1.33 - 1.77)	<0.001	1.51 (1.31 - 1.73)	<0.001	2.56 (2.17 - 3.02)	<0.001
Female	1		1		1	
<b>Age</b>						
14 - 16	1.21 (1.03 - 1.45)	0.015	1.01 (0.87 - 1.18)	0.838	1.10 (0.92 - 1.33)	0.273
17 - 19	1		1		1	
<b>Marital Status</b>						
Single	1.07 (0.77 - 1.48)		1.07 (0.86 - 1.34)	0.512	1.12 (0.86 - 1.46)	0.380
Others	1		1		1	
<b>Place of residence</b>						
Urban	-	-	1		-	
Rural	-		1.36 (1.14 - 1.61)	<0.001	-	-
<b>Mother's education</b>						
Did not study	1		-	-	1	
≤ 8 years	1.03 (0.84 - 1.25)	0.764	-	-	1.52 (1.11 - 2.09)	0.009
> 8 years	1.17 (0.93 - 1.46)	0.167	-	-	1.50 (1.09 - 2.06)	0.012
<b>Occupational status</b>						
No	1.16 (0.96 - 1.40)	0.114	1.17 (0.99 - 1.38)	0.061	-	-
Yes	1		1		-	
<b>Geographic mesoregion</b>						
Metropolitan	1		1		1	
Zona da Mata	1.11 (0.91 - 1.37)	0.290	1.15 (0.96 - 1.39)	0.123	0.84 (0.68 - 1.04)	0.122
Agreste	1.78 (1.41 - 2.11)	<0.001	1.71 (1.40 - 2.08)	<0.001	1.27 (1.02 - 1.59)	0.027
Sertão	1.92 (1.54 - 2.41)	<0.001	1.74 (1.42 - 2.13)	<0.001	2.42 (1.87 - 3-14)	<0.001
Sertão do São Francisco	0.90 (0.70 - 1.15)	0.419	2.96 (2.29 - 3.83)	<0.001	2.88 (2.11 - 3.94)	<0.001
<b>Shift</b>						
Day	3.10 (2.65 - 3.63)	<0.001	1		1	
Night	1		0.59 (0.51 - 0.69)	<0.001	0.44 (0.35 - 0.55)	<0.001
Full-time*	-	-	2.42 (1.93 - 3.04)	<0.001	1.70 (1.42 - 2.03)	<0.001
<b>Grade</b>						
1st grade	1.04 (0.85 - 1.26)	0.656	1.00 (0.83 - 1.20)	0.987	1.16 (0.93 - 1.44)	0.186
2nd grade	0.89 (0.73 - 1.08)	0.260	0.87 (0.74 - 1.04)	0.132	0.97 (0.79 - 1.19)	0.803
3rd grade	1		1		1	

\* Includes students in the part-time and full-time shifts; - Values not included due to non-significance in the crude analysis; £ Values according to binary logistic regression.

ciated with greater participation in Physical Education classes, as well as living in the regions of Agreste, Sertão.

In 2016, the Ministry of Education proposed a reform in the LDB, called “New Secondary Education”, represented by Provisional Measure No. 746/201614, which intended to remove the mandatory PE classes for high school students. In 2017, after publication in the media and the positioning of entities in the area against the Reform of Secondary Education, the Senate voted in favor of the permanence of PE as “studies and practices”, mandatory in basic education. The Ministry of Education’s decision to modify the status of PE in the high school curriculum may worsen the results that research has revealed regarding the difficulty of legitimizing this component in the country.

The trend towards increasing classes in Pernambuco differs from the current scenario of research related to participation in PE classes. Designed to assess secular changes in PE among US high school students, the Youth Risk Behavior Surveillance - YRBS findings showed that the percentage of participation in PE classes on at least one day a week did not change from 1991 to 2013 among high school students in the USA. However, it decreased significantly among those who reported participating daily in classes, from 41.6% in 1991 to 25.4% in 1995, remaining unchanged until 2013<sup>15</sup>.

It is believed that this modification was caused due to legal and structural changes, rather than a greater interest of students in practice. It is likely that the changes regulated by Normative Instruction No. 02/201116 have influenced the increase in student participation. The inclusion of PE classes in the curriculum facilitated access to classes. In this way, the student no longer has to go back to school after their regular shift just to attend PE classes.

The global debate around PE classes has generated reflections that seek to solve the obstacles encountered in making this discipline effective in school curricula. Difficulties regarding the offer of classes, the structure of the environment, the pedagogical proposals, the systematization of contents and the motivation of teachers and students have weakened access to the knowledge provided by PE in basic education.

Although the individual determinant has not been investigated, studies in the literature indicate that low motivation and willingness to attend classes is related to the pedagogical practice used by teachers, in addition to the content taught during classes<sup>17,18,19</sup>. Studies related to the provision of content in PE classes in-

dicating little variation in themes, sport being the main knowledge topic taught by teachers<sup>20,21</sup>.

Male students are more likely to take PE classes compared to female students. This difference increased in the last year (2016), which demonstrates that although girls participate more in classes, they continue to participate less than boys. These data corroborate with other studies already described in the literature<sup>21</sup>.

When evaluating the geographic mesoregions, it was possible to verify that between the 2006 and 2011 surveys there was an inversion in the category of Sertão do São Francisco. In 2011 and 2016, students from this mesoregion were more likely to participate in SPE classes compared to students from the Metropolitan mesoregion. It is likely that both this inversion and the difference between the other mesoregions occurred due to the implementation of reference schools, mainly the change of classes to the shift<sup>11</sup>, considering that students from schools located in the interior had greater difficulty in accessing to return to school only for PE classes.

In the same period, it is noted that full-time school students are also more likely to participate in SPE classes compared to day shift students. This change probably occurred due to a structural issue in the number of classes offered for this teaching modality, which authorizes the offer of two SPE classes through Normative Instruction No. 02/201116.

Among the main strengths of the study, the performance of an extensive field collection stands out, with sufficient representativeness and sample size to allow greater confidence in the extrapolation of results to the investigated population. In addition, the methodological similarity of the three surveys and their scope, including the participation of night shift students and from all mesoregions of the state.

The main limitation found in the study is the use of the instrument that only allows the information of self-reported measures. However, an attempt was made to mitigate this possible bias by carrying out pilot studies and training the collection teams to standardize the application of the instrument, with students being continuously assisted by the group of researchers so that they could clarify doubts and help fill in the questions.

In the end, despite the findings showing a positive trend in participation in PE classes, the interpretation of these results must be carried out with caution. It is noted that the change in prevalence is a real result, however, the justifications given are based on documents that regulate the administrative changes carried out by

the Department of Education. In addition, the absence of monitoring and evaluation of these policies does not allow us to affirm the cause and effect relationship.

The present investigation points to contributions to the current moment of SPE, presenting data referring to the ten-year time trend of participation in PE classes by high school students in the state of Pernambuco. It should also be noted that this research can contribute to decision-making regarding the planning of public intervention policies in the state of Pernambuco, as it indicates a change in student behavior in relation to participation in PE classes.

It is recommended that future investigations explore the characteristics of these classes, the content taught, the levels of physical activity during classes and the environment where they are offered. This clipping is necessary to evaluate the quality of SPE classes, considering the numerous publications that refer to the priority of research within the scope of the school as a space that favors the practice of physical activities for adolescents.

### Conflict of interest

The authors declare no conflict of interest.

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### Author Contributions

All authors actively participated in the study. Soares MD participated in the design and writing of the manuscript, analysis and interpretation of data. Simão MJFL participated in the writing of the manuscript and in the relevant critical review of the intellectual content. Soares FC contributed to the analysis and interpretation of data and revision of the manuscript. Bezerra J participated in the design, critical review and approval of the manuscript. Tassitano RM and Barbosa Filho VC participated in the critical review and final approval of the version to be published.

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