

# Association between religiosity, physical activity, and sedentary behavior in adolescents

## Associação entre religiosidade, atividade física e comportamento sedentário em adolescentes

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### Abstract

The aim of this cross-sectional study was to analyze the association between religiosity and physical activity level, sedentary behavior and enrollment in physical education classes among adolescent attended in public high school from Pernambuco State. Data about 4,207 students (14-19 years old) were obtained used the School-based Health Survey. Multiple and bivariate analyzes were conducted. The adolescents who reported to be Catholics were high likely to be insufficiently active (OR=1.39; 95%CI: 1.14-1.71) and exposed to sedentary behavior during weekend days (OR=1.26; 95%CI: 1.03-1.53) in comparison who reported 'no religious affiliation'. In addition, Protestants showed 76% high likely to be no enrollment in physical education classes (OR=1.76; 95%CI: 1.36-2.27). The religious practice was a factor associated to all dependent variables, except for the physical activity level. These results support that religiosity was associated with physical activity, sedentary behavior and enrollment in physical education classes.

### Keywords

Religion; Adolescent behavior; Motor activity; Sedentary lifestyle.

### Resumo

*O objetivo deste estudo transversal foi analisar a associação da religiosidade com o nível de atividade física, comportamento sedentário e participação na educação física em adolescentes estudantes do ensino médio da rede pública do estado de Pernambuco. Dados de 4207 estudantes (14-19 anos) foram coletados mediante utilização do Global School-based Health Survey. Os dados foram analisados mediante análises bivariáveis e multivariáveis. Comparados aos adolescentes que relataram "não ter religião", os católicos tinham maior chance de apresentar nível insuficiente de prática de atividade física (OR=1,39; IC95%:1,14-1,71) e comportamento sedentário em dias do final de semana (OR=1,26; IC95%:1,03-1,53). Identificou-se também que os evangélicos apresentaram chance 76% superior de não participar das aulas de educação física (OR=1,76; IC95%:1,36-2,27). A prática religiosa estava associada a todas as variáveis, exceto a atividade física. Concluiu-se que a religiosidade é um fator associado à atividade física, comportamento sedentário e participação na educação física.*

### Palavras-chave

Religião; Comportamento do adolescente; Atividade motora; Estilo de vida sedentário.

## INTRODUCTION

The benefits brought to health by the practice of physical activities have been well documented in the literature<sup>1</sup>. Nevertheless, studies have shown high prevalence of insufficient levels of physical activity practice both in Brazilian adolescents<sup>2</sup> and in adolescents from other countries<sup>3</sup>, particularly among young women and older youths<sup>4,5</sup>. The available evidence also suggests the existence of a trend of decline in physical activity level as age advances, which is expressed more intensely during adolescence<sup>6,7</sup>.

In parallel with the reduction in the physical activity level, it has been observed that the young population is more exposed to what is called sedentary behaviors<sup>7</sup> and to lower participation in physical education classes<sup>8</sup>. The increased prevalence of exposure to these behavioral risk factors, isolated or in combination, may be among the causes of the high incidence of overweight in young populations and, later, of the increasing incidence of obesity and cardiovascular diseases in adults<sup>9,10</sup>.

A line of investigation that has been adopted to study the reasons for the rising prevalence of insufficient physical activity levels and sedentary behaviors is the identification of associated factors. In addition, studies have been developed with the aim of analyzing strategies aiming at the promotion of physical activity, such as investigations about the role that physical education classes can play to increase the youths' physical activity level<sup>11,12</sup>.

Similarly to what has been observed in relation to other health events, one hypothesis that has been discussed is that religion can be a factor associated with physical activity practice and sedentary behavior because religious factors can influence the development of attitudes, beliefs and values in people, even among young ones. When a person connects himself with a religious denomination, he is also adhering to a set of symbols, behaviors and social practices that can shape his lifestyle and, therefore, affect his health<sup>13</sup>.

Although some religious doctrines lead their practitioners to adopt health risk behaviors<sup>14,15</sup>, generally speaking, studies suggest that there is a positive association between religiosity and health practices<sup>16-18</sup>. There is evidence that religious practice is positively associated with physical<sup>19</sup> and mental<sup>16</sup> wellbeing. Furthermore, it has been noted that lack of an effective religious practice is associated with adoption of several health risk behaviors, such as smoking, alcoholism, use of illicit drugs and risky sexual behavior<sup>20,21</sup>.

In relation to physical activity and sedentary behavior, studies with adults have shown that religiosity indicators (participation in religious events, religious commitment, divine social support) are factors associated with higher levels of physical activity<sup>22,23</sup>. Studies with adolescents are scarce, but it is possible to raise the hypothesis that religiosity is associated with physical activity level in young individuals. Thus, the aim of this study was to analyze the association of religiosity indicators (religious affiliation and practice) with physical activity level, sedentary behavior and participation in physical education classes among High School students.

## METHODS

To develop the study, a cross-sectional, school-based, statewide design was adopted (State of Pernambuco, Northeastern Brazil). The study was based on a secondary analysis of data from the project called "Lifestyles and health risk behaviors in adolescents: from prevalence studies to intervention". The investigation proto-

col was submitted to and approved by the Research with Human Beings Ethics Committee in accordance with the norms established in Resolutions 196 and 251 of the National Health Council.

The target population – estimated at 352,829 subjects according to data from the Education and Culture Department of the State of Pernambuco – was constituted of High School students enrolled in state-run public schools, aged between 14 and 19 years. To calculate the sample's size, the following parameters were adopted: 95% confidence interval; maximum tolerable error of 3%; sample design effect of 4; and prevalence estimated at 50% (option adopted because of the multiple factors analyzed in the study). Based on these parameters, the calculated sample size was 4,217 subjects.

From the point of view of the sampling process, the aim was to guarantee that the selected students represented the target population regarding distribution according to geographical region, school size and enrolment period (day/evening). Regional distribution was analyzed from the number of students enrolled in each one of the 17 GEREs (*Gerências Regionais de Ensino* – Regional Education Offices). School size was classified into three levels according to the number of students enrolled in High School (public schools), in view of the following criteria: size I (small) – less than 200 students; size II (medium) – 200 to 499 students; and size III (large) – 500 students or more. The students enrolled in the morning and afternoon periods were grouped into one single category (day students). All the students of the drawn classes were invited to participate in the study.

Sample selection was performed through two-stage cluster sampling. School and class were adopted as primary and secondary sampling units, respectively. In the first stage, the schools were drawn so as to include at least one school of each size per GERE. In the second stage, 203 classes were drawn among those existing in the schools drawn in the first stage so that the desired sample size could be reached.

The instrument used in data collection was the questionnaire Global School-based Student Health Survey (GSHS), proposed by the World Health Organization with the objective of assessing exposure to health risk behaviors among adolescents. The version in Portuguese was submitted to a validation process and to a pilot study and is available to readers upon request to the authors of this paper. It presented good consistency of measures and content and face validity. Reproducibility indicators (consistency of test-retest measurements) ranged from moderate to high in the majority of the items of the instrument, and the concordance coefficients varied from 0.52 to 1.0.

Data was collected in the period from April to October 2006. The questionnaires were administered in the classroom, without the presence of the teachers, to all students who were present on the collection day, regardless of age. The students were continuously assisted by the professionals who administered the questionnaires (always two per class), who clarified and helped in the filling in of information.

Participation was voluntary and all the students were informed that they could give up at any stage of data collection. Besides, the questionnaires contained no personal identification (name, enrolment number). A passive consent document was used to obtain, from parents of students younger than 18 years, permission for them to participate in the study. The document contained a clear description of the study's objective and requested that the parents informed the school if they did not agree with their children's participation. Students aged 18 or older signed the document themselves, indicating that they agreed to participate in the study.

For the analysis, the following were considered dependent variables: the general physical activity level, exposure to sedentary behavior, and participation in physical education classes. The adopted criteria to the classification of the physical activity level complied with the recommendations of Cavill et al<sup>24</sup>: a subject was considered physically “active” when he reported accumulating, at least, 60 minutes of daily physical activities in five or more days of the week. The other subjects were classified as “insufficiently active”. According to the criteria adopted in a previous study<sup>25</sup>, exposure to sedentary behavior was determined by time in hours spent watching television. Subjects who reported watching television during three or more hours per day were considered exposed, and two variables related to exposure to sedentary behavior were considered in the analyses, one reflecting the adolescent’s conduct on weekdays and the other reflecting weekend days. Participation in physical education classes was defined as a dichotomous variable (participants/non-participants), in which “participants” were the adolescents who reported participating in, at least, one class per week.

Religious affiliation and practice (practitioner/non-practitioner) were the independent variables. Religious affiliation was determined by one single question (“what is your religion?”), and the following categories of answers were offered: I don’t have a religion, Catholic, Protestant, Spiritualist or other. Subsequently, it was decided to group “spiritualist” and “other” into one single category, due to the low frequency of respondents. In relation to religious practice, one question was also used (“Do you consider that you are a practitioner of your religion?”), and the answers were categorized dichotomously (yes/no).

The potential confounding factors considered in the multivariate analyzes were: sex (male/female); age group (14-16/17-19 years); skin color (white/non-white); period of classes (day/evening); High School year (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>); school size (small, medium and large); place of residence (urban/rural); living with parents (yes/no); mother’s level of schooling (low= $\leq 8$ , medium=9-11 and high= $\geq 12$  years); and adolescent’s occupational status (worker/non-worker). The adolescent who reported having a regular job and receiving a salary was considered a worker, regardless of having a formal register in the employment book.

For data tabulation, the program Epi Data (version 3.1) was used. The feature “Check” was used to electronically control data entry in the keyboarding stage. So as to detect and correct errors, data entry was repeated and the files were compared. More information on the study’s methodological procedures can be found in previous publications<sup>25,26</sup>.

Data analysis was carried out using the statistical package SPSS version 15. Bivariate analyses were performed with the utilization of the Chi-square test ( $\chi^2$ ) for heterogeneity and trend (in the case of variables in ordinal scale). In the multivariate analysis, binary logistic regression was used separately to each dependent variable, considering the following outcomes: (1) insufficiently active; (2) sedentary behavior on weekdays (3 hours or more/day watching TV); (3) sedentary behavior on weekend days (3 hours or more/day watching TV); and (4) not participating in physical education classes.

The analyses were carried out in two stages: first, simple (non-adjusted) regressions of the independent variables were performed in relation to the outcomes focused in the study. Then, in accordance with a hierarchical model, multivariate analyses were performed aiming to determine whether or not the religiosity indicators were associated with the outcomes. The hierarchical model considered

three levels: a) a distal level, in which the demographic variables were included (sex, age and skin color); b) an intermediate level, in which the socioeconomic and school-related factors were included (period, school year, school size, place of residence, living with parents, adolescent's occupational status, and mother's level of schooling); and c) the proximal level, in which the religiosity factors were included (religious practice and affiliation). The variables were maintained in the model when the identified p value was below 0.2. The results are presented in the form of odds ratios and the respective confidence intervals.

## RESULTS

Seventy-six schools were visited (11% of the total number of state-run schools of the State of Pernambuco) in 44 municipalities, which represents approximately 23% of Pernambuco's municipalities. Of the students aged between 14 and 19 years who were present at the schools on the occasion of the visit for data collection, 83 refused to participate in the study (1.9% of refusals); thus, 4,207 students answered the questionnaire (mean 16.8 years;  $s = 1.4$ ), and 59.8% were of the female sex.

With this number of participants ( $n=4,207$ ), it was verified that Odds Ratio (OR) values equal to or higher than 1.2 could be considered as significant, with a 95% confidence interval, 80% power and prevalence of the outcome of 35% among non-exposed and 39% among exposed adolescents. Table 1 presents the adolescents' demographic, socioeconomic, and school-related characteristics, as well as the religiosity indicators, stratified by sex.

The prevalence of insufficient levels of physical activity practice was 65.1% (95%CI: %: 63.6-66.6), being significantly ( $p<0.001$ ) higher among the girls (70.2%; 95%CI: 68.4-71.9) compared to the boys (57.7%; 95%CI: 55.3-60.0). It was also verified that 64.9% (95%CI: 63.4-66.3) of the respondents reported not participating in the physical education classes, and the proportion of subjects that reported this was significantly higher among the girls (67.8%; 95%CI:66.0-69.6) compared to the boys (60.5%; 95% CI:58.2-62.8).

It was observed that on weekdays 40.8% of the subjects reported watching 3 or more hours of television per day, a conduct that was operationally defined in this study as sedentary behavior. No significant difference was found between boys and girls. Concerning the adolescents' conduct on weekend days, it was noted that the prevalence of sedentary behavior was higher than what was observed on weekdays (49.9%; 95%CI:48.4-51.4), and significantly higher among the boys (54.0%; 95%CI: 51.6-56.4) compared to the girls (47.1%; 95%CI: 45.2-49.1).

The bivariate analyses showed that religious affiliation is a factor associated with the four outcomes considered in this study: insufficient physical activity level, non-participation in physical education classes, sedentary behavior on weekdays and sedentary behavior on weekend days (Figure 1). It was observed that the prevalence of insufficient physical activity level was higher among the adolescents who reported being "Catholics"; on the other hand, it was also among these adolescents that a lower prevalence of non-participation in physical education classes was found. Regarding sedentary behavior, the prevalence was lower among the "Protestant adolescents" both on weekdays and on weekend days. The stratification of the analyses by sex showed that among the boys, these associations were not significant, except for sedentary behavior on weekend days.

**Table 1** – Characteristics of the demographic, socioeconomic and religious variables of students according to sex. Pernambuco, Brazil, 2006.

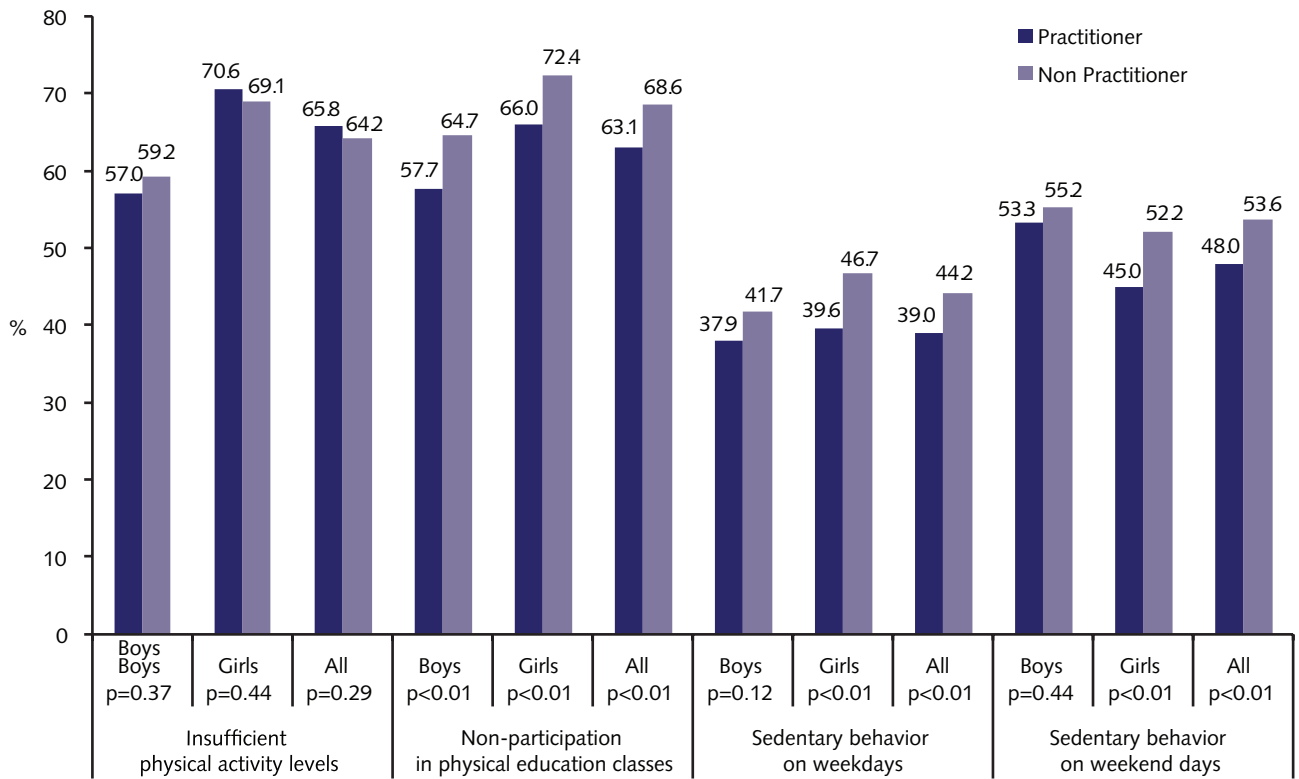
Variable	Category	Boys		Girls		All	
		n	%	n	%	n*	%
Period	Day	908	53.9	1,506	60.0	2,414	57.6
	Evening	778	46.1	1,002	40.0	1,780	42.4
Year	1st	778	46.1	1,099	43.8	1,877	44.7
	2nd	522	31.0	818	32.6	1,340	31.9
	3rd	386	22.9	593	23.6	979	23.3
Age group	14-16	598	35.4	1,165	46.4	1,763	42.0
	17-19	1,089	64.6	1,346	53.6	2,435	58.0
Skin color	White	417	24.8	639	25.5	1,056	25.2
	Other	1,262	75.2	1,866	74.5	3,128	74.8
Place of residence	Urban	1,311	78.1	1,983	79.5	3,294	79.0
	Rural	367	21.9	510	20.5	877	21.0
Mother's level of schooling	Low	1,086	69.4	1,771	74.5	2,857	72.5
	Medium	352	22.5	480	20.2	832	21.1
	High	127	8.1	126	5.3	253	6.4
Lives with parents	Yes	1,130	68.1	1,510	60.6	2,640	63.6
	No	529	31.9	981	39.4	1,510	36.4
Occupational status	Does not work	1,157	69.2	2,119	84.8	3,276	78.5
	Works	514	30.8	381	15.2	895	21.5
School size	<200	152	9.0	221	8.8	373	8.9
	200-499	456	27.0	628	25.0	1,084	25.8
	>500	1,079	64.0	1,662	66.2	2,741	65.3
Religious affiliation	No affiliation	325	19.4	281	11.2	606	14.5
	Catholic	926	55.2	1,541	61.6	2,467	59.0
	Protestant	358	21.3	600	24.0	958	22.9
	Other	70	4.1	80	3.2	150	3.6
Practitioner of the religion	Yes	965	57.7	1,770	71.1	2,735	65.7
	No	708	42.3	721	28.9	1,429	34.3

\* the number of respondents differs from 4,207 because of missing values for some variables.

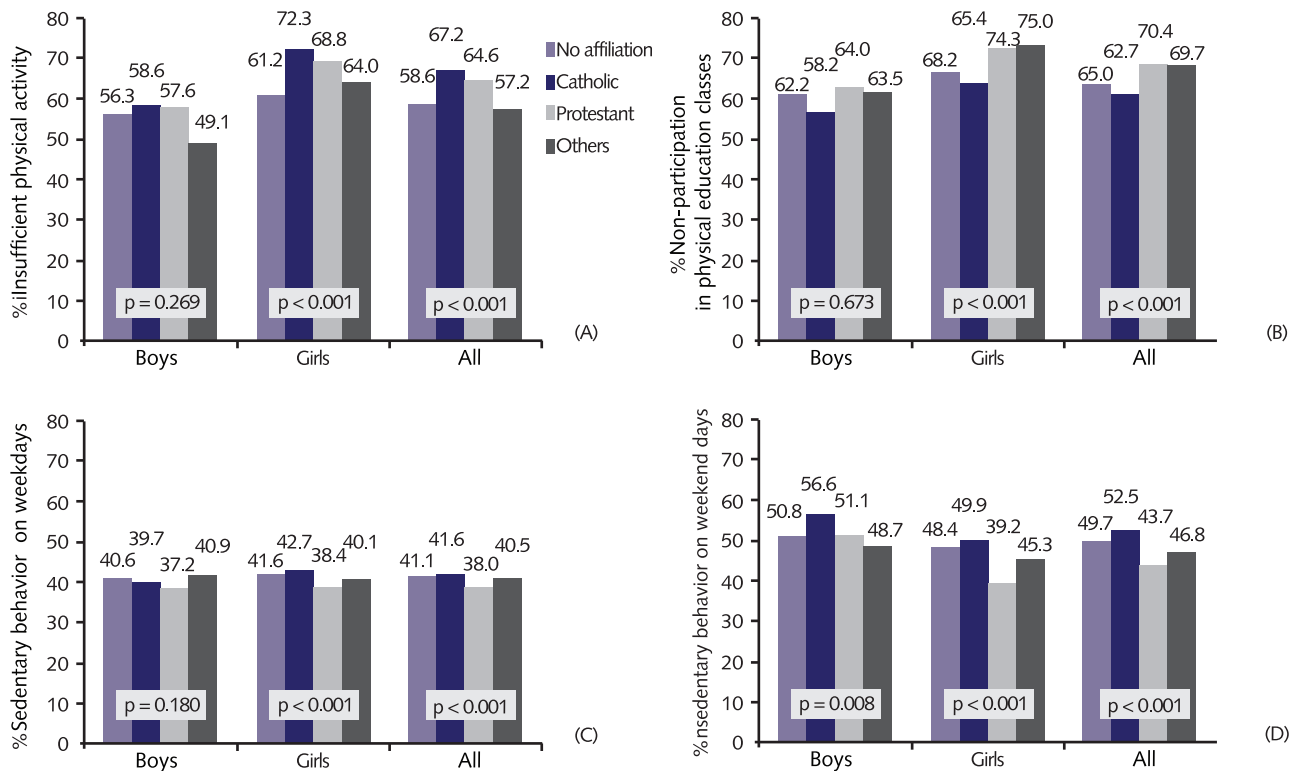
Still regarding the results of the bivariate analyses, it was identified that religious practice is a factor associated with non-participation in physical education classes, sedentary behavior on weekdays and sedentary behavior on weekend days. The results point to higher prevalences of these outcomes among the adolescents who reported not being practitioners of a religion (Figure 2).

The logistic regression analyses adjusted for potential confounding factors enabled to identify that both religious affiliation and religious practice are factors associated with physical activity level, participation in physical education classes and sedentary behavior. However, the meaning of the associations seems to differ: while religious practice is inversely associated with them, it was observed that having a religious affiliation is directly associated with the occurrence of three of the four outcomes analyzed in this study (Table 2). Adolescents who reported being Catholics had odds that were 39% and 26% higher of presenting, respectively, insufficient level of physical activity practice and sedentary behavior on weekend days, compared to the adolescents who informed not having a religious affiliation. On the other hand, it was found that the Protestant adolescents, compared to those who informed not having a religious affiliation, presented odds 76% higher of not participating in physical education classes.





**Figure 1** – Absolute and relative frequency of adolescents exposed to insufficient physical activity levels (A), non-participation in physical education classes (B), sedentary behavior on weekdays (C) and sedentary behavior on weekend days (D) according to religious affiliation, by sex. Pernambuco, Brazil, 2006.



**Figure 2** – Absolute and relative frequency of adolescents exposed to insufficient physical activity levels, non-participation in physical education classes, sedentary behavior on weekdays and sedentary behavior on weekend days according to religious practice, by sex. Pernambuco, Brazil, 2006.

**Table 2** – Crude and adjusted logistic regression analyses of the association between religiosity indicators (religious affiliation and practice) and insufficient physical activity levels (outcome 1), non-participation in physical education classes (outcome 2), and sedentary behavior on weekdays (outcome 3) and on weekend days (outcome 4). Pernambuco, Brazil, 2006.

Variable	Category	crudeOR	95%CI	p value	adjustedOR	95%CI	p value
<b>Outcome 1: insufficient levels of physical activity</b>							
Religious affiliation	No affiliation	1			1		
	Catholic	1.45	1.21-1.73	<0.01	1.39	1.14-1.71	<0.01
	Protestant	1.29	1.05-1.59	0.016	1.22	0.97-1.55	0.095
	Others	1.16	0.82-1.66	0.403	1.23	0.84-1.79	0.281
Religious practice	No	1			1		
	Yes	1.08	0.94-1.23	0.291	0.91	0.78-1.06	0.239
<b>Outcome 2: non-participation in physical education classes</b>							
Religious affiliation	No affiliation	1			1		
	Catholic	0.91	0.75-1.09	0.312	1.17	0.94-1.45	0.167
	Protestant	1.28	1.03-1.59	0.026	1.76	1.36-2.27	<0.01
	Others	0.99	0.69-1.42	0.926	1.35	0.91-2.01	0.138
Religious practice	No	1			1		
	Yes	0.78	0.68-0.90	<0.01	0.70	0.60-0.83	<0.01
<b>Outcome 3: sedentary behavior on weekdays</b>							
Religious affiliation	No affiliation	1			1		
	Catholic	1.20	0.85-1.22	0.829	1.18	0.96-1.44	
	Protestant	0.88	0.71-1.08	0.222	0.99	0.79-1.26	
	Others	1.21	0.85-1.71	0.286	1.32	0.91-1.90	
Religious practice	No	1			1		
	Yes	0.81	0.71-0.92	<0.01	0.79	0.69-0.92	
<b>Outcome 4: sedentary behavior on weekend days</b>							
Religious affiliation	No affiliation	1			1		
	Catholic	1.12	0.94-1.34	0.221	1.26	1.03-1.53	
	Protestant	0.79	0.64-0.97	0.022	0.91	0.72-1.14	
	Others	0.94	0.68-1.33	0.734	0.99	0.69-1.44	
Religious practice	No	1			1		
	Yes	0.80	0.70-0.91	<0.01	0.79	0.68-0.91	

## DISCUSSION

This study aimed to analyze the association of religiosity indicators (religious affiliation and practice) with physical activity level, sedentary behavior and participation in physical education classes among adolescent students. The results showed that there is an association between the religiosity indicators and the analyzed outcomes. Concerning religious affiliation, it was observed that: (1) Catholic adolescents, compared to those who reported not having a religion, had higher odds of being insufficiently active and of being exposed to sedentary behavior on weekend days; and (2) Protestant adolescents had higher odds of not participating in physical education classes. Finally, it is possible to state that religious practice is a factor that is not associated with physical activity level, but it reduces the odds of non-participation in physical education classes and of exposure to sedentary behavior, both on week and on weekend days.

It is advisable to interpret with caution the results presented in this study, mainly in order to avoid causal inferences between religiosity and the health con-



ducts that were investigated, as the behavior related to physical activity and exposure to sedentary behaviors has a complex causal chain<sup>27</sup> and cannot be attributed exclusively to religiosity. In addition, it is not possible to discard the possibility of an information bias, as even with anonymity guaranteed, some students may have omitted religious affiliation due to self-censorship or to memory errors. A strategy that was adopted to mitigate this limitation was the utilization of a questionnaire that had been previously tested and presented a good level of reproducibility, with data collected by trained interviewees who were experienced in conducting this kind of fieldwork.

This study was carried out with a relatively large sample, representative of the High School students attending public schools in the State of Pernambuco (Northeastern Brazil). In addition, the sample was sufficiently large to ensure an adequate statistical power to the analyses that were performed.

Finally, as far as we know, this is one of the first comprehensive investigations carried out in Brazil with the aim of analyzing the association between religiosity, practice of physical activities and sedentary behavior. Many studies about factors associated with health conducts among adolescents have focused mainly on investigating the extent to which religiosity may be associated with heavy consumption of alcohol and tobacco<sup>28,29</sup>. Besides focusing on the analysis of little explored health conducts, this study considered simultaneously two religiosity factors (religious affiliation and practice); in other studies, each one of these factors is usually analyzed separately<sup>13</sup>.

The study conducted by Loch<sup>15</sup> was carried out with a relatively small group of subjects, the subjects were selected in one single school, and different religiosity indicators were used; however, it presented converging evidences in relation to what was observed in the present study. According to Loch<sup>15</sup>, “participation in groups of youths” and the frequency of attendance of religious events were factors positively associated with a higher level of practice of physical activity among the investigated adolescents.

Similar results were also observed in studies carried out with adults from the United States of America. The studies indicated that the religiosity indicators “religious commitment” (among women) and “divine social support” (among men) were positively associated with the subjects’ physical activity level<sup>23</sup>. Similarly, an investigation performed with approximately six thousand adults enabled to verify that people who attended religious events at least once a week presented higher levels of physical activity<sup>22</sup>. Thus, religiosity is presented as a facilitator of the adoption of a physically active lifestyle<sup>30</sup>.

However, a specific finding of the present study calls our attention to the fact that some elements of religiosity, such as religious affiliation, may function as a barrier to the practice of physical activities and as a facilitator of the exposure to sedentary behavior, like what was observed among the adolescents who reported being “Catholics”. Therefore, these subjects would have higher odds of adopting a combined condition of health risk: low physical activity level allied with sedentary behavior. However, there is no consistent evidence to explain the mechanism of the influence that religious affiliation has on the exposure to sedentary behaviors.

Still concerning religious affiliation, there are not enough data to explain the Protestant adolescents’ higher odds of non-participation in physical education classes compared to those who reported not having a religion. It is possible that the doctrine adopted by some Protestant denominations neither stimulates nor

values participation in the classes because the importance of this curricular component for the subjects' personal, humanistic and spiritual formation is not recognized. But this hypothesis need to be further investigated, possibly through qualitative investigation approaches.

The findings reported in this research strengthen evidences presented in other studies, according to which religiosity is a factor associated with practice of physical activity<sup>13,15</sup> and sedentary behavior<sup>14</sup>. However, we have not found studies that showed an association with participation in physical education classes. Some factors seem to be directly associated, while others present an inverse relationship to these conducts. The amount of available studies and the quality of the adopted design prevent us from making generalizations at this point, but it is possible to suppose that the investigation in this line of research reveals intervention strategies for promotion of physical activity based on religious factors.

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