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Determinants of teachers' work ability in basic education in Brazil: Educatel Study, 2016

Determinantes de capacidade para o trabalho no cenário da Educação Básica do Brasil: Estudo Educatel, 2016

Determinantes de capacidad para el trabajo en el escenario de la educación infantil de Brasil: Estudio Educatel, 2016

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Abstract

The study aimed to analyze the relationship between health, work characteristics, education, and skills on the work ability of teachers in basic education in Brazil. This was a cross-sectional, population-based study using data from the Brazilian National Survey on Health, Work Conditions, and Absences in Schoolteachers in Basic Education *(Educatel Study). A probabilistic sample of 6,510 teachers answered a telephone interview in 2015 with questions on sociodemographic data, health status, education and skills, work characteristics, and absenteeism. Structural equation modeling (SEM) was used in multivariate analysis and standardized coefficients (SC) were calculated to analyze direct and indirect effects between the outcomes. Health status showed a direct effect on work ability (SC = -0.83, p < 0.01). Work characteristics directly affected health status (SC = 0.60, p < 0.01) and work ability (SC = -0.25, p < 0.05), especially noise at work and students' unruliness. Total effect (sum of direct and indirect effects) of work characteristics on work ability was -0.75 (p < 0.01). The study concluded that the relations between health status and work characteristics of Brazilian teachers in basic education are complex and negatively affect work ability. Potential actions to promote and maintain work ability should take into account the psychosocial demands of teaching and measures to maintain order and discipline in the classroom.*

Absenteeism; Job Satisfaction; Working Conditions; Work Capacity Evaluation; School Teachers

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Introduction

Work ability is defined as workers' perception of how they feel in performing their job as a function of the demands and their health status and physical and mental capacities [1]. Work ability is considered a measure of functional aging and predictive of early retirement, morbidity, and mortality in different occupational groups [2,3].

There is extensive literature on the determinants of work ability. Didactically, they can be grouped into three categories: factors related to the individual, to the work, and to life outside of work. Individual factors include age, psychosocial disorders, self-rated health, musculoskeletal disorders [4], and life habits such as physical activity [5]. Work-related predictors include environmental and ergonomic conditions and physical and psychosocial demands [2].

Although studies have been done in different occupational settings, questions on work ability in Brazil still lack greater attention [6]. There is a need for nationally representative and longitudinal design studies to accompany the variations in work ability, as well as to assess the results of interventions. Knowledge of these indicators is important for the development of measures and recommendations to optimize workers' jobs, improve work conditions and the work community, and allow better living and longer time at work [7].

Evidence suggests that functional aging in the teaching profession is cause for concern [8]. Changes incorporated by the school system, especially in basic education, require teachers' skills beyond the ability to teach. These professionals are also required to accompany each student's psychological and scholastic development and act as administrators in school planning [9,10].

In addition to the mental load, professional use of one's voice, age-related factors, care for one's voice, and allergies have been described in the literature as weighing on teachers, but they are neither sufficient nor necessary causes of voice disorders [11]. Teaching work has been described as one of the principal determinants of teachers' voice disorders. An environment with outdoor and indoor noise, inadequate classroom acoustics, too many students in the classroom, dust and chalk powder, almost always intensified by the duration of exposure or the work's organizational pace, are some of the noxious agents that contribute to teachers' illness [10,12,13].

Teachers depend on their voice to perform their work, and voice disorders tend to progressively distance them from teaching. However, studies disagree on the relationship between voice disorders and loss of work ability. Two studies of teachers in the São Paulo municipal school system indicate early functional aging in female schoolteachers with voice disorders and stress at work [14,15]. Meanwhile, no association was confirmed between voice disorders and work ability in a study of teachers in the state school system in Alagoas, Brazil [16].

Regardless of the target outcome, the available data are limited on the weight of work demands on work ability among schoolteachers in basic education. When current teaching and administrative demands are not accompanied by the necessary support, teachers run the risk of progressive work overload resulting in early functional aging [17].

The aim of this study was to test the direct and indirect effects of health status, work characteristics, education, and skills on the work ability of schoolteachers in basic education in Brazil.

Methods

This was a cross-sectional observational study with a quantitative approach to data from the *Brazilian National Survey on Health, Work Conditions, and Absences in Schoolteachers in Basic Education* (Educatel Study). Educatel was a nationwide telephone survey conducted in 2015 and 2016 with the aim of revealing the health status and work conditions of schoolteachers in basic education (preschool through 12th grade) in Brazil [18].

The sampling plan consisted of selection of classroom teachers in basic education in Brazil in 2015, on a national scale. The probabilistic sampling used stratification according to the following: major geographic region, census area (urban versus rural), age bracket, sex, school's administrative system (public versus private), type of employment, and teaching level [19].

Considering a total population of 2,229,269 schoolteachers according to the 2014 *School Census* of the Brazilian National Institute for Educational Studies and Research "Anísio Teixeira" (INEP) [20], an estimated 38% prevalence of absenteeism/illness [10], 95% confidence interval, maximum predicted error of 1.15% for the estimated prevalence of absenteeism for the entire population of schoolteachers in Brazil, and correction for finite populations, a minimum sample size of 6,500 teachers was estimated [19]. Subsequently, 13,243 teachers were selected, aiming to increase the margins for obtaining the minimum necessary number of interviews for the survey to succeed. The study excluded teachers that were no longer working at the school, those that did not respond to 15 attempts at contact (done on different days and at different times, including Saturdays and evenings), and those working in schools without a telephone or in which the telephone listed in the original data source was nonfunctional. By the end of the data collection, 119,378 phone calls had been made, allowing to conclude 6,510 interviews (85.2% success rate).

The study was approved by the Institutional Review Board of Federal University in Minas Gerais (UFMG) (CAAE: 48129115.0.0000.5149).

Work ability was operationalized as a latent variable (not observed), using four manifest variables (directly observed): absence from work in the last 12 months for any reason, a dichotomous variable categorized as 0 = no and 1 = yes; functional limitation, measured by the question on the occurrence of problems at work or for professional development because of voice problems in the previous four weeks, ranging from 0 = never or almost never to 4 = often; self-rated health, an ordinal variable with five possible answers ranging from 1 = very good to 5 = very bad, maintaining the ordinal characteristics of self-rated health, only combining the categories bad and very bad due to the low frequency; satisfaction with work, assessed by the dichotomous response as 0 = no and 1 = yes to the question on whether the teacher was satisfied with his or her job.

The latent variable health status was operationalized using four directly measured variables: use of anxiolytic or antidepressant medication in the last four weeks, a dichotomous variable categorized as 1 = no and 2 = yes; occupational disease diagnosed by a physician, dichotomous variable categorized as 1 = no and 2 = yes; sleep problems, measured by the question: "In recent weeks, how often have you lost sleep due to worries?". A four-point Likert scale varying from 1 = not at all to 4 = much more than usual were the possible answers; physical activity, assessed by yes or no to the question about whether the interviewee practiced some form of physical exercise or sport in the last three months.

Teachers' work characteristics were measured by seven manifest variables with the following questions: "Does your work demand too much of you?"; "Do you have enough time to perform all your tasks at work?"; "Do you have the possibility of learning new things at work?"; "How often is the noise at work so loud you have to raise your voice to talk with someone?"; "How often is your workplace agitated due to students' unruliness?". On all the questions, the options for answers varied from 1 = never or almost never to 4 = often, according to the worker's perception; verbal violence was measured by the question: "In the last 12 months of work, have you suffered verbal violence from students?". The options were 1 = never, 2 = once, or 3 = twice or more; social support at work is a dimension of the *Job Stress Scale* (JSS), an instrument based on the demand-control model, with the items (calm and pleasant work environment; relationship between coworkers; support and understanding from coworkers; relations with superiors; and appreciation by coworkers) that assess the support workers receive from management and coworkers [21]. This is a four-point Likert scale that varies from 4 = totally agree to 1 = totally disagree.

Education and skills were defined by five manifest variables: time at work in basic education and in the school, both of which were quantitative questions measured in years and months; teacher's educational level, a dichotomous variable where 1 = secondary school or less and 2 = university education under way or completed; graduate studies, assessed by the question of whether the teacher had concluded a specialization course, Master's, or PhD, where 1 = no and 2 = yes; complementary training, a dichotomous variable where 1 = no and 2 = yes, answering whether they had finished complementary teachers' training.

Age was measured in years as a continuous variable.

The analyses were performed with Amos 16.0 (https://www.ibm.com/) and SPSS, version 18.0 (https://www.ibm.com/). First, descriptive analyses were done to characterize the study sample.

Structural equation modeling (SEM) was performed to assess interrelations between determinants of work ability. Figure 1 shows this procedure's stages. The method consists of a multivariate statistical technique that allows simultaneously examining relations of dependence between variables, that is, allowing the dependent variable in one relationship to be the independent variable in another [22]. SEM combines factor analysis and regression techniques, taking measurement errors into account [22].

SEM has two parts: the measurement model and the structural model (Figure 1). While the former involves each latent variable's specification (validity and reliability) by the observed variables, the structural model allows analyzing explanatory relations between multiple variables simultaneously.

To construct the measurement model, we proposed four latent variables and one manifest variable (Figure 2) and used confirmatory factor analysis to estimate each latent variable's indicators. Standardized coefficients less than 0.3 were removed due to the low factor load [22].

The next step was to test each latent variable's goodness-of-fit and parsimony. Evidence of good fit included: comparative fit index (CFI) (> 0.90); Tucker-Lewis index (TLI) (> 0.9) for an acceptable fit and (> 0.95) as indicative of good fit; and root mean square error of approximation (RMSEA) with (≤ 0.05) as a good indicator of parsimony and (≤ 0.08) as an acceptable indicator [22]. Alternative models were analyzed to optimize the model's fit, and the correlation between pairs of latent variables was tested separately. Statistical significance considered alpha of 5%. The parameters were estimated using the maximum likelihood method. Choice of the estimation method was based on Olsson et al. [23]. The study compared three different estimation methods (maximum likelihood, generalized least squares, and weighted least squares) and concluded that the maximum likelihood method furnished the most realistic results with large sample sizes and models with significant differences in the coefficients and fit indices, even in the absence of normality in the estimates. Since most of the variables were ordinal and there were missing data, we adopted Bayesian estimation and Markov Chain Monte Carlo multiple imputation to complement the comparison of the estimated coefficients [24].

Next, we examined the structural relations between the latent variables. Standardized coefficients were used to interpret the paths specified in the structural model. Values greater than 0.30 indicate a moderate effect, and values greater than 0.50 suggest a strong effect. Such coefficients are interpreted in terms of standard deviations (SD). That is, they represent the effect on the dependent variable for each increase of one standard deviation in the independent variable [22].

Results

The majority of the 6,510 participants were women (63.2%), with mean age 40 years (SD = 10.6 years). The most frequent age bracket was 35 to 44 years (29.9%), and the majority were married or in stable unions (60.4%), self-declared white (42.6%), with university education completed or in progress (92.2%), and with children (66.7%). Monthly personal income ranged from one to three times the minimum wage (approximately USD 250-750). Table 1 shows the complete data.

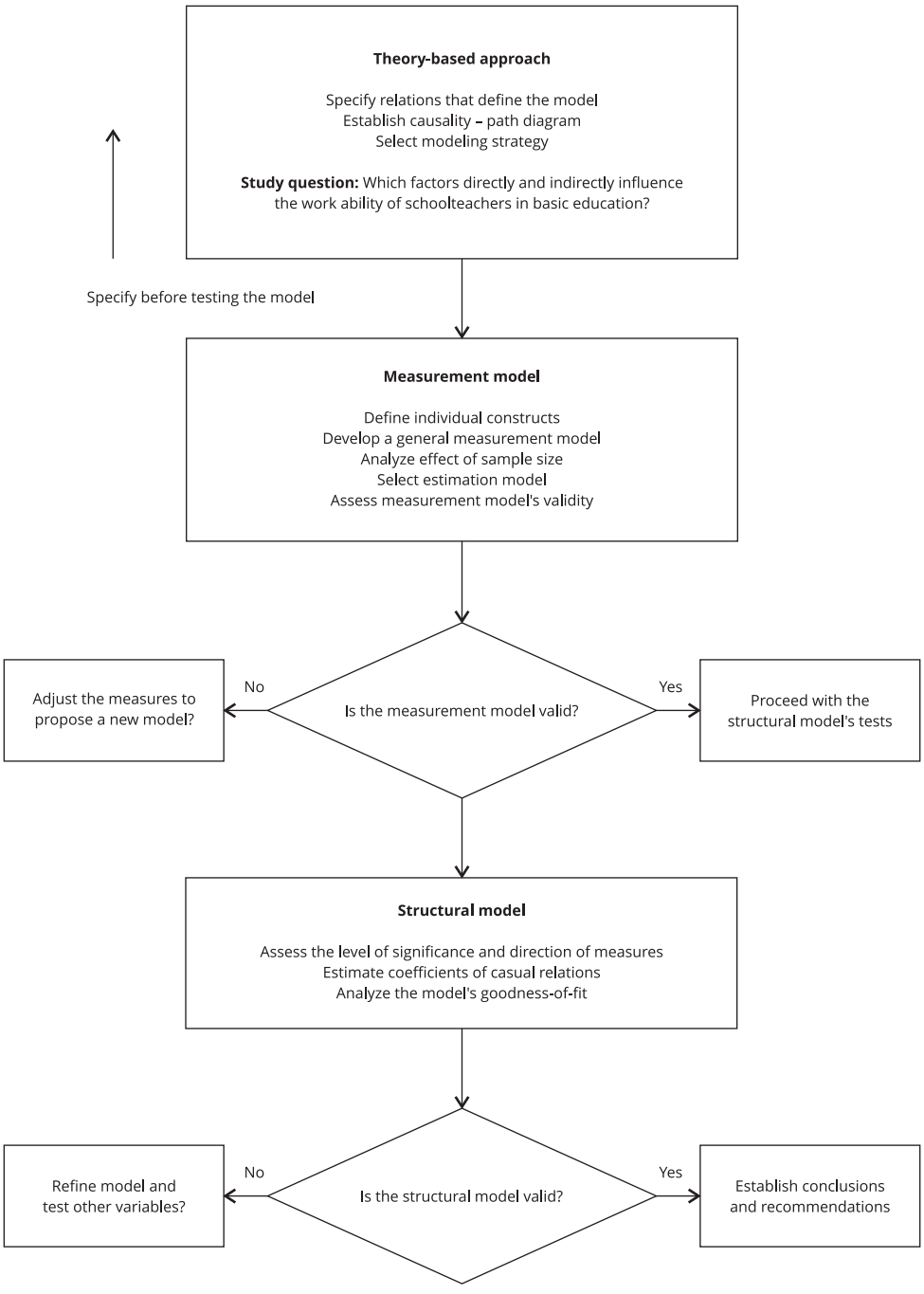
Table 2 shows the measurement model's goodness of fit indices for each latent variable. Confirmatory factor analysis indicated good fit for the work ability variable.

The model for health status as a latent variable showed a perfect fit (Table 2). However, the factor load for physical activity as practical variable was 0.12. A new model without the variable was tested. We opted to eliminate physical activity as a practical variable, since the model's goodness-of-fit indices did not change.

The model for the latent variable "work characteristics" did not show a good fit (Table 2) and required adjustments to optimize its quality. Observed variables with factor load less than 0.30 were removed one by one, and new models were tested. Two observed variables were removed from the initial model: time to complete tasks and the development of skills. The final model showed high goodness-of-fit indices for both the overall fit and parsimony.

Figure 1

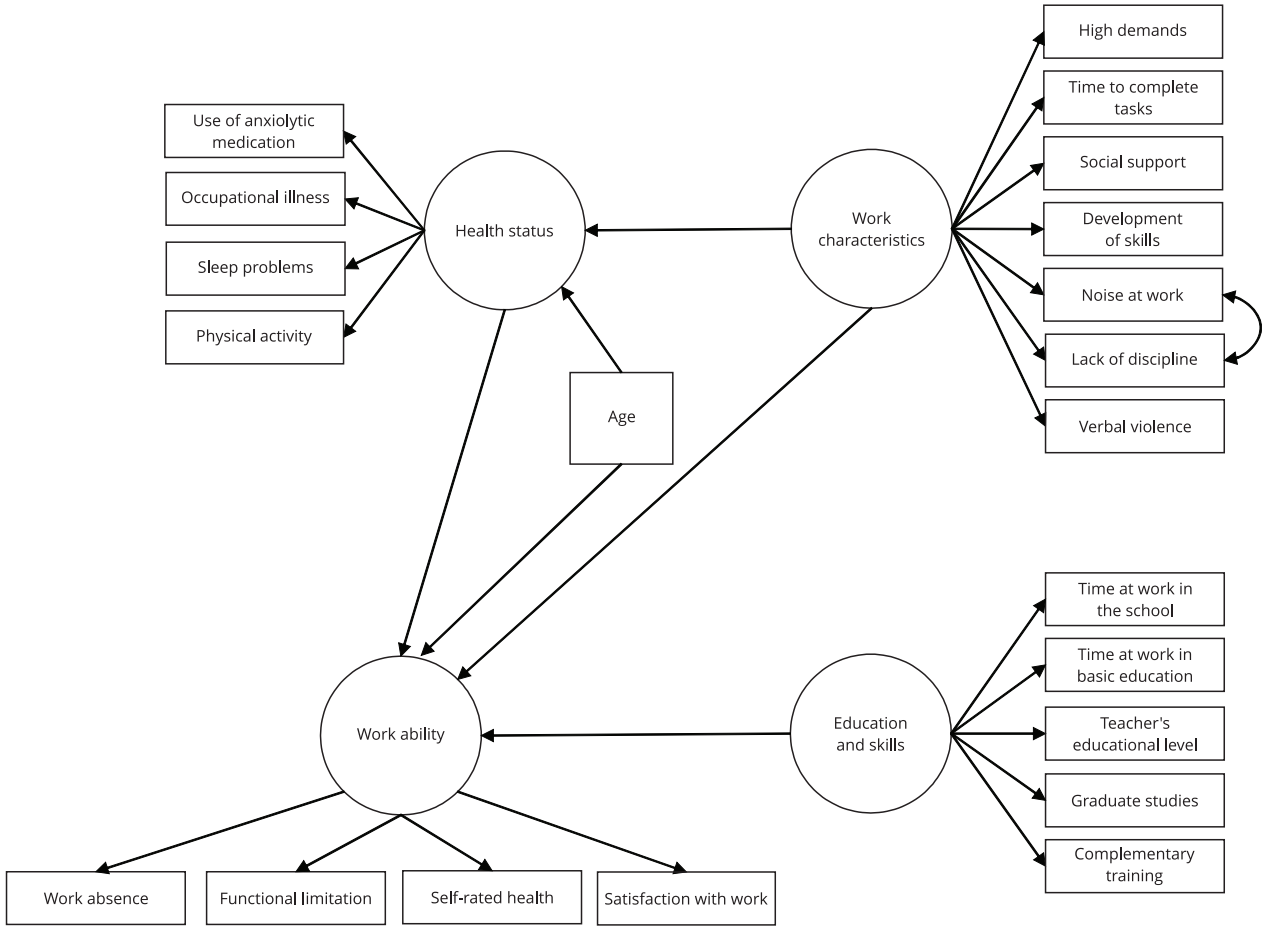
Stages in structural equation modeling.



Source: adapted from Hair et al. [22].

Figure 2

Hypothetical theoretical model to operationalize work ability.



The latent variable "education and skills" showed a satisfactory fit (Table 2). However, the observed variables had a low factor load (< 0.24), except for the graduate studies variable (factor load = 0.94). We thus opted to exclude this latent variable and test the variable's single effect. Since there was no significant effect on work ability, the graduate studies variable was removed from the study.

Importantly, the proposed factor solutions for each latent variable were significant ($p < 0.01$).

After obtaining satisfactory measurement models, we proceeded with the analyses to test the initial hypotheses that would explain work ability. The results obtained from the original database (without imputing the missing data) were compared to the results after multiple imputation. No discrepancies were observed in the estimates of the standardized coefficients in the statistical significance or in the model's fit, confirming goodness-of-fit between the model and the data. Figure 3 shows the structural model with the estimated standardized coefficients. SEM as a strategy to test the effect of the latent variables "health status" and "work characteristics" and age as an observed variable on work ability displayed satisfactory fit (CFI = 0.913; TLI = 0.881; RMSEA = 0.054). The model also produced satisfactory standardized coefficients based on moderate to high factor loads, all significant ($p < 0.01$). The residuals in the final model were less than 0.049 (data not shown), reflecting a good residual covariance matrix.

Table 1

Number of observations and frequencies according to sociodemographic characteristics of schoolteachers in Basic Education. Data from the Educatel Study, Brazil, 2016.

Individual characteristics	n	%
Sex		
Male	2,394	36.8
Female	4,116	63.2
Age bracket (years)		
18-24	374	5.7
25-34	1,844	28.3
35-44	1,944	29.9
45-54	1,604	24.6
> 54	744	11.4
Marital status		
Single	1,870	28.7
Stable union	3,935	60.4
Separated, divorced, widow(er)	705	10.8
Schooling		
Primary or secondary	510	7.8
University	6,000	92.2
Color/Race		
White	2,771	42.6
Brown	1,520	23.4
Black	206	3.2
Asian-descendant	37	0.5
Indigenous	24	0.4
Not reported	1,952	29.9
Children		
No	2,165	33.3
Yes	4,345	66.7
Personal income (minimum wage)		
≤ 1	505	7.8
1-2	1,856	28.5
2-3	1,701	26.1
3-5	1,444	22.2
> 5	802	12.3

Table 2

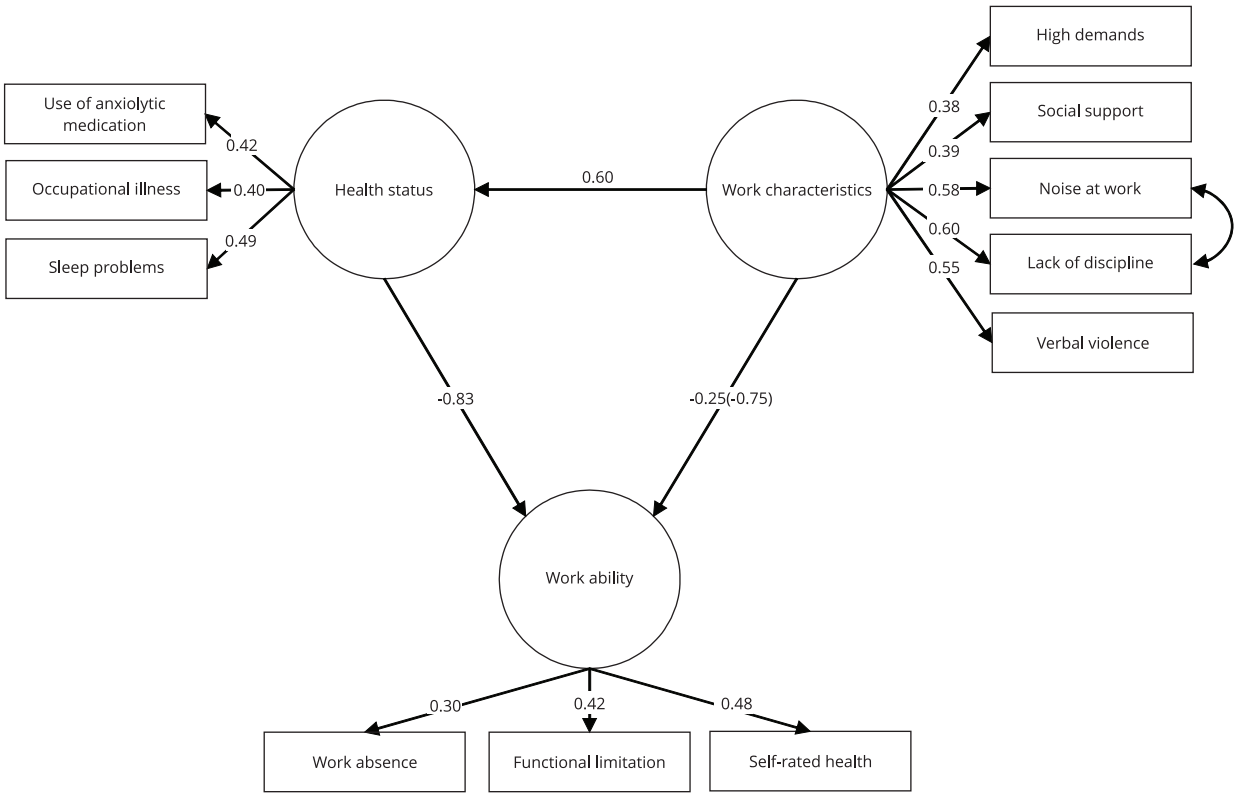
Goodness-of-fit indices and parsimony for each latent variable considering the initial and final models. Educatel Study, Brazil, 2016.

Latent variables	Measures			
	CFI		RMSEA	
	Initial	Final	Initial	Final
Work ability	0.956	0.956	0.043	0.043
Health status	1.000	1.000	0.001	0.080
Work characteristics	0.895	0.967	0.083	0.068
Education and skills	0.878	-	0.050	-

CFI: comparative fit index; RMSEA: root mean square error of approximation.

Figure 3

Result of analyses of structural relations to investigate the relationship between health status, work characteristics, and work ability.



In the path analysis, the effect of age on health status and work ability was not confirmed. The age variable was thus excluded from the model. Likewise, the manifest variable "work satisfaction" showed a factor load less than 0.30 and was removed from the model.

Confirming the initial hypotheses, health status and work characteristics have a direct effect on teachers' work ability. Health status was the principal factor associated with work ability. Besides the direct impact, work characteristics also have an effect on work ability via health status (indirect effect). The total effect (sum of direct and indirect effects) of work characteristics was -0.75.

Discussion

The study aimed to test the direct and indirect effects of conditioning factors on the work ability of Brazilian schoolteachers in basic education, using a proxy for indicators of absenteeism, functional loss due to voice problems, and self-rated health. The results support work ability as a complex construct with predictors related dynamically through an interconnected network.

The direct effect of health status on work ability is consistent. This dimension forms the base of the work ability model and is considered a critical resource for workers to exploit their productive potential [1].

Repercussions on teachers' physical and mental health and professional performance have been highlighted in different contexts, featuring the high prevalence of psychological disorders in the

teaching profession [17,25]. Mental disorders are among the main causes of illness for teachers, along with musculoskeletal disorders and voice problems [13,26,27].

In this study, work characteristics directly influenced health status and work ability, that is, work ability is influenced indirectly by teaching's demands. When the workload exceeds the worker's physical, cognitive, and/or affective capacity to achieve the school's objectives, it can lead to illness and loss of work ability [25].

Porto et al. [13] analyzed teachers' absenteeism and observed a scenario of mental overload; it is not implausible to associate this overload with the gap between the ultimate purpose of teaching and the multiple and conflicting demands arising from the social transformations that have altered the school's role [10]. Marçal & Peres [11] found an increase in students' unruliness and classroom noise as causes of stress and vocal symptoms in teachers. There is also vast literature pointing to an association between attrition in student/teacher relations and voice-related quality of life and vocal symptoms [28,29]. Understanding how these interactions occur can be essential for preserving and sustaining work ability.

In short, the current study's results corroborate those of other Brazilian [25] and international studies [8] that emphasize teachers' adverse work conditions. When the workload is disproportional to individual resources, work ability is compromised [30]. Such evidence emphasizes the urgent need for interventions to favor the work ability of Brazilian schoolteachers in basic education.

The non-significant effect of age on health status or work ability was unexpected. This finding may be partly associated with a healthy worker effect. The fact that the sample consisted mostly of younger teachers, with an unequal distribution at the extremes, may have implications for the results. Some 66% of the teachers in the sample were 45 years or younger, thus younger than the first significant decline in work ability [2]. Homogeneous populations are also known to limit the contrasts between age and determinants of work ability [5]. From whatever the angle, the negative effect of functional aging is widely acknowledged [2,4].

The latent variable "education and skills" was not associated with work ability, differing from the literature [2]. Manifest variables not captured by the survey might explain this finding.

The current study's limitations and strengths need to be addressed. The cross-sectional design limits causal inferences. Thus, the proposed relations should be viewed as hypotheses of causality.

However, the choice of structural equation modeling as the statistical method merits highlighting given its robustness for assessing complex constructs and simultaneously testing relations between variables [23]. Another strength of the study was its probabilistic and nationally representative sample of Brazilian schoolteachers in basic education.

Another potential limitation was that the sample excluded teachers who were no longer working at the school at the time of the sample selection, besides those who did not reply to 15 attempts to contact them or that worked in schools where the telephone was nonexistent or nonfunctional. Likewise, a possible recall bias or healthy worker effect cannot be ruled out.

Still, the representative, probabilistic, and random sample guarantees adequate external validity. Weighting factors used in the Educatel Study partially correct the non-participation rate, when not every individual has the same probability of being selected for the study. This allows adjusting part of the estimates that remain as biases and extrapolating inferences based on the results to the country's entire schoolteacher population.

The telephone interview used as this study's methodology is subject to content bias related to the questions and the interview's duration. There are lower odds of mistakes or of an interviewee that originally agrees to participate but then decides to decline. However, studies have shown similar results when comparing telephone surveys and face-to-face interviews [31]. Besides, the method is justified by the logistic complexity and high cost of face-to-face interviews when the goal is nationwide representativeness, as in the case of the Educatel Study [18]. In order to decrease these biases, we opted for a computer-assisted interview to ensure data-processing security and speed [32], and an eight-minute time limit was set for application of the telephone questionnaire.

The interviews were also conducted by a specialized company whose work was monitored throughout the study. Strategies were also employed to augment teachers' participation: (1) scheduling the interviews at the most convenient times for teachers; (2) searching for alternative telephone contacts in case the teacher was absent from the school or unable to participate in the survey; (3)

simple, streamlined data collection, since the questionnaire was prepared in keeping with the telephone survey format (short, automatically skipping non-applicable questions, and real-time data feeding into the system's database).

The survey's greatest strength is that Educatel is the first nationwide Brazilian study to provide a diagnosis of health and work conditions in basic education. In recent decades, the schoolteacher's mission has extrapolated the classroom in order to guarantee a link between the school and the community [12]. On the one hand, teachers are required to respond to the school system's new teaching and administrative demands, and on the other, teachers suffer from insecurity and helplessness, both objectively (from inadequate work conditions) and subjectively [10].

In relation to the study's results specifically, we confirmed the association between health, work, and work ability. As reported, teaching work is highly stressful, with demands that are not always accompanied by the necessary means for teachers to mobilize their capacities [17]. The final consequence is a loss of teachers' work ability and their capability to offer a quality education.

In order to improve teachers' work ability, the current study's results suggest that municipal school authorities and school administrators need to assimilate and reinterpret such values as autonomy, participation, and democratization in the school workplace and decision-making [33]. Medical and psychological care, when necessary, are vital to prevent teachers' health problems from becoming irreversible [13]. Structural changes in teachers' psychosocial work environment are equally important to prevent conflicts and lack of discipline [9]. Decreasing the size of classes and measures aimed at teachers' empowerment in caring for their own vocal health can also be useful [11]. In conclusion, the results of the Educatel Study can contribute to overcoming this reality to the extent that such results can back proposals to favor teachers' work ability.

Contributors

M. A. Alcantara was responsible for the study's conception, data analysis and interpretation, writing of the manuscript, critical revision, and approval of the final version for publication. A. M. Medeiros, R. M. Claro and M. T. Vieira participated in the conception, study project, data analysis and interpretation, and approval of the final version for publication.

Additional informations

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Resumo

O objetivo desse estudo foi analisar a relação entre saúde, características do trabalho, educação e competências sobre a capacidade para o trabalho de professores da Educação Básica no Brasil. Trata-se de um estudo transversal, de base populacional, segundo dados da Pesquisa Nacional sobre Saúde, Condições de Trabalho e Faltas dos Professores nas Escolas da Educação Básica *(Estudo Educatel). Uma amostra probabilística composta por 6.510 professores respondeu a um questionário telefônico (2015) contendo informações sociodemográficas, estado de saúde, educação e competências, características do trabalho e absenteísmo. A modelagem de equações estruturais (MEE) foi usada como técnica multivariada e os coeficientes padronizados (CP) foram calculados para analisar os efeitos diretos e indiretos entre os desfechos. O estado de saúde apresentou um efeito direto sobre a capacidade para o trabalho (CP = -0,83, p < 0,01). As características do trabalho interferiram diretamente no estado de saúde (CP = 0,60, p < 0,01) e capacidade para o trabalho (CP = -0,25, p < 0,05), com destaque para ruído no trabalho e indisciplina dos alunos; o efeito total (soma dos efeitos direto e indireto) das características do trabalho sobre a capacidade para o trabalho foi igual a -0,75 (p < 0,01). Este estudo concluiu que as relações entre estado de saúde e características do trabalho dos professores da Educação Básica são complexas e afetam negativamente a capacidade para o trabalho. Potenciais ações de promoção e manutenção da capacidade para o trabalho devem considerar as exigências psicossociais da atividade docente e medidas para controlar a ordem e a disciplina na sala de aula.*

Absenteísmo; Satisfação no Emprego; Condições de Trabalho; Avaliação da Capacidade de Trabalho; Professores Escolares

Resumen

El objetivo fue analizar la relación entre salud, características del trabajo, educación y competencias sobre la capacidad para el trabajo de profesores de educación básica en Brasil. Es un estudio transversal, de base poblacional, según datos de la Encuesta Nacional sobre Salud, Condiciones de Trabajo y Ausencias de los Profesores en las Escuelas de Educación Básica *(Estudio Educatel). Una muestra probabilística, compuesta por 6.510 profesores, respondió a un cuestionario telefónico (2015), que contenía información sociodemográfica, estado de salud, educación y competencias, características del trabajo y absentismo. Se utilizó modelos de ecuaciones estructurales (MEE) como técnica de análisis multivariantes y se calcularon los coeficientes estandarizados (CP por sus siglas en portugués) para analizar los efectos directos e indirectos entre las variables. El estado de salud presentó un efecto directo sobre la capacidad para el trabajo (CP = -0,83, p < 0,01). Las características del trabajo interfirieron directamente en el estado de salud (CP = 0,60, p < 0,01) y capacidad para el trabajo (CP = -0,25, p < 0,05), destacando el ruido en el trabajo e indisciplina de los alumnos; el efecto total (suma de los efectos directo e indirecto) de las características de trabajo sobre la capacidad para el trabajo fue igual a -0,75 (p < 0,01). Este estudio concluyó que las relaciones entre estado de salud y características del trabajo de los profesores de educación básica son complejas y afectan negativamente la capacidad para el trabajo. Potenciales acciones de promoción y manutención de la capacidad para el trabajo deben considerar las exigencias psicosociales de la actividad docente y medidas para controlar el orden y la disciplina en la clase.*

Absentismo; Satisfacción en el Trabajo; Condiciones de Trabajo; Evaluación de Capacidad de Trabajo; Maestros

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