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SMARTPHONE DEPENDENCE AND ASSOCIATED FACTORS AMONG ELEMENTARY SCHOOL TEACHERS IN THE MINAS GERAIS STATE PUBLIC SCHOOL SYSTEM - BRAZIL

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Abstract: Smartphone addiction has become a public health problem. The objective of this study was to evaluate the factors associated with smartphone addiction among public school teachers in the state of Minas Gerais. This is an epidemiological, cross-sectional, quantitative, observational study conducted as *a web survey*. Binary logistic regression was performed to assess the magnitude of associations between sociodemographic variables, work-related variables, habits and behaviors, as well as clinical and health conditions. A total of 1,907 teachers responded. Most were women, aged 40 years, not in a stable relationship, with an income between 3 and 5 minimum wages. Factors such as age (OR = 3.13 p = 0.004), working night shifts (OR = 1.40 p = 0.012), high psychological demand (OR = 1.52 p = 0.002), inadequate nutrition (OR = 2.99 p = 0.000), anxiety (OR = 1.38 p = 0.028), depression (OR = 0.59 p = 0.005), and common mental disorders (OR = 2.57 p = 0.000) were associated with SD. A significant proportion of teachers have SD, and health strategies need to be implemented to track risk factors and prevent SD.

Keywords: Smartphone Dependence, Teachers, Epidemiology, Mental Health.

Introduction

Smartphones are the most widely used device in Brazil for accessing the internet and are present in virtually all Brazilian households (IBGE, 2020). The main purpose is the use of social networks (Birenboim and Shoval, 2016), and Romero *et al* (2020) observed that excessive use of Instagram was correlated with Smartphone Dependence (SD) (R^2= 0.482).

Smartphone Dependence (SD) has been described as a behavioral disorder characterized by impulsivity and uncontrollable use of the device, with constant viewing of notifications and excessive use of applications, being compared to other behavioral addictions (Gutiérrez *et al*, 2016). SD has been identified as a global public health problem according to the World Health Organization (WHO) (WHO, 2014). The prevalence of SD in a group of future early childhood teachers in Spain was significant (53.4%) (Alves *et al*, 2021) . The absence of device use in dependent individuals manifests itself as anxiety, withdrawal, depression, irritability, and significant social repercussions (Borges *et al.*, 2021; Nascimento *et al.*, 2020).

The diagnostic classification is still unclear because it does not clearly present this DS nomenclature. However, behavioral addiction disorders have already been recognized by the American Psychiatric Association, which has defined behavioral addiction as distinct from substance dependence. It is important to note that the neuropsychological mechanism is established in the literature and involves one of the brain's reward systems, with dopamine as the neurotransmitter involved (Alves *et al*, 2021 ; Khoury *et al*, 2020; Castellon *et al*, 2022).

Factors have been identified as associated with this phenomenon, such as being in younger age groups, anxiety, depression,

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and being female. Although most studies are cross-sectional, these characteristics were recurrent, especially in Asian studies (Romero *et al*, 2020; Frydenlund *et al*, 2023; Nunes *et al*, 2021; Vieira *et al*, 2022).

Although the risks of SD among adolescents are well known, little is known about these risks among teachers. The teaching profession has undergone changes in the profile of morbidities that affect it, moving from chalk allergies to depression, anxiety, and stress, conditions that contribute to the development of addictions (Leite and Nunes, 2022). DS does not seem to have been studied in Brazilian teachers, especially in the post-pandemic context, which has affected human relationships in several ways, including the increased use of digital technologies present in smartphones (Alves *et al*., 2021). In addition, smartphones were the device most used by teachers for remote classes during the pandemic (Oliveira, 2021).

Thus, this study aimed to assess the factors associated with smartphone dependence among public school teachers in the state of Minas Gerais .

METHODOLOGY

Study design

This is an epidemiological, observational, descriptive study with a quantitative approach and conducted as *a web survey,* carried out with basic education teachers from public schools in the state of Minas Gerais, Brazil. It refers to a cross-sectional (baseline) study of the ProfSMinas Project "Health and Working Conditions of Basic Education Teachers in the State of Minas Gerais: A Longitudinal Study" . The items

on the checklists were observed: Reporting of Observational Studies in Epidemiology (STROBE) (Eysenbach, 2004) and Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Malta *et al*, 2010), which deal with cross-sectional studies and *web surveys*, respectively.

Population and Sample

Although in *web surveys* there is no control over the sample, i.e., over how many respondents will participate in the study (Boni, 2020), the minimum necessary sample was still estimated. The State Department of Education of Minas Gerais (SEE-MG) reported that there were approximately 90,000 teachers divided among 3,441 schools, according to the 2021 payroll. Thus, to perform the sample calculation, a formula based on disease or event prevalence was used, considering an infinite population, with a prevalence of 50%, a tolerable error of 3%, and an additional 20% to compensate for possible losses (non-response rate). In the end, a minimum sample of 1,282 teachers was estimated.

Data collection strategy

Initially, a partnership was established between the ProfsMinas project coordination and SEE-MG. Emails were sent to the state's regional education offices and later to the teachers' institutional email addresses. The study form was generated in *Google Forms* and the *link* was sent in these emails.

Those who were employed as teachers in basic education in state schools in Minas Gerais at the time of data collection and agreed to participate in the study were included. Teachers who were not working in teaching positions, retired teachers, and

those who answered "no" when asked if they would participate in the study did not participate. In order to avoid duplicate responses, teachers were asked to provide their state employee registration number (MASP).

Variables

The online form was constructed using validated instruments. The variables considered for this study were inspired by the theoretical framework tested by Romero-Rodrigues *et al* (2020).

The outcome of interest was SD, a variable obtained using the Smartphone Addiction Inventory SPAI-BR (Khoury *et al.*, 2017), an instrument for screening smartphone addiction consisting of 26 items with yes and no response options, translated and validated for Brazil. The total score obtained by summing the items ranges from 0 to 26 points, and a cutoff point of 9 or more positive responses is considered SD.

Sociodemographic and economic characteristics were considered: gender; age; self-declared skin color; census area (rural or urban); marital status; level of education; family income; and whether the teacher was the main financial provider in the household.

In addition, teaching characteristics were considered: weekly working hours; shift worked; whether they had another job; type of employment relationship. Control over work, social support, and psychological demand were assessed using the Job Stress Scale, in its summarized version validated for Portuguese (Alves *et al.*, 2004). It is a 17-question instrument, with five questions assessing psychological demands, including quantitative aspects such as time, concentration levels, and speed of work performance,

and qualitative aspects such as task interruptions and contradictions. Six questions deal with the control that workers have over their own work, i.e., autonomy in decision-making about work performance and the possibility of mobilizing and developing skills. Another six questions assess the third dimension, social support, which indicates the level of social interaction between the worker and their colleagues, as well as their relationship with their superiors. The response options for each of the dimensions are presented on a Likert scale (1-4), and the average of the sum of each was used to define the groups of high/low demand, high/low control, as well as high/low social support (Alves *et al.*, 2004).

The variables related to behavior and lifestyle were: smoking; assessment of diet and level of physical activity. Smoking was assessed by the question: do you smoke? Individuals were classified as: no, I have never smoked; yes, I currently smoke and I am an ex-smoker. Dietary assessment was performed using the Dietary Assessment Scale, an instrument containing 24 questions designed to measure healthy eating practices in accordance with the recommendations of the Dietary Guidelines for the Brazilian Population (BRASIL, 2014). The response options are presented on a four-point Likert scale. The total score is obtained from the sum of the items (1 to 24) and is categorized as: inadequate diet (up to 30 points), needs modification (between 31 and 41 points), and healthy diet (above 41 points). The level of physical activity was determined using the International Physical Activity Questionnaire (IPAQ) (Matsudo et al., 2001), which contains questions regarding the frequency and duration of physical activity. This variable was dichotomized into very ac-

tive/active/insufficiently active A and sedentary/insufficiently active B, as proposed in other studies (Baretta *et al*, 2007; Brandão *et al*, 2021).

The variables related to health status considered were: fear of COVID-19, self-assessment of health, medical diagnosis of Chronic Noncommunicable Disease (CNCD), medical diagnosis of depression and/or anxiety, symptoms of Common Mental Disorder (CMD), Body Mass Index (BMI), and reports of back pain. Fear of COVID-19 was measured using the instrument for investigating people's fear of COVID-19 (Peres *et al.*, 2021). The scale has seven items that are answered on a Likert scale. The total score is obtained from the sum of the items (7 to 35 points), and the higher the score, the greater the fear. Regarding self-assessment of health, two questions were extracted from the SF-12 instrument (Camelier, 2004), which assesses quality of life as perceived by the individual. The presence of NCDs considered reports of medical diagnosis of diabetes, hypertension, heart and/or circulatory problems—diseases that share behavioral risk factors. In addition, reports of medical diagnosis of other disorders: dyslipidemia, gastroesophageal reflux, and respiratory problems. The presence of depression and anxiety was based on positive responses to the following questions: "Have you been medically diagnosed with depression/anxiety in the last 12 months?". Symptoms of Common Mental Disorder (CMD) were assessed using *the Self Reporting Questionnaire* (SRQ-20) (Santos *et al*, 2009). The instrument assesses health situations that do not meet sufficient criteria for the diagnosis of depression and/or anxiety but are characterized by symptoms such as insomnia, fatigue, forgetfulness, among others, which

can trigger significant functional disability for the individual. It presents 20 questions with dichotomous answers (yes or no) referring to the last 30 days. The cutoff point for classification of suspected CMD was 7 or more positive responses. BMI classification followed WHO recommendations (WHO, 1995) and was calculated using the teachers' self-reported weight and height, classifying them as eutrophic (≤ 24.99), overweight (25.00 to 29.99), or obese (≥ 30.00), with pregnant women excluded from this analysis (22). Back pain was assessed by the question "In the last 6 months, have you experienced back pain?".

Statistical analysis

The *Statistical Package for Social Sciences* (SPSS®) 24.0 software was used for the analyses. Initially, a frequency table was prepared for descriptive analysis of the variables investigated. Next, bivariate analyses were performed using Pearson's chi-square test to verify the associations between DS and the independent variables (sociodemographic characteristics, working conditions, habits and behaviors, and health conditions). The independent variables that showed an association with SD, at a significance level of 0.20, were selected for multiple analysis. At this stage, the Binary Logistic Regression model was adopted. The backward method was used to enter the variables into the model. Multicollinearity was diagnosed by analyzing collinearity statistics: tolerance and variance inflation factor (VIF). The magnitude of the associations was verified using the Odds Ratio (OR), with a 95% confidence interval. The quality of the final model fit was assessed using the Hosmer Lemeshow test and Nagelkerke's R^2.

Ethical issues

The study was approved by the Research Ethics Committee of the State University of Montes Claros – UNIMONTES under opinion No. 4.964.125/2021. At the beginning of the digital form, the Free and Informed Consent Form (FICF) was presented, which teachers had the option to print, along with a question asking if they agreed to participate in the study. The ProfsMinas project was funded by the Minas Gerais State Research Support Foundation (FAPEMIG) process APQ-00901-22 .

RESULTS AND DISCUSSION

A total of 1,982 teachers from the state school system of Minas Gerais returned the form to DS. However, 75 questionnaires were excluded because they did not meet the inclusion criteria established in this study, leaving 1,907 eligible questionnaires. Of these, 353 (18.5%) presented DS.

In the descriptive analysis (Table 1), it was observed that most were women, with a mean age of 44.37 years, self-declared white, with an income between 3 and 5 minimum wages, in stable relationships, presenting themselves as the main breadwinners of the household, and satisfied with their work. Regarding habits/behaviors, it was observed that most teachers were physically active. In terms of clinical and health conditions, back pain stood out among teachers.

The variables age, income, marital status, working hours, shift, type of employment, social support, control over work, psychological demands, job satisfaction, smoking, diet, clinical and health conditions, fear of COVID-19, self-rated health, hypertension, cardiovascular disease, reflux, respiratory problems, depression, anxiety, common mental disorder, and back pain.

In the final adjusted multiple analysis (Table 2), the odds of SD were higher among teachers aged up to 39 years (OR = 3.13), among teachers working night shifts (OR = 1.40), and among those with high psychological demands (OR = 1.52). In addition, teachers who had an inadequate diet (OR = 2.99) were three times more likely to have DS than those who had a healthy diet, as well as those who had a diet that needed modification (OR = 1.84). Clinical and health conditions such as a high fear of COVID-19 (OR = 1.50), anxiety (OR = 1.38), and the presence of common mental disorders (OR = 2.57) also increased the chance of SD. In contrast, a diagnosis of depression reduced the chance of SD among teachers (OR = 0.59). The Hosmer and Lemeshow test showed p = 0.720, suggesting good data fit, and in collinearity, the tolerance statistics were close to 1 and the VIF, all below 5. Considering the quality of the final adjusted model, it was possible to explain 19.6% of the variability of SD, the dependent variable.

This study found a prevalence of 18.5% of SD among teachers and associated with this condition factors such as age group up to 39 years, working night shifts, and high psychological demands at work, lifestyle habits such as poor diet, and clinical and health conditions such as fear of COVID-19, anxiety, depression, and common mental disorders.

Little is known about SD in professional populations, but the proportion found is lower when compared to adolescents and young adults. Dasgupta *et al* (2017) found a prevalence of 43.6% of SD among engineering and medical students. Among Indian

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Variables	Characterization		Smartphone dependence				p-value
	n	%	No	%	Yes	%	
Socioeconomic factors							
Age							
60 years or older	106	5.6	98	92.5	8	7.5	0.000
40 to 59 years	1173	61.5	990	84.4	183	15.6	
Up to 39 years old	627	32.9	465	74.2	162	25.8	
Gender							
Male	434	22.8	353	81.3	81	18.7	0.926
Female	1,473	77.2	1201	81.5	272	18.5	
Area							
Rural	202	10.6	171	84.7	31	15.3	0.221
Urban	1705	89.4	1383	81.1	322	18.9	
Skin color							
White	1040	54.5	842	81.0	198	19.0	0.516
Non-white	867	45.5	712	82.1	155	17.9	
Income							
6 minimum wages or more	342	17.9	269	78.7	73	21.3	0.058
3 to 5	1089	57.1	881	80.9	208	19.1	
Up to 2	476	25.0	404	84.9	72	15.1	
Marital status							
No union	1160	60.8	961	82.8	199	17.2	0.058
With union	747	39.2	593	79.4	154	20.6	
Main provider							
No	1142	59.9	932	81.6	210	18.4	0.867
Yes	765	40.1	622	81.3	143	18.7	
Working conditions							
Working hours							
< 40 hours per week	1253	65.7	1055	84.2	198	15.8	0.000
> 40 hours per week	654	34.3	499	76.3	155	23.7	
Night shift							
No	1348	70.8	1123	83.3	225	16.7	0.001
Yes	555	29.2	427	76.9	128	23.1	
Type of Employment							
Competitive exam/ permanent	1096	57.5	857	78.2	239	21.8	0.000
Hired/appointed	811	42.5	697	85.9	114	14.1	
Other employment							
No	1277	67.0	1048	82.1	229	17.9	0.355
Yes	630	33.0	506	80.3	124	19.7	
Control over work							

High	896	47	758	84.6	138	15.4	0.001
Low	1011	53.0	796	78.7	215	21.3	
Social support							
High	893	46.9	770	86.2	123	13.8	0.000
Low	1014	53.1	784	77.3	230	22.7	
Psychological demand							
Low	925	48.5	815	88.1	110	11.9	0.000
High	982	51.5	739	75.3	243	24.7	
Job satisfaction							
Satisfied	1592	83.5	1332	83.7	260	16.3	0.000
Dissatisfied	315	16.5	222	70.5	93	29.5	
Behaviors/Habits							
Smoking							
No	1583	83.0	1285	81.2	298	18.8	0.113
Yes	115	6.0	89	77.4	26	22.6	
Ex-smoker	209	11	180	86.1	29	13.9	
Food							
Healthy	971	50.9	867	89.3	104	10.7	0.000
Needs modification	738	38.7	568	77.0	170	23.0	
Inadequate	198	10.4	119	60.1	79	39.9	
Level of physical activity							
Active	1252	70.2	1053	83.8	204	16.2	0.000
Sedentary	530	29.8	405	76.4	125	23.6	
Clinical and health conditions							
Fear of COVID-19							
Low/moderate	1313	68.9	1117	85.1	196	14.9	0.000
Very	594	31.1	437	73.6	157	26.4	
Self-assessment of health							
Excellent	931	48.8	785	84.3	146	15.7	0.007
Regular	913	47.9	721	79.0	192	21.0	
Poor/very poor	63	3.3	48	76.2	15	23.8	
Diabetes							
No	1789	93.8	1460	81.6	329	18.4	0.598
Yes	118	6.2	94	79.7	24	20.3	
High blood pressure							
No	1483	77.8	1197	80.7	286	19.3	0.103
Yes	424	22.2	357	84.2	67	15.8	
Cardiovascular disease							
No	1830	96.0	1496	81.7	334	18.3	0.155
Yes	77	4.0	58	75.3	19	24.7	

Reflux							
No	1574	82.5	1302	82.7	272	17.3	0.003
Yes	333	17.5	252	75.7	81	24.3	
Respiratory problems							
No	1459	76.5	1213	83.1	246	16.9	0.001
Yes	448	23.5	341	76.1	107	23.9	
Depression							
No	1658	86.9	1368	82.5	290	17.5	0.003
Yes	249	13.1	186	74.7	63	25.3	
Anxiety							
No	1171	61.4	1017	86.8	154	13.2	0.000
Yes	736	38.6	537	73.0	199	27.0	
Common mental disorder							
Absent	1222	64.1	1098	89.9	124	10.1	0.000
Present	685	35.9	456	66.6	229	33.4	
BMI							
Eutrophic	654	34.7	515	79.8	130	20.2	0.361
Overweight	746	39.1	617	82.7	129	17.3	
Obesity	466	24.4	383	82.2	83	17.8	
Back pain							
No	646	33.9	578	89.5	68	10.5	0.000
Yes	1261	66.1	976	77.4	285	22.6	

SM = minimum wage

Source: the authors themselves

Table 1 – Characterization of the sample and bivariate analysis for Smartphone Dependence among teachers in the public school system of the state of Minas Gerais, Brazil, 2021 (n = 1,907).

Variables	Adjusted OR (95% CI)	p-value
Socioeconomic factors		
Age		
60 years or older	1.00	
40 to 59 years old	1.94 (0.90-4.19)	0.088
Up to 39 years	3.13 (1.44-6.80)	0.004
Working conditions		
Night shift		
No	1.00	
Yes	1.40 (1.07-182)	0.012

Psychological demand		
Low	1	
High	1.52 (1.16-2.00)	0.002
Behaviors/habits		
Diet		
Healthy	1.00	
Needs modification	1.84 (1.39-2.45)	0.00
Inadequate	2.99 (2.04-4.37)	0.00
Clinical and health conditions		
Fear of COVID-19		
Low/moderate	1.00	
High	1.50 (1.15-1.95)	0.003
Depression		
No	1.00	
Yes	0.59 (0.41-0.85)	0.005
Anxiety		
No	1.00	
Yes	1.38 (1.03-1.86)	0.028
Common mental disorder		
Absent	1.00	
Present	2.57 (1.90-3.46)	0

Findings (β= -3.739 p = 0.000)

Pseudo R^2 = 19.6%

Table 2 – Multiple analysis of the relationship between smartphone dependence and study variables among public school teachers in the state of Minas Gerais, Brazil, 2021 (n = 1,907).

dental students, Prasad et al (2017) found 24.12%. Khoury *et al* (2017) observed a prevalence of 35.66% among Brazilian university students. Among young Lebanese, the prevalence was 35.9% (Matar and Jaalouk, 2017). In Turkey, 39.8% of university students were found to have SD (Demirci *et al*, 2015). The fact that the proportion is lower among teachers does not mitigate the problem, since it is a disorder that causes suffering and harm in the lives of these people. The smartphone was created in the 2000s (Santos *et al.*, 2019), and considering that younger age groups are digital natives who have always lived with digital technologies and are not yet fully formed in terms of personality, they are more prone to addiction and dependence (Rozin and Zagonel, 2012). This study found that teachers aged 39 and under were 3.13 times more likely to be in the DS category when compared to teachers aged 60 and over. This information is corroborated by Khoury *et al* (2017) in a previous study for the adaptation and validation of the Smartphone Addiction Inventory (SPAI-BR), which pointed to a prevalence of 35% in a young population (18-25 years old).

Two occupational characteristics of teachers were associated with SD: teaching night shifts, which increased the odds by 40% compared to those who did not work night shifts, and high psychological demand, which increased the odds by 52%. In a review study, Silva e Costa (2023) pointed out that night work was related to several health effects, including addiction to substances such as alcohol and smoking, but the relationship with behavioral addiction does not seem to have been studied to date. In 2014, Brand *et al.* introduced a theoretical model to explain the development and maintenance of internet addiction. The factors that influenced addiction, such as psychopathological, personality, and social cognition factors, did not directly impact addiction but were mediated by a dysfunctional coping style and expectations of internet use, which would be characterized by problem-solving difficulties and avoidance behaviors, in addition to the individual's expectation that the internet would distract them from problems and negative feelings.

High psychological demand is characterized by psychological pressures, which in an individual with a personality vulnerable to stress would be more prone to dysfunctional behavior in coping with these pressures and, as avoidance behavior, smartphone use (Silva and Costa, 2023).

In terms of behaviors and lifestyle habits, unhealthy eating was associated with SD among teachers. In a Chinese study (Wang *et al.*, 2023) involving 1,112 university students, negative eating habits were correlated with SD: consumption of *fast food* and soft drinks (p<0.01), and skipping breakfast (p<0.05). Alosaimi *et al* (2016), in a study involving 2,367 Saudis, observed that 30% of participants developed a less healthy lifestyle since they started using smartphones: *fast food* consumption, weight gain, and less exercise. In this study, an OR = 2.99 was observed for poor diet in relation to SD. Obesity is a health effect already linked to excessive smartphone use (Jai and Singh, 2015). Thus, a rehabilitation program for changing eating behaviors and exercise habits, employing, among other approaches, cognitive behavioral therapy, has already been proposed (Kim, 2013) for the treatment of SD with significant positive results. It is important to note that phy-

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sical activity and BMI were not associated with SD in this study.

Regarding the clinical and health conditions of teachers, components related to mental health seem to have a greater association with SD. Fear of COVID-19, depression, anxiety, and GAD were associated with SD. Yam et al (2021) and Bousier *et al* (2020) point to a linear and positive relationship between fear of COVID-19 and SD during the pandemic, with social isolation and the volume of information about the virus through social media intensifying fear of infection and, consequently, compulsive device use.

In a systematic review, Ratan *et al* (2021) stated that depression and anxiety are the most common mental health conditions associated with DS. However, in this study, these conditions had distinct associations. Depression reduced the chance of SD (OR = 0.59) among teachers. However, in the study by Demirci *et al* (2015) with university students, the severity of SD was positively correlated with depression (r = 0.276 p<0.001). Among 1,513 students in Saudi Arabia, OR = 17.76 (p< 0.001) was observed between depression and SD (El-sayed and Abu-zaid, 2020). As this was a condition declared based on medical diagnosis, the teachers in this study were probably already receiving medication and follow-up care, which contributed as a protective factor.

Kim *et al* (2018) found an RR = 1.44 (p<0.001) among Korean adults with anxiety disorder in relation to SD. Elhai *et al* (2020)[47]proposed the mediation of the relationship between anxiety and problematic smartphone use by "fear of missing out," or FOMO, a syndrome characterized by the constant need to know what others are

doing. The association of DS with anxiety would be explained in part by the influence of this syndrome. In this study, 38.6% of teachers reported having a medical diagnosis of anxiety, and during the pandemic, these symptoms may have been exacerbated by social isolation.

Still on the subject of teachers' mental health, it was observed that Common Mental Disorder (CMD) remained associated with SD (OR = 2.57). Nunes *et al* (2021) found suspected CMD in 52.4% of the adolescent population studied, and this attribute was associated with SD, with a 27.2% increase in the chance of SD. In previous studies (Firat *et al.*, 2018; Körmendi, 2018), it was observed that smartphone use time is directly related to impulsivity, anxiety, depression, interpersonal sensitivity, and symptoms of hostility.

One limitation of this study is its cross-sectional design, which does not allow for the establishment of a causal relationship, but the association provides clues for a partial understanding of the phenomenon. The final model explained 19.6% of the variability in DS in the sample of teachers, suggesting that there may be other predictive factors related to the professional category itself, habits and behaviors, and even clinical and health conditions, in addition to other variables not addressed in this study. However, conducting a *web survey* had the advantages of remote data collection, speed in collecting and publishing results, and ensured social distancing, which was important during the COVID-19 pandemic (Boni, 2020).

FINAL CONSIDERATIONS

It is necessary to intervene in order to mitigate the impacts of SD on teachers' health. This intervention can take the form of periodic occupational health assessments and collective awareness campaigns on the abusive use of smartphones within the school grounds. In the periodic assessment, the individual characteristics of smartphone habits should be addressed. In collective approaches, the state itself, together with school boards , can promote care and advise the adoption of behaviors that can reduce the chance of SD.

Public policies aimed at preventing DS in future teachers should be considered, and further studies to assess the relationship between night work and DS will be necessary. Attention should be drawn to the association between mental health characteristics and DS and the need for prevention/care programs in this area.

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