









Barriers to physical activity and associated factors in public school teachers – a cross-sectional epidemiological study

Barreiras para prática de atividade física e fatores associados em professores da rede pública – estudo epidemiológico transversal

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ABSTRACT

Introduction: Teachers have a high prevalence of insufficient physical activity (PA) levels. However, the barriers to the practice of PA in this population and their associated factors are still not established in the literature. **Objective:** To describe the barriers to PA and identify associated factors in public school teachers. **Methods:** A sample of 246 teachers were evaluated (45.2 ± 10.4 years, 76% women). Barriers to PA, socioeconomic status, work-related factors, and PA level were assessed by questionnaire. The PA level according to each barrier was compared by analysis of variance and the association between barriers for PA and independent variables was analyzed by logistic regression. **Results:** Lack of Time (LT) and laziness, tiredness, or discouragement (LTD) were the most reported barriers (36.2% and 35.0%, respectively). Obese teachers were more likely to report LTD (OR = 2.34, $p < 0.05$) and less likely to report no barrier to PA (OR = 0.07, $p < 0.05$), when compared with teachers with normal weight. Teachers who reported working 21-30 hours/week were more likely to report LTD than those who worked 20 or less hours/week (OR = 4.12, $p < 0.05$). Teachers with moderate-to-low PA level in leisure-time and sports practice were more likely to report LTD as the main barrier to PA (OR = 2.53, $p < 0.05$ and OR = 2.29, $p < 0.05$; respectively). **Conclusion:** LT and LTD were the most frequently reported barriers to PA by teachers. LTD was associated with obesity, higher hours worked, and lower PA level.

Keywords: behavior and behavior mechanisms; exercise; obesity; psychology, sports; teachers.

RESUMO

Introdução: Professores apresentam elevada prevalência de níveis insuficientes de atividade física (AF). No entanto, as barreiras para a prática de AF nesta população e fatores associados ainda não são estabelecidos na literatura. **Objetivo:** Descrever as barreiras para AF e identificar fatores associados em professores da rede pública de ensino. **Métodos:** Foram avaliados 246 professores ($45,2 \pm 10,4$ anos, 76% mulheres). Barreiras para AF, condição socioeconômica, jornada de trabalho e nível de atividade física foram avaliados por questionário. O nível de AF de acordo com cada barreira foi comparado pela análise de variância e a associação entre barreiras e variáveis independentes foi analisada por regressão binária. **Resultados:** Falta de tempo (FT) e preguiça, cansaço ou desânimo (PCD) foram as barreiras mais reportadas pelos professores (36,2% e 35,0%, respectivamente). Professores obesos foram mais propensos a reportar PCD (OR = 2,34, $p < 0,05$) e menos propensos a não reportar nenhuma barreira (OR = 0,07, $p < 0,05$), quando comparados com professores de peso normal. Professores que trabalhavam entre 21-30 horas/semana foram mais propensos a reportar PCD comparados aos que trabalhavam por até 20 horas/semana (OR = 4,12, $p < 0,05$). Professores com níveis de AF moderado a baixo no tempo livre e na prática esportiva foram mais propensos a reportar PCD (OR = 2,53, $p < 0,05$ e OR = 2,29, $p < 0,05$; respectivamente). **Conclusão:** A FT e PCD foram as barreiras mais frequentemente reportadas por professores, sendo a PCD associada com obesidade, maior jornada de trabalho e menor AF.

Palavras-chave: comportamento e mecanismos comportamentais; exercício físico; obesidade; psicologia do esporte; professores.

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Introduction

Physical inactivity has been considered an important health impairment, being responsible for approximately 9% of early mortality and for a reduction in life expectancy worldwide [1]. The reasons for the low adherence to an active lifestyle are considered as barriers for physical activity [2]. These barriers have been associated with sociodemographic factors, socioeconomic condition, marital status, educational level, and self-rated health in adult population [3].

The prevalence of workers who do not meet sufficient levels of physical activity was 64% [4] and the factors directly or indirectly related to working conditions have also frequently been reported as barriers to physical activity for both men and women [5]. In this sense, teachers, whose teaching activity directly impacts on people instruction, correspond to a group of workers who may present health impairments related to psychological overload and physical inactivity [6].

Approximately 50% of teachers present low physical activity levels [7], which highlights the need for investigations into the determinants of this elevated level of physical inactivity, since studies involving teachers are infrequent and generally unspecific [8], as well as the programs of physical activity promotion in the school environment are generally focused on students [9], without including the teachers.

Thus, describing the barriers to physical activity among teachers from the public educational system may contribute to the promotion of strategies to confront physical inactivity in this group of workers. Therefore, the current study aimed to describe the prevalence of barriers to physical activity among public school teachers and to identify whether there is an association of barriers with sociodemographic and work-related factors, and levels of habitual physical activity.

Methods

Study design

This is an observational study with a cross-sectional design, written according to the STROBE - Strengthening the Reporting of Observational Studies in Epidemiology - checklist [10]. The study involved teachers from the public educational system of the city of Presidente Prudente, located in the Southeastern region of Brazil. This city has a population of 227,072 inhabitants and a human development index of 0.806, 0 is the lowest and 1 is the highest level. The research was previously approved by the Ethics in Research Committee from *Universidade Estadual Paulista (Unesp)* - under protocol CAAE 72191717.9.0000.5402.

Sampling process and data collection

According to the Educational Department, the city of *Presidente Prudente/SP* has 23 public schools and 650 teachers working in these institutions. For the sample size calculation, a prevalence of outcome of 50% was considered, which is adopted in

epidemiological studies with multiple outcomes or unknown outcome prevalence, aiming to enhance the sample size [11]. A tolerable error of 5%, confidence interval of 95%, and an 80% study power were also considered, resulting in a minimum sample size of 242 participants.

For the recruitment of participants, the schools were randomized for selection according to the geographic location (north, south, east, west, and central), considering an equal proportion of participants to be recruited from each city region ($n = 242/5$). Initially, two schools were randomly selected from each geographical region and authorization to visit the schools was requested from the manager of the institutions. In case of a negative response, another school from the same region was randomly selected following the same process. The schools were randomly selected until the minimum sample size was reached, or until all schools had been contacted. In schools that authorized the research, all the teachers were invited to participate in data collection. At the end of the sampling process, 10 schools did not authorize the research and all the remaining 13 schools were visited and their teachers were assessed, covering all the schools in the city.

The data collection occurred between August 2016 and June 2017, performed in a specific room provided by each school, and scheduled at the time of collective pedagogical work activities (when teachers come together to plan their work activities in the institution). Teachers who were part of the public educational system of the city, who were not absent from work, and who signed the Informed Consent form agreeing to research procedures were considered eligible to participate in the study.

Physical activity engagement

The habitual practice of physical activity was assessed by the Baecke questionnaire, previously validated, with good reproducibility in the Brazilian population [12]. This instrument considers three different domains of physical activity (occupation, sports practice, and leisure time). The Baecke questionnaire contains a total of 16 questions with responses on a Likert frequency scale (never, rarely, sometimes, frequently, always), of which eight questions are about occupational activities (standing time, need to walk, lifting weights, and feeling tired after a working day), four questions are about sports practice (participation in sports or training, weekly frequency, duration, and length of time), and four questions are about leisure time activities, including active commuting (walking or cycling to school, work, or shopping). This instrument provides a dimensionless score for each assessed domain, where the sum of the three scores corresponds to the total physical activity. As this instrument does not have a specific cut-off point for physical activity level definition, each domain score was stratified into quartiles, being classified as high level (4th quartile), moderate level (3rd quartile), and low level of physical activity (1st and 2nd quartiles).

Barriers to physical activity

This variable was assessed by the adapted version of the Barriers to Physical Activity and Exercise Participation questionnaire [13], which presented good internal consistency and a good test-retest correlation (Cronbach alpha = 0.92 and $r = 0.74-0.95$, respectively) in adults from 45-65 years of age. To respond to the questionnaire, the participant is required to report the main barrier to physical activity, according to the following options: 1) Laziness, tiredness, or discouragement; 2) Lack of company; 3) Lack of money; 4) Lack of time; 5) Lack of motivation; 6) Fear of getting hurt; 7) Pain, injury, or disability; 8) Climate conditions; 9) Lack of suitable location; 10) Lack of knowledge about the practice; 11) Lack of ability to practice; 12) Shame of the body; 13) Need to rest; 14) Not being able to go to the place of practice; 15) Lack of fun during practice; 16) Lack of family support; 17) Other barrier (please specify); and 18) No barrier.

Socioeconomic condition

The Brazilian criteria for economic classification [14] was adopted to assess the socioeconomic condition of the sample. This instrument considers the educational level, as well as the presence and quantity of specific rooms and consumer goods at home, providing a score which classifies the individual into a socioeconomic class from highest to lowest (A1, A2, B1, B2, C1, C2, D, and E). The sample was stratified into high (A1, A2, B1), medium (B2, C1), and low (C2, D, E) socioeconomic classes.

Anthropometric measurements

Body mass was measured by a digital scale (WISO®), with a precision of 0.1kg and maximum capacity of 180 kg. Height was measured by a wall-mounted stadiometer (Sanny®), with a precision of 0.1cm and maximum capacity of 2.2 meters. These measurements were collected with participants barefoot, without carrying personal belongings, and wearing light clothes. Through the measurements of body mass and height, the body mass index was calculated by dividing body mass in kilograms by square of the height in meters ($BMI = kg/m^2$). The sample was further classified into underweight, normal weight, overweight, and obesity, according to criteria from the World Health Organization [15].

Work-related factors

Information was collected about the number of weekly hours worked and the length of time in the profession in years, through the following questions: "How many hours do you work per week in your profession?" and "How many years have you been working in this profession?". For statistical analysis, the weekly hours worked were classified into "20 hours or less", "21-30 hours", "31-40 hours", and "40 hours or more". The years in the profession were stratified into "10 years or less", "11-20 years", and "20 years or more". The teachers were also questioned about how many schools they work in (one school, two schools, three or more schools) and how exhausting they consider their work (very little, little, normal, high, very high).

Statistical analysis

Descriptive characteristics of the sample are presented as mean and standard deviation for continuous variables and frequency for categorical variables. Analysis of variance was adopted to compare the scores of physical activity according to each reported barrier, with the Bonferroni *post-hoc* used to identify differences between physical activity domains. Logistic binary regression models were used to analyze the magnitude of association between barriers for physical activity and categories of independent variables, being adjusted for sex, age, and socioeconomic condition. The analyses were performed using IBM® SPSS Statistics version 24.0, with a significance level of $p < 0.05$ and 95% confidence interval.

Results

The sample was composed of 246 public school teachers, with an average age of 45.2 ± 10.4 years, and 76% women. Participants presented mean values of 27.4 ± 5.4 for body mass index, 37.5 ± 12.2 weekly hours worked, 17.4 ± 8.6 years in the profession, 3.0 ± 0.6 occupational physical activity score, 2.5 ± 1.4 sports practice score, 2.2 ± 0.6 leisure time physical activity score, and 7.6 ± 1.8 total physical activity score. Regarding how many schools the teachers reported working in, 57% of the sample worked in a single school, 26% worked in two schools, 15% worked in three or more schools, and 2% did not respond. When asked about how exhausting they consider their work, 7% considered it very little/little, 40% considered it as normal, 52% considered it as high/very high, and 1% did not respond. The descriptive characteristics of the sample are presented in Table I.

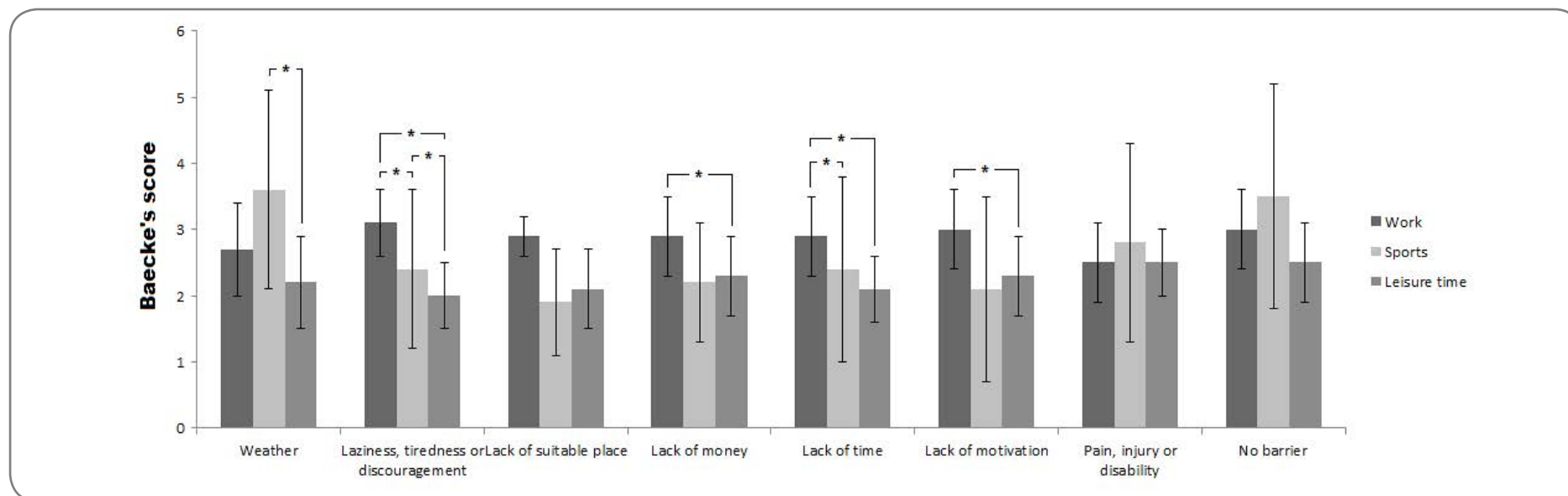
The comparisons of physical activity scores according to each reported barrier are presented in Figure 1. Significant differences in physical activity scores were observed among participants who reported the barriers of climate conditions, laziness/tiredness/discouragement, lack of money, lack of time, and lack of motivation.

Table II presents the association of barriers to physical activity with nutritional status, weekly hours worked, and physical activity levels in different domains. Obese teachers were more likely to report laziness/tiredness/discouragement as the main barrier for physical activity and 93% less likely to report no barrier when compared with teachers who were normal weight. Considering weekly hours worked, when compared with teachers who worked for 20 hours or less, teachers who worked 31-40 hours were 84% less likely to report climate conditions as the main barrier for physical activity, whereas teachers who worked 21-30 hours were four times more likely to report laziness/tiredness/discouragement. No association was observed between barriers for physical activity with variables of sex, age, and socioeconomic condition. In relation to physical activity level, teachers with a moderate level of sports practice and low level of leisure time physical activity were more likely to report laziness/tiredness/discouragement as the main barrier for physical activity, when compared with teachers with high physical activity levels in respective domains. Finally, tea-

chers with a low level of total physical activity were less likely to report no barrier, even after adjustment for sex, age, and socioeconomic condition.

Table I - Descriptive characteristics of the sample (n = 246)

Variable	n (%)
Sex	
Men	59 (24.0)
Women	187 (76.0)
Socioeconomic condition	
High	90 (36.6)
Medium	148 (60.2)
Low	8 (3.2)
Nutritional status	
Underweight	8 (3.2)
Normal weight	90 (36.6)
Overweight	73 (29.8)
Obesity	74 (30.4)
Weekly hours worked	
20 hours or less	27 (11.3)
21-30 hours	25 (10.5)
31-40 hours	139 (58.2)
40 hours or more	48 (20.1)
Years of profession	
10 years or less	60 (25.0)
11-20 years	95 (39.6)
20 years or more	85 (35.4)
Barriers for physical activity	
Climate conditions	9 (3.7)
Laziness, tiredness or discouragement	86 (35.0)
Lack of suitable location	5 (2.0)
Lack of money	14 (5.7)
Lack of time	89 (36.2)
Lack of motivation	12 (4.9)
Pain, injury or disability	10 (4.1)
No barrier	21 (8.5)



*Statistical significance at $p < 0.05$ level

Figure 1 - Comparison of physical activity scores in different domains according to each reported barrier to physical activity in public school teachers ($n = 246$)

Table II - Association of barriers to physical activity with nutritional status, weekly worked hours, and physical activity level in public school teachers ($n = 246$)

	Climate conditions	Laziness, tiredness or discouragement	Lack of money	Lack of time	Lack of motivation	Pain, injury or disability	No barrier
	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)
Nutritional status							
Underweight	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Normal weight	0.89 (0.06; 2.19)	1.40 (0.28; 6.90)	1.04 (0.67; 2.45)	1.22 (0.25; 5.86)	1.15 (0.35; 4.92)	2.50 (0.89; 4.21)	0.58 (0.23; 1.79)
Overweight	2.60 (0.45; 15.22)	0.76 (0.37; 1.57)	0.51 (0.12; 2.05)	1.04 (0.54; 2.00)	2.51 (0.58; 10.96)	1.33 (0.08; 22.56)	0.76 (0.27; 2.21)
Obesity	1.21 (0.16; 9.02)	2.34 (1.20; 4.56)*	0.92 (0.03; 3.57)	0.72 (0.37; 1.40)	0.84 (0.13; 5.52)	4.47 (0.46; 6.26)	0.07 (0.01; 0.59)*
Years of profession							
10 years or less	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
11-20 years	1.15 (0.03; 2.78)	1.38 (0.61; 3.15)	1.07 (0.18; 6.19)	0.94 (0.42; 2.10)	0.53 (0.10; 2.76)	2.23 (0.02; 6.32)	2.07 (0.21; 10.29)
20 years or more	1.60 (0.14; 7.34)	0.96 (0.37; 2.72)	1.54 (0.16; 14.95)	1.32 (0.49; 3.57)	0.12 (0.01; 1.95)	2.51 (0.13; 8.39)	2.85 (0.26; 11.17)

Table II - Continuation

	Climate conditions	Laziness, tiredness or discouragement	Lack of money	Lack of time	Lack of motivation	Pain, injury or disability	No barrier
	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)	OR (IC 95%)
Weekly hours worked							
20 hours or less	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
21-30 hours	0.98 (0.56; 1.45)	4.12 (1.23; 13.85)*	0.28 (0.03; 3.02)	0.75 (0.22; 2.54)	3.01 (0.28; 13.52)	0.65 (0.09; 1.78)	0.98 (0.45; 2.91)
31-40 hours	0.16 (0.03; 0.85)*	1.65 (0.63; 4.32)	0.26 (0.05; 1.28)	1.29 (0.52; 3.24)	0.72 (0.12; 4.19)	3.16 (0.30; 8.57)	1.13 (0.23; 3.50)
40 hours or more	0.14 (0.01; 1.47)	1.36 (0.46; 4.04)	0.63 (0.11; 3.51)	1.92 (0.68; 5.37)	0.27 (0.02; 3.44)	3.87 (0.23; 11.02)	1.07 (0.21; 4.78)
Occupational PA							
High (Q4)	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Moderate (Q3)	0.53 (0.03; 8.75)	1.10 (0.52; 2.34)	1.14 (0.20; 6.62)	0.86 (0.40; 1.82)	1.94 (0.21; 17.99)	1.04 (0.95; 1.14)	0.86 (0.22; 3.36)
Low (Q1-Q2)	2.28 (0.26; 20.31)	0.74 (0.35; 1.57)	1.27 (0.23; 7.01)	0.83 (0.40; 1.73)	1.87 (0.20; 17.43)	1.82 (0.19; 17.22)	0.72 (0.19; 2.69)
Sports practice							
High (Q4)	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Moderate (Q3)	0.34 (0.06; 1.95)	2.29 (1.10; 4.76)*	2.22 (0.22; 22.11)	0.98 (0.48; 1.99)	0.73 (0.10; 5.64)	0.22 (0.02; 2.28)	0.34 (0.11; 1.07)
Low (Q1-Q2)	0.27 (0.05; 1.58)	1.21 (0.58; 2.50)	4.28 (0.51; 35.98)	1.38 (0.70; 2.71)	2.27 (0.43; 11.95)	0.39 (0.06; 2.53)	0.20 (0.06; 0.70)*
Leisure time PA							
High (Q4)	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Moderate (Q3)	0.15 (0.01; 1.50)	1.32 (0.60; 2.91)	1.23 (0.23; 6.54)	2.02 (0.95; 4.30)	0.92 (0.20; 4.19)	0.69 (0.10; 4.96)	0.48 (0.17; 1.39)
Low (Q1-Q2)	0.68 (0.14; 3.42)	2.53 (1.13; 5.70)*	0.78 (0.12; 5.03)	1.42 (0.64; 3.14)	0.82 (0.15; 4.49)	0.17 (0.01; 2.11)	0.09 (0.02; 0.46)*
Total PA							
High (Q4)	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Moderate (Q3)	0.31 (0.03; 3.10)	2.03 (0.93; 4.41)	0.45 (0.04; 5.13)	0.64 (0.29; 1.39)	1.38 (0.21; 9.09)	2.76 (0.27; 28.45)	0.52 (0.16; 1.75)
Low (Q1-Q2)	0.57 (0.12; 2.72)	1.42 (0.70; 2.86)	2.08 (0.42; 10.29)	1.12 (0.59; 2.14)	1.87 (0.35; 10.12)	0.77 (0.07; 8.92)	0.20 (0.06; 0.66)*

PA= Physical activity; OR = Odds ratio; CI = Confidence interval. Q4 = 4th quartile of Baecke score; Q3 = 3rd quartile of Baecke score; Q1-Q2 = 1st and 2nd quartiles of Baecke score; *Statistical significance at $p < 0.05$ level in the analysis adjusted by sex, age, and socioeconomic condition.

Discussion

The present study observed that public school teachers reported a lack of time (36.2%) and laziness/tiredness/discouragement (35.0%) as the main barriers to physical activity. The presence of barriers to physical activity was associated with important outcomes in the present study, such as a higher chance of being obese, greater weekly hours worked, and lower levels of habitual physical activity. No association was observed between barriers to physical activity and sociodemographic factors.

These findings corroborate in part with recent literature reviews, which reported a lack of time and lack of motivation as the most frequent barriers in the general adult population. [16,17] Mailey *et al.* [5] observed that the work journey corresponds to one of the main reasons associated with insufficient physical activity levels. Although sociodemographic factors were not associated with barriers to physical activity in the present study, these variables were considered as potential confounding factors and used as adjustments in the analysis.

Previous findings reported that psychological and environmental barriers to physical activity have been reported more than physical barriers [18]. The results of the present study corroborate with this evidence, since laziness/tiredness/discouragement was one of the most widely reported barriers and was significantly associated with independent variables. One possible hypothesis is that teachers have work conditions which go beyond physical effort, such as a noisy work environment, which can trigger mental fatigue and vocal impairment [19], excessive exposure to chalk dust that can cause inflammation of the respiratory system [20], longer working hours that can result in increased stress levels [21], in addition to episodes of moral harassment and professional pressure that can cause physical and psychological problems and directly affect their life habits [22].

The present study observed that obese teachers were more likely to report laziness/tiredness/discouragement as the main barrier to physical activity. High levels of body mass index have been associated with physical inactivity among workers [23]. Individuals with overweight/obesity tend to have lower physical activity levels and lower physical fitness, which may result in lower energy expenditure during the day and lead to a positive caloric imbalance, contributing even more to weight gain.

Teachers who reported climate conditions as the main barrier for physical activity were more likely to have greater weekly hours worked in the present study. The city of Presidente Prudente is located in an intertropical region of Brazil, which presents high temperatures during a great part of the year and this excessive heat may compromise adherence to the outdoor practice of physical activity, as well as the adoption of active commuting in daily life [24]. In addition, almost half of the teachers from the present study reported working in at least two different schools, which can limit the adoption of active commuting due to heat, distance between the workplaces, and lower time availability.

The occupational physical activity level showed no association with barriers to physical activity in the present study. The occupational physical activity domain presented the highest scores when compared to the other domains in the present study and may be related to the excessive weekly hours worked by the teachers. The teachers working 31-40 hours per week were four times more likely to report laziness/tiredness/discouragement as the main barrier to physical activity when compared to teachers working 20 hours or less. In this sense, an excess of work activities has been associated with the onset of musculoskeletal disorders in different body regions [25] and can limit physical activity engagement in the other domains, such as leisure time, sports practice, and commuting.

Teachers with lower levels of physical activity in leisure time, sports practice, and in total were associated with greater chances of reporting a barrier to physical activity when compared to teachers with higher levels of physical activity in these domains in the present study. A possible hypothesis is the occurrence of a reverse causality in this association, where being less active could be related with a lower release of hormones responsible for satiety and well-being, such as endorphins [26] and serotonin [27], which may contribute to sedentary individuals not showing pleasure or motivation about the possibility of exercising.

The present study has important limitations that should be highlighted. The assessment of physical activity using a questionnaire may be susceptible to bias of memory and classification of intensity. In addition, the Baecke questionnaire for habitual physical activity does not allow determination of the prevalence of teachers who meet global recommendations of 150 minutes of moderate-to-vigorous physical activity per week [28], or the possible association with study variables. Another important factor is that participants were requested to report only the main barrier to physical activity, which compromised inferences about a secondary role of other less frequent barriers, and the clustering of barriers. The present study also did not consider the presence of chronic diseases or other health problems in the sample, which could be related with low adherence to physical activity, since workers who reported having at least one chronic disease were less likely to meet global recommendations of physical activity [29].

On the other hand, as strengths, the present study managed to cover all the public schools of the city which agreed to participate, and assessed all the teachers from these institutions, which minimized sample selection bias. Furthermore, the statistical analysis was adjusted for potential confounding factors (sex, age, and socioeconomic condition), and analysis of work-related factors added important information about the association of barriers to physical activity in teachers.

Conclusion

Lack of time and laziness/tiredness/discouragement were the most commonly reported barriers to physical activity by public school teachers. However, only laziness/tiredness/discouragement was associated with obesity, greater weekly hours

worked, and lower levels of habitual physical activity. Strategies aiming to improve physical activity levels among public school teachers need to focus mainly on motivational factors, taking into consideration the nutritional status and the weekly hours worked by this population.

Potential conflict of interest

No conflicts of interests have been reported for this article.

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Authors' contributions

Conception of the research: Tebar WR, Gil FCS, Christofaro DGD; **Data collection:** Gil FCS, Delfino LD, Souza JM; **Analysis and data interpretation:** Tebar WR; Gil FCS; Christofaro DGD; **Statistical analysis:** Tebar WR; Christofaro DGD; **Writing of the manuscript:** Tebar WR, Gil FCS, Christofaro DGD; **Critical review:** Fernandes RA, Silva DAS; Mota J.

References

1. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012;380(9838):219-29. doi: 10.1016/S0140-6736(12)61031-9
2. Owen N. Strategic initiatives to promote participation in physical activity. *Health Promot Int*. 1996;11(3):213-8. doi: 10.1093/heapro/11.3.213
3. Herazo-Beltrán Y, Pinillos Y, Vidarte J, Crissien E, Suarez D, García R. Predictors of perceived barriers to physical activity in the general adult population: a cross-sectional study. *Braz J Phys Ther* 2017;21(1):44-50. doi: 10.1016/j.bjpt.2016.04.003
4. Garcez AS, Canuto R, Paniz VMV. Association between work shift and the practice of physical activity among workers of a poultry processing plant in southern Brazil. *Nutr Hosp* 2015;31(5):2174-81. doi: 10.3305/nh.2015.31.5.8628
5. Mailey EL, Huberty J, Dinkel D, McAuley E. Physical activity barriers and facilitators among working mothers and fathers. *BMC Public Health* 2014;14:657. doi: 10.1186/1471-2458-14-657
6. Scheuch K, Haufe E, Seibt R. Teachers' Health. *Dtsch Arztebl Int* 2015;112(20):347-56. doi: 10.3238/arztebl.2015.0347
7. Brito WF, Santos CL, Marcolongo AA, Campos MD, Bocalini DS, Antonio EL, et al. Physical activity levels in public school teachers. *Rev Saude Publica* 2012;46(1):104-9. doi: 10.1590/S0034-89102012000100013
8. Rosales-Ricardo Y, Orozco D, Yaulema L, Parreño A, Caiza V, Barragán V, et al. Physical activity and health in teachers. A review. *Apunts Med Esport* 2017;52(196):159-166. <https://www.apunts.org/en-pdf-X1886658117620868>
9. Committee on Physical Activity and Physical Education in the School Environment; Food and Nutrition Board; Institute of Medicine; Kohl HW III, Cook HD, editors. *Educating the Student Body: Taking Physical Activity and Physical Education to School* [Internet]. Washington (DC): National Academies Press (US); 2013. 6, Approaches to Physical Activity in Schools. [cited 2022 Apr 7]. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK201495/>
10. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol* 2008;61(4):344-9. doi: 10.1016/j.jclinepi.2007.11.008
11. Agranonik M, Hirakata VN. Sample size calculation: proportions. *Rev HCPA* [Internet] 2011[cited 2022 Apr 4];31:382-8. Available from: [https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/#:~:text=n%20%3D%20N*X%20%2F%20\(N%20is%20the%20population%20size](https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/#:~:text=n%20%3D%20N*X%20%2F%20(N%20is%20the%20population%20size)
12. Florindo AA, Latorre MRD, Jaime PC, Tanaka T, Zerbini CAF. Methodology to evaluation the habi-

tual physical activity in men aged 50 years or more. *Rev Saude Publica* 2004;38(2):307-14. doi: 10.1590/S0034-89102004000200022

13. Justine M, Azizan A, Hassan V, Salleh Z, Manaf H. Barriers to participation in physical activity and exercise among middle-aged and elderly individuals. *Singapore Med J* 2013;54(10):581-6. doi: 10.11622/smedj.2013203

14. Instituto Brasileiro de Opinião Pública e Estatística. Levantamento sócio econômico-2009-IBOPE [Internet]. Rio de Janeiro. [cited 2022 Apr 7]. Available at: www.abep.org/novo/CMS/Utils/FileGenerate.ashx?id=46.

15. World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. *World Health Organ Tech Rep Ser* [Internet]. 1995 [cited 2022 Apr 7];854:1-452. Available from: <https://pubmed.ncbi.nlm.nih.gov/8594834/>

16. Rech CR, Camargo EM, Araujo PAB, Loch MR, Reis RS. Perceived barriers to leisure-time physical activity in the Brazilian population. *Rev Bras Med Esporte* 2018;24(4):303-9. doi: 10.1590/1517-869220182404175052

17. Kelly S, Martin S, Kuhn I, Cowan A, Brayne C, Lafortune L. Barriers and facilitators to the uptake and maintenance of healthy behaviours by people at mid-life: a rapid systematic review. *PLoS One* 2016;11(1):e0145074. doi: 10.1371/journal.pone.0145074

18. Planchard JH, Corrion K, Lehmann L, d'Arripe-Longueville F. Worksite Physical activity barriers and facilitators: a qualitative study based on the transtheoretical model of change. *Front Public Health* 2018;6:326. doi: 10.3389/fpubh.2018.00326

19. Kristiansen J, Lund SP, Persson R, Shibuya H, Nielsen PM, Scholz M. A study of classroom acoustics and school teachers' noise exposure, voice load and speaking time during teaching, and the effects on vocal and mental fatigue development. *Int Arch Occup Environ Health*. 2014;87(8):851-60. doi: 10.1007/s00420-014-0927-8

20. Zhang Y, Yang Z, Chen Y, Li R, Geng H, Dong W, et al. Fine chalk dust induces inflammatory response via p38 and ERK MAPK pathway in rat lung. *Environ Sci Pollut Res Int* 2018;25(2):1742-51. doi: 10.1007/s11356-017-0558-1

21. Lee K, Suh C, Kim JE, Park JO. The impact of long working hours on psychosocial stress response among white-collar workers. *Ind Health* 2016;55(1):46-53. doi: 10.2486/indhealth.2015-0173

22. Campos IC, Serafim AC, Custódio KV, Silva L, Cruz RM. Moral harassment of public schools teachers. *Work* 2012;41(Suppl 1):2001-7. doi: 10.3233/WOR-2012-0422-2001

23. Samir N, Mahmud S, Khuwaja AK. Prevalence of physical inactivity and barriers to physical activity among obese attendants at a community health-care center in Karachi, Pakistan. *BMC Res Notes* 2011;4:174. doi: 10.1186/1756-0500-4-174

24. Al-Mohannadi AS, Farooq A, Burnett A, Van Der Walt M, Al-Kuwari MG. Impact of climatic conditions on physical activity: a 2-year cohort study in the Arabian Gulf region. *J Phys Act Health* 2016;13(9):929-37. doi: 10.1123/jpah.2015-0593

25. Andersen LL, Clausen T, Persson R, Holtermann A. Perceived physical exertion during healthcare work and risk of chronic pain in different body regions: prospective cohort study. *Int Arch Occup Environ Health* 2013;86(6):681-7. doi: 10.1007/s00420-012-0808-y

26. Rokade PB. Release of endomorphin hormone and its effects on our body and moods: A Review International Conference on Chemical, Biological and Environment Sciences (ICCEBS) Bangkok. 2011 [Internet]. [cited 2022 Apr 7]. Available from: <https://www.semanticscholar.org/paper/Release-of-Endomorphin-Hormone-and-Its-Effects-on-A-Rokade/d9d6a77f113bb866ea1588edf646a60e25ca1755>

27. Melancon MO, Lorrain D, Dionne IJ. Changes in markers of brain serotonin activity in response to chronic exercise in senior men. *Appl Physiol Nutr Metab*. 2014;39(11):1250-6. doi: 10.1139/apnm-2014-0092

28. WHO. World Health Organization. Global Recommendations on Physical Activity for Health. Geneva: WHO; 2010.

29. Loeff B, Hollander EL, Boot CR, Proper KI. Physical activity of workers with and without chronic diseases. *Prev Med Rep* 2015;3:30-5. doi: 10.1016/j.pmedr.2015.11.008

