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Physical violence against schoolteachers: an analysis using structural equation models

Violência física contra professores no espaço escolar: análise por modelos de equações estruturais

Violencia física contra profesores en el ámbito escolar: análisis mediante modelos de ecuaciones estructurales

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Abstract

This study aimed to identify associations between sociodemographic, workplace, and school environmental factors and the occurrence of physical violence against teachers at school. This was a cross-sectional study of teachers that had been working for at least a year in elementary or middle schools in the state school system in Londrina, Paraná State, Brazil. A convenience sample was taken of the 20 schools with the most teachers in the city of Londrina. Data were obtained through interviews and self-completed questionnaires in 2012 and 2013. Physical violence was defined as reports of attempted or actual physical aggression using cold steel weapons or firearms in the 12 months prior to the study. Structural equation models were used for the data analysis. Of the 937 teachers eligible for the study, 789 (84.2%) were interviewed. The physical violence victimization rate in schoolteachers was 8.4%. Work conditions (number of schools where the teachers worked and type of employment contract) showed a direct effect on physical violence (p = 0.032), as did having experienced previous situations of violence in the school (p = 0.059). Age (up to 40 years) was indirectly related to physical violence, correlating with worse work conditions. The results highlight the importance of improving teachers' work conditions and implementing measures to prevent violence both in schools and in society as a whole.

Workplace; Faculty; Working Conditions

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Introduction

Physical violence is defined as the use of force or power with the objective of injuring, causing pain or incapacity, and even potentially leading to death [1]. Although it is not the most common form of violence, physical violence is the most frequently identified kind due to the lesions it causes and their consequences [2]. In Brazil, a total of 59,681 deaths from physical violence were reported in 2014, of which 42,755 involved the use of firearms and 12,102 involved cold steel weapons [3].

Violence in school is a major social problem, specifically when perpetrated against teachers. This type of violence is not detected by traditional information systems, which makes it difficult to monitor its occurrence. Thus, studies are needed to identify the prevalence, characteristics, and factors involved in violence in schools. An American survey, the APA Task Force on Violence Directed Against Teachers, investigated the experience of violence against 2,000 teachers working at various levels of teaching. The results showed that 80% of the teachers reported having experienced at least one episode of violence in the previous year, 94% of which perpetrated by students. Nearly half of the teachers (44%) reported having suffered physical aggression [4].

In studies with teachers, sociodemographic characteristics such as gender, conjugal status, and educational level were factors associated with the occurrence of physical violence [5,6,7]. Still, characteristics related to work condition and the school itself are more closely related to the occurrence of violence, like the number of students per classroom, teaching level, type of school [7], size of the school, and perception of the school environment [8]. A study in Minnesota, USA, further showed that teachers who had witnessed physical violence between one and three times in the 30 days prior to the survey showed threefold higher odds of suffering the same form of violence themselves [9].

Despite this troubling situation, quantitative studies on school violence in Brazil are still scarce, and most focus on violence between students or against students [10,11,12,13]. A recently published systematic review identified only four articles with quantitative data that investigated violence against teachers in Brazilian schools [14]. The main forms of violence against teachers in these studies were: aggression [15,16,17], threats, insults [15,18], racist attacks [15], and feelings of insecurity in the school environment [18], showing the limited range of the literature on physical violence against teachers.

Studies on physical violence against teachers generally analyze for direct relations between independent variables and the outcome, such as linear regression [5], logistic regression [6], and Poisson regression [7]. However, considering violence as a complex phenomenon, analyses are needed that also examine indirect effects or mediation, such as with structural equation models [19].

Considering the theme's relevance and using structural equation modeling, the current study aimed to identify associations between sociodemographic, workplace, and school environmental factors and physical violence against teachers.

Methods

This was a cross-sectional epidemiological study in Londrina, Paraná State, Brazil, from August 2012 to June 2013, as part of a larger study: *Pro-Teacher: Health, Lifestyle, and Work of Teachers in the State School System in Londrina*. The invitation to participate was addressed to all teachers from the 20 schools with the most teachers in Londrina's city limits (out of 63) in the state elementary and middle school system. The schools were selected by convenience, due to accessibility, distributed across all areas of the city, and including approximately 70% of the elementary teachers. The current study only considered teachers that had taught for at least a year.

Data were collected by previously trained interviewers at the teacher's school, scheduled when they were not involved in classroom activities. The data collection instrument was tested in a pilot study with 82 teachers from three state schools in a smaller city in Greater Metropolitan Londrina. After adjustments, the definitive instruments consisted of a form for annotation of the answers to the interviews (taking approximately 40 minutes) and a questionnaire completed by the teachers themselves after the interview (taking approximately 15 minutes), with questions that were essentially self-reported, for example race/color, and scales validated only for self-completion, not used in the current study. The data were double-keyed in a databank created in Epi Info (Centers for Disease

Control and Prevention, Atlanta, USA), version 3.5.4 for Windows, and after checking and correcting for discrepancies, the consolidated databank was analyzed.

Losses were defined as teachers that were on leave at the time of the data collection (21 days in each school) and did not return to work within 30 days after the end of the data collection, those whom it was not possible to contact after five attempts, and those who refused to participate in the study.

Physical violence in school (in the 12 months prior to the study and in the school's space) was the study outcome, defined as an affirmative answer to one of the three following questions: "Have you suffered physical aggression or attempts at physical aggression?"; "Have you suffered physical aggression or attempts at physical aggression with cold steel weapons (knives, pocket knives, scissors, etc.)?"; and "Have you suffered physical aggression or attempts at physical aggression with firearms?".

The independent variables refer to sociodemographic characteristics (gender, age, and self-reported race/color), work (type of employment contract and number of workplaces), and school environment (quality of teacher-student relationship, having been threatened, or having witnessed physical violence in the school in the 12 months prior to the study). Gender and self-reported race/color were recorded by the teacher on the questionnaire. The other variables were obtained during the interview.

The race/color variable was collected with the following options (according to the official Brazilian census categories): yellow, white, indigenous, brown, or black, and was then grouped as white or non-white. Information on age was collected as continuous and then categorized as 40 years or less and 41 years or more. The variable "number of workplaces" (number of different schools where the teachers were teaching) was categorized as one, two, and three or more, and "type of contract" as stable versus temporary employment contract. Information on the teacher-student relationship was collected with the following question: "How do you rate your relationship with students?". The options were excellent, good, fair, or bad. This variable was then dichotomized as excellent/good and fair/bad. Having witnessed physical violence against other teachers or students and having received threats in the school were categorized as yes or no.

Structural equation models were used to investigate associations between physical violence and teacher-student relationship, sociodemographic characteristics, work conditions, threats, and witnessing physical violence in the school. These models allow analyzing the theoretical complexity of the study variables through the definition of a linear equations system that represents hypothetical effects, established by the researcher, of the independent variables over the course of the target outcome's causal chain [20]. Two equations are used: the measurement equation, referring to the definition of the latent variables, and the structural equation, used to identify the effect of the latent and/or observed variables on the target outcome. In this context, two types of variables can be used: observable, i.e. directly measured, and latent, represented by measurement equations and only partially measured by linear combinations of the observed variables. For specification of the structural equation, the latent variables are further classified as exogenous (independent) or endogenous (dependent). Exogenous latent variables are independent variables whose causes are not added to the model. Meanwhile, the endogenous variable is the model's dependent variable, determined theoretically by relations specified by the researcher [21,22].

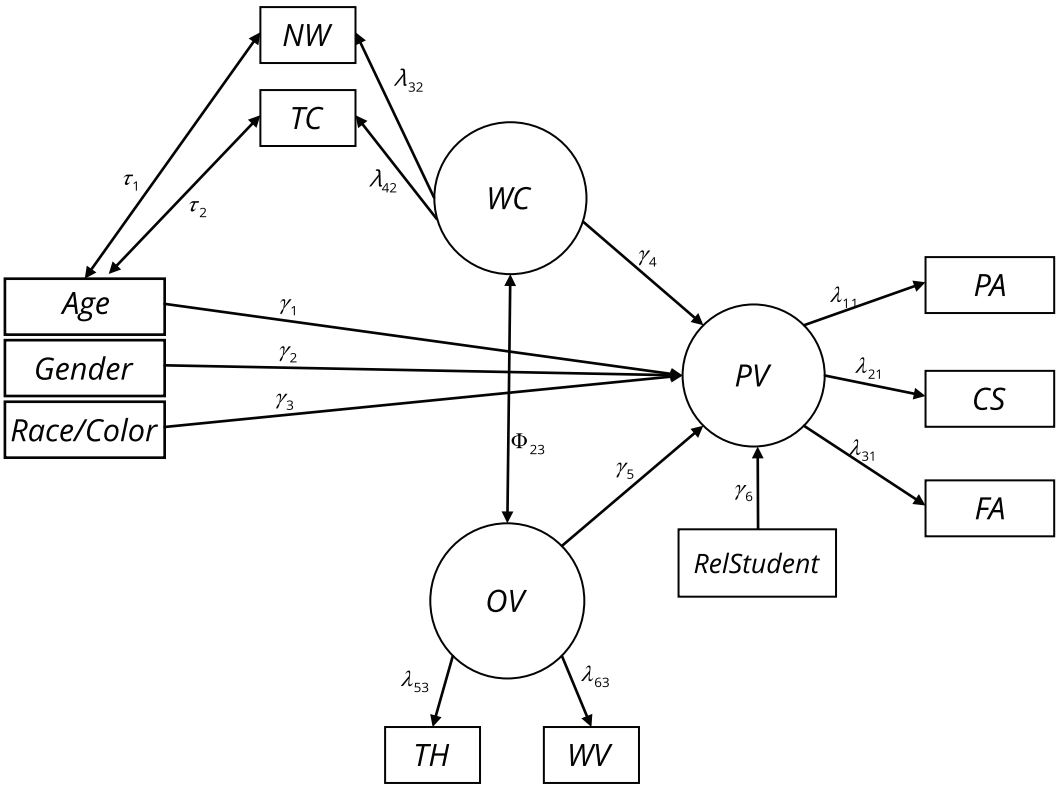
A path diagram was thus developed, based on previous studies on the theme, in which sociodemographic characteristics [5,6,7] and work conditions [7,8] showed a significant association with physical violence against schoolteachers, establishing possible relations between the observed and latent variables and this outcome.

The latent variable "physical violence" (PV) was constructed from three observed variables: violence or attempts at physical aggression (PA), aggression with cold steel weapons (CS), and aggression with firearms (FA). Work conditions (WC) resulted from two observed variables: number of workplaces (NW) and type of work contract (TC). Having witnessed physical violence against other teachers or students (WV) and having suffered threats (TH) were combined to form the latent variable "other situations of violence in the school" (OV).

The structural model considered the relations between exogenous latent variables (WC and OV) and the endogenous variable (PV), adjusted for teacher's gender, age, and race/color and perceived teacher-student relationship (RelStudent) (Figure 1). Modification indices were analyzed to identify relations not considered in the model's specification that might improve its fit.

Figure 1

Technical-conceptual model for the occurrence of physical violence.



λ: standardized factor loads; Φ: correlation between latent variables; τ: correlations between observed variables; γ effects of observed or latent variables on the endogenous variable PV; CS: aggression with cold steel weapons; FA: aggression with firearms; NW: number of workplaces; OV: other forms of violence; PA: physical aggression; PV: physical violence; RelStudent: bad/fair teacher-student relationship; TC: type of contract; TH: threats; WV: witnessed physical violence; WC: work conditions.

Missing data and outliers were verified. Only the variable "having witnessed physical violence in school" showed missing data. To adjust the structural equation model, we used weighted least squares mean and variance adjusted estimation (WLSMV), appropriate for modeling categorical observed variables. The model's goodness of fit was verified by the Tucker-Lewis index (TLI) (reference for good fit: TLI > 0.90), confirmatory fit index (CFI) (reference for good fit: > 0.90), root mean square error of approximation (RMSEA) (reference for good fit: < 0.05), and standardized root mean square residual (SRMR) (reference for good fit: < 0.08).

All the analyses were performed with the public domain R package, version 2.4.1 (The R Foundation for Statistical Computing, Vienna, Austria, http://www.r-project.org). The structural equation model was adjusted with the Lavaan statistical package.

The research project was approved by the Institutional Review Board of Universidade Estadual de Londrina (case review n. 01817412.9.0000.5231), and the interview was only conducted after explanation of the study's objectives and consent by the participant, who signed a free and informed consent form.

Results

Of the 937 teachers eligible for the study in the 20 selected schools, 65 (6.9%) were on leave and did not return within 30 days after the end of the data collection at their schools, 20 (2.1%) had not been found after five attempts, and 63 (6.7%) refused to participate, totaling 148 losses (15.8%). The final study sample thus consisted of 789 teachers (response rate = 84.2%).

Teachers' mean age was 40.7 years (standard deviation = 9.9 years; range 23-68). Nearly two-thirds were women (66.4%), and nearly three-fourths were white (74%). The majority had stable work contracts (64.1%) and nearly one-third worked in three or more schools (31.8%). A small proportion of the teachers rated their relations with students as fair or bad (10.3%). As for "other situations of violence in the school environment", 601 teachers (76.3%) reported having witnessed some episode of physical violence, while 169 (21.4%) reported having suffered threats (Table 1).

Sixty-two (7.9%) of the teachers reported having suffered aggression or attempts at physical aggression, of which six (0.8%) with cold steel weapons and four (0.5%) with firearms (Table 1). The frequency of reports of physical violence in the school, was 8.4%, since some teachers had suffered more than one type of violence.

As for measurement of the exogenous variables, except for the observed variable "number of workplaces" ($\lambda = 0.456$), the factor loads showed low values (less than 0.40), albeit statistically significant ($p < 0.05$). For the endogenous variable PV, the factor loads were also low, and not significant ($p = 0.198$) in the case of the observed variable "aggression with firearms".

Different regression equations were tested for the structural model, with analysis of modification indices. Goodness of fit was unsatisfactory for race/color and gender in the model, so these variables, which did not show statistical significance, were removed from the subsequent analyses. In addition, the covariances between teacher's age, type of contract, and number of workplaces were added to the model. The final model thus included the observed variables age and teacher-student relationship (RelStudent) and the latent variables work conditions and other situations of violence in the school.

There was a statistically significant association between "work conditions" and physical violence ($p = 0.032$), and although "other violence in the school" did not show a p-value < 0.05, it was the variable with the strongest effect on physical violence (Table 2). There were also positive correlations between the observed variables "age" and "number of workplaces", "age" and "type of contract", and between the latent variables "work conditions" and "other violence in the school". The model's goodness of fit indices, RMSEA, CFI, and SRMR, showed satisfactory values (Table 2).

Work conditions had a significant direct effect on the physical violence construct. Age showed an indirect association with physical violence, correlating (age ≤ 40 years) with worse work conditions (Figure 2).

Discussion

This study found that one out of twelve teachers reported having suffered physical violence in the school in the 12 months prior to the interview. Work conditions, such as temporary work contracts and number of different schools in which they taught were significantly associated with physical violence. Having witnessed or suffered other types of violence in school were also associated with physical violence, without reaching statistical significance due to the level set in the study ($p < 0.05$), but close to it ($p = 0.059$).

Some methodological issues should be addressed. The study is unique in Brazil in that it discusses physical violence against teachers, specifically using structural equation modeling. The analysis provided a better understanding of how the factors relate to each other and their direct and indirect influences on physical violence against teachers. Although it was a cross-sectional study and did not allow determining the temporal relationship between any two variables, we proposed a causal diagram considering that sociodemographic factors and work conditions precede physical violence in schools, according to the literature [5,6,7,8]. The observed variables showed low loads in the construction of the latent variables, probably due to the small numbers in reports of physical violence, threats, and worse work conditions, but the theoretical model showed high goodness of fit indices.

Table 1

Characteristics of teachers in the state school system in Londrina, Paraná State, Brazil.

Variables	n	%
Gender		
Female	524	66.4
Male	265	33.6
Age (years)		
≤ 40	387	49.0
≥ 41	402	51.0
Race/Color		
Yellow	33	4.2
White	584	74.0
Indigenous	4	0.5
Brown	121	15.3
Black	40	5.1
NA	7	0.9
Number of workplaces		
1	190	24.1
2	348	44.1
≥ 3	251	31.8
Type of contract		
Stable	506	64.1
Temporary	283	35.9
Teacher-student relationship		
Excellent	168	21.3
Good	540	68.4
Fair	77	9.8
Bad	4	0.5
Witnessed physical violence *		
Yes	601	76.3
No	187	23.7
Suffered threats		
Yes	169	21.4
No	620	78.6
Suffered physical violence		
Attempts or actual physical aggression	62	7.9
Attempts or actual aggression with cold steel weapons	6	0.8
Attempts or actual aggression with firearms	4	0.5

NA: not avaliable.

* n = 788 due to missing data in database.

The way information was obtained on violence against teachers, based on self-report, is subject to distortions resulting from recall bias, the interviewees' urge to report the experience of violence, and even their perception of violence. Despite the possibility of information bias, physical violence is considered a traumatic event, potentially unforgettable for the victims. Healthy worker bias may also have occurred due to loss of some teachers (15.8%), especially those on sick leave. These losses may have led to underestimation of the study's results, since adverse work conditions [23] and having experienced situations of violence [24] are important factors for teachers' sick leave. Another limitation involves the study's external validity, i.e., the impossibility of extrapolating the findings to other samples of teachers and other contexts, even though the profile of the teachers in Londrina is similar to that of other

Table 2

Estimated parameters for model of physical violence against teachers in the state school system in Londrina, Paraná State, Brazil.

	λ	SD	95%CI	p-value
Latent variables (measurement model)				
Physical violence				
PA	0.136	0.060	0.019; 0.253	0.022
CS	0.019	0.010	0.000; 0.038	0.046
FA	0.007	0.005	-0.004; 0.018	0.198
WC				
TC	0.244	0.048	0.150; 0.338	< 0.001
NW	0.456	0.089	0.281; 0.632	< 0.001
OV				
TH	0.217	0.039	0.141; 0.293	< 0.001
WV	0.136	0.026	0.085; 0.187	< 0.001
Regressions (structural model)				
Physical violence				
Age	0.185	0.170	-0.149; 0.519	0.277
Teacher-student relationship (RelStudent)	0.465	0.345	-0.211; 1.141	0.177
WC	0.246	0.115	0.021; 0.472	0.032
OV	0.567	0.300	-0.022; 1.155	0.059
Correlations			**95%CI**	**p-value**
Age ↔ NW (τ_1)	0.068		0.042; 0.094	< 0.001
Age ↔ TC (τ_2)	0.069		0.053; 0.086	< 0.001
WC ↔ OV (Φ_{23})	0.209		0.030; 0.389	0.02
Index				
RMSEA	0.029			
CFI	0.928			
TLI	0.882			
SRMR	0.041			

λ: standardized factor loads; Φ: correlation between latent variables; τ: correlations between observed variables; 95%CI: 95% confidence interval; CFI: comparative fit index; CS: aggression with cold steel weapons; FA: aggression with firearms; NW: number of workplaces; OV: other forms of violence; PA: physical aggression; RelStudent: bad/fair teacher-student relationship; RMSEA: root mean square error of approximation; SD: standard deviation; SRMR: standardized root mean square residual; TC: type of contract; TH: threats; TLI: Tucker-Lewis index; WV: witnessed physical violence; WC: work conditions.

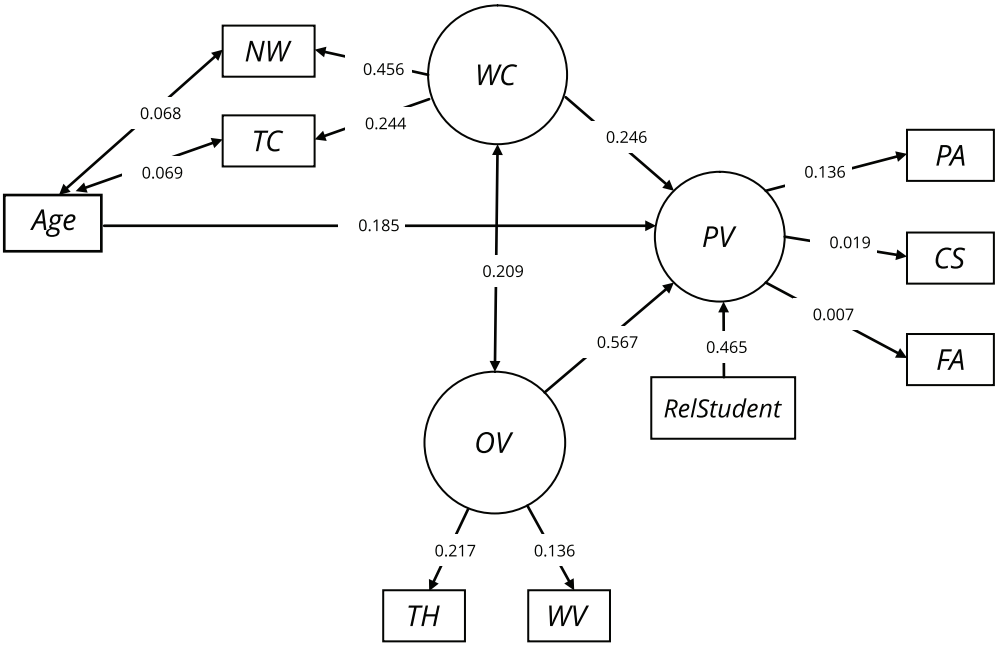
cities in Brazil [25,26]. Neither is school violence exclusive to that city [15,16,17]. We should also highlight the study's positive features, like the high response rate and the fact that the participating teachers represent approximately 70% of the elementary and middle school teacher population in Londrina.

Reports of physical aggression and use of weapons against teachers reveal the seriousness of this type of violence in school. The low frequency of the variables comprising the latent variable "physical violence", especially aggression involving cold steel weapons and firearms, may have affected the model, with insufficient power to demonstrate effects with statistical significance. However, even with lower frequencies than psychological violence [5], the use of weapons in schools is an extremely serious event that poses grave risks to people's physical and mental health. According to Malta et al. [27], the feeling of insecurity and fights with cold steel weapon and firearms reflect the violence pervading the school environment, expressed by the inequalities and iniquities in the distribution of resources and equipment in the country.

The same context includes reports of other types of violence in school. This finding is consistent with observations in a North American study that identified higher odds of suffering physical violence in teachers that had witnessed more episodes of violence, especially physical aggression [9]. Thus, the

Figure 2

Final structural equation model with direct and indirect effects on physical violence against teachers in the state school system in Londrina, Paraná State, Brazil.



CS: aggression with cold steel weapons; FA: aggression with firearms; NW: number of workplaces; OV: other forms of violence; PA: physical aggression; PV: physical violence; RelStudent: bad/fair teacher-student relationship; TC: type of contract; TH: threats; WV: witnessed physical violence; WC: work conditions.

association between having witnessed physical violence or having received threats and having actually suffered violence is a recurrent problem that appears simultaneously in different ways in schools, such that teachers feel unsafe and constantly vulnerable to violence. Violence in the workplace has major adverse consequences for physical [28,29] and psychological health [30], besides jeopardizing the school's ultimate objectives of educating, teaching, and learning [31].

Teachers' work conditions were directly associated with physical violence. Teachers on temporary contracts are often overworked, with a high classroom load, teaching in more schools and having less decision-making power on the schools where they are allocated to teach, when compared to teachers with job stability [32]. Such conditions, indicative of precarization of work, significantly expose teachers to physical violence. Thus, teachers on temporary contracts tend to be sent to schools located in more violence-prone neighborhoods.

Age had an indirect impact on physical violence, since it correlates with work conditions. This result is explained by the fact that temporary contracts are more common among younger teachers. According to a study from 2002 to 2013, Brazil's elementary school system underwent a major change in teachers' age profile. There was a large drop in the contingent of teachers 25 years and younger who started their teaching careers on stable contracts [33]. In other words, younger teachers are probably working proportionally more as temps and under less adequate work conditions. However, it is not possible to rule out that older and more experienced teachers also have greater capacity to deal with conflicts [34] and thus reduce the risk of physical violence.

Gender and race/color were not associated statistically with physical violence in this study. However, they are factors of human diversity that are frequently related to violent events that generate

suffering and negatively influence victims' health [35,36] and work [37]. Other factors that may expose teachers to higher risk of violence, such as sexual orientation, religion, or beliefs, were not examined in this study.

Violence is a complex phenomenon resulting largely from relations in society, communication, and conflicts of power, with its conceptual thrust determined by each individual's sociocultural conception and life experience [1,38]. The current article thus did not aim to exhaust the topic, but to understand that violence in schools should be viewed in light of the violence in society as a whole and around schools [39], resulting mainly from social exclusion and intrinsically related to other aspects not addressed here, such as cultural impositions, social inequalities, the drug traffic, and lack of future prospects, opportunities, and work [40,41]. In addition, the perpetration of violence and its victimization involve situations of tension, revolt, emotions, and feelings that should be addressed in greater depth in other types of studies, including those with qualitative approaches, for example.

In summary, the current study found that work conditions and other forms of violence in the school are factors that contribute to physical violence against teachers. The findings thus highlight the importance of improving teachers' work conditions and implementing measures to prevent violence both in schools and in society as a whole. In school, it is important to encourage measures to promote democratic relations, respect for diversity, and peaceful coexistence [42]. Such measures should be holistic, interdisciplinary, and permanent [42]. Public policies to reduce violence in the schools' surroundings and in society in general can have a direct effect on reducing such violence inside schools [27,39].

Contributors

F. N. Melanda, H. G. Santos and D. A. J. Salagioni collaborated in the study's planning and design and participated in the data analysis, writing of the preliminary versions, critical revision, and approval of the final version for publication. A. E. Mesas and A. D. González collaborated in the study's planning and design and participated in the data analysis, critical revision, and approval of the final version for publication. S. M. Andrade collaborated in the study's planning and design and participated in the data analysis, critical revision, and approval of the final version for publication.

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Resumo

Objetivou-se identificar associações de fatores sociodemográficos, do trabalho e do ambiente escolar com a ocorrência de violência física no espaço escolar contra professores. Trata-se de um estudo transversal com professores que atuavam há pelo menos um ano no Ensino Fundamental ou Médio da rede estadual de Londrina, Paraná, Brasil. Foram selecionadas, por conveniência, as 20 escolas com o maior número de professores do município. Os dados foram obtidos por meio de entrevistas e questionários autopreenchidos, nos anos de 2012 e 2013. Violência física foi definida como relatos de tentativas ou agressões físicas, com o uso de armas brancas ou de fogo, nos 12 meses anteriores à pesquisa. Modelos de equações estruturais foram utilizados para a análise dos dados. Dos 937 docentes elegíveis para a pesquisa, 789 (84,2%) foram entrevistados. A frequência de relatos de vitimização por violência física na escola foi de 8,4%. As condições de trabalho (número de locais e tipo de contrato de trabalho) apresentaram efeito direto sobre a violência física (p = 0,032), assim como ter vivenciado outras situações de violência na escola (p = 0,059). A idade (até 40 anos) apresentou relação indireta com a violência física, correlacionando-se com piores condições de trabalho. Com base nesses resultados, destaca-se a importância de melhora das condições de trabalho dos professores e de implantação de ações de prevenção à violência na escola e na sociedade.

Violência no Trabalho; Docentes; Condições de Trabalho

Resumen

El objetivo de este estudio fue identificar asociaciones entre factores sociodemográficos, laborales y de ambiente escolar con la ocurrencia de violencia física contra profesores en el ámbito escolar. Se trata de un estudio transversal, con profesores que ejercían desde hacía por lo menos un año en la enseñanza primaria o secundaria en la red estatal educativa de Londrina, Paraná, Brasil. Se seleccionaron, por su conveniencia, las 20 escuelas con mayor número de profesores del municipio. Los datos se obtuvieron mediante entrevistas y cuestionarios autocompletados, durante los años 2012 y 2013. La violencia física se definió como relatos de tentativas o agresiones físicas, con el uso de armas blancas o de fuego, durante los 12 meses anteriores a la investigación. Se utilizaron modelos de ecuaciones estructurales para los análisis de los datos. De los 937 docentes elegibles para la investigación, se les realizó la entrevista a 789 (84,2%). La frecuencia de relatos de victimización por violencia física en la escuela fue de 8,4%. Las condiciones de trabajo (número de locales y tipo de contrato de trabajo) presentaron un efecto directo sobre la violencia física (p = 0,032), así como haber vivido otras situaciones de violencia en la escuela (p = 0,059). La edad (hasta 40 años) presentó una relación indirecta con la violencia física, correlacionándose con peores condiciones de trabajo. En base a esos resultados, se destaca la importancia de una mejora en las condiciones de trabajo de los profesores y de la implantación de acciones de prevención frente a la violencia en la escuela y en la sociedad.

Violencia Laboral; Docentes; Condiciones de Trabajo

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