Assessment of behavior-related pain in school teachers during emergency remote teaching: cross-sectional study

Avaliação de dor relacionada ao comportamento de professores durante o ensino remoto emergencial: estudo observacional transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: In the teacher's professional practice, there is a high level of stress, anxiety and incidence of pain. With the advent of COVID-19 and the emergence of remote teaching, it is possible that this scenario has been aggravated. The objective of this study was to evaluate chronic pain, central sensitization and pain catastrophizing among primary education teachers during remote teaching offered due to the pandemic.

METHODS: A cross-sectional analytical observational study. Participants were 200 teachers from different regions of Brazil who responded through an online form a sociodemographic questionnaire and a questionnaire about their working conditions. In addition, pain intensity was assessed using the Visual Analog Pain Scale (VAS), central sensitization state was assessed using the Central Sensitization Questionnaire (CSI), and pain catastrophizing was assessed using the Catastrophic Thinking Scale about Pain (PCS).

RESULTS: Most of the teachers were female, white, from the southeast region, with lato sensu specialization, had an income of 2 to 2.5 minimum wages, working 21 to 40 hours a week. Most of the teachers reported pain intensity equal to eight and the body region most affected was the lumbar spine. It was observed that teachers with low salary, uncomfortable environment and longer days dedicated to remote teaching showed a greater tendency to central sensitization and pain catastrophizing. Most teachers reported pain intensity equal to eight and the most affected body region was the lumbar spine. Teachers with uncomfortable furniture reported increased pain, especially in the lumbar spine and neck. They also showed higher levels of central sensitization to pain, inversely proportional to their salary income and, in sum, teachers with a greater feeling of discomfort catastrophized more which reflects the physical and emotional damage that pain can cause.

CONCLUSION: Remote teaching during the pandemic of COVID-19 impacted physical and emotional changes in teachers of primary education. The professionals perceived that their furniture was not the most adequate for the high amount of time they had to work on academic activities using computers (in general, over 40 hours a week), they reported increased pain, especially in the lumbar spine and neck, they presented higher levels of central pain sensitization, which was influenced by low salary income, and, in sum, teachers with higher feelings of discomfort catastrophized more, which reflects the physical and emotional damage that pain may cause. All these affections tend to reduce the teachers' quality of life and, consequently, affect the teaching and learning processes.

Keywords: Catastrophization, Central nervous system sensitization, Chronic pain, COVID-19, Pandemics, School teachers.

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HIGHLIGHTS
• Lower back pain was reported by teachers as the most frequent during remote teaching.
• Time superior than eight hours in front of the computer influences pain sensitivity.
• Higher salary income is associated with lower pain sensitization

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RESUMO

JUSTIFICATIVA E OBJETIVOS: Na atuação profissional do professor, há elevado nível de estresse, ansiedade e incidência de dor. Com o advento do COVID-19 e a emergência do ensino remoto, é possível que este cenário tenha sido agravado. O objetivo deste estudo foi avaliar quadros de dor crônica, sensibilização central e catastrofização da dor em professores da rede básica durante o ensino remoto ofertado devido à pandemia.

MÉTODOS: Trata-se de um estudo observacional analítico do tipo transversal. Participaram 200 professores de diferentes regiões do Brasil que responderam, através de um formulário online, perguntas sobre aspectos sociodemográficos e suas condições de trabalho, além de serem avaliadas a intensidade de dor por meio da Escala Analógica Visual de dor, o estado de sensibilização central por meio do Questionário de Sensibilização Central (CSI) e a catastrofização da dor por meio da Escala de Pensamento Catastrófico sobre a Dor.

RESULTADOS: A maioria dos professores eram do sexo feminino, brancos, da região sudeste, com especialização lato sensu, apresentavam renda de 2 a 2,5 salários-mínimos e jornada de trabalho de 21 a 40 horas semanais. A maioria dos professores relatou intensidade de dor igual a oito e a região do corpo mais afetada foi a coluna lombar. Observou-se que professores com baixo salário, ambiente desconfortável e maior jornada dedicada ao ensino remoto apresentaram maior tendência à sensibilização central e à catastrofização da dor. Professores com mobiliário desconfortável relataram aumento da dor, em especial, na coluna lombar e no pescoço. Apresentaram também maiores níveis de sensibilização central à dor, inversamente proporcional à sua renda salarial e, de maneira somatória, professores com maior sensação de desconforto catastrofizaram mais o que reflete os prejuízos físicos e emocionais que a dor pode causar.

CONCLUSÃO: O ensino remoto durante a pandemia do CO-VID-19 impactou alterações físicas e emocionais nos professores da rede básica de ensino. Os profissionais perceberam que seu mobiliário não era o mais adequado para a alta permanência de tempo que tiveram de trabalhar em atividades acadêmicas pelo computador (em geral, acima de 40 horas semanais), relataram aumento da dor, em especial na coluna lombar e no pescoço, apresentaram maiores níveis de sensibilização central à dor, que foi influenciado por baixa renda salarial e, de maneira somatória, professores com maior sensação de desconforto catastrofizaram mais, o que reflete os prejuízos físicos e emocionais que a dor pode causar. Todos estes acometimentos tendem a reduzir a qualidade de vida do professor e, consequentemente, afetar o processo de ensino e aprendizagem.

Descritores: Catastrofização, COVID-19, Dor crônica, Pandemias, Professores escolares, Sensibilização do sistema nervoso central.

INTRODUCTION

The International Association for the Study of Pain (IASP) defines pain as ''an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage''[1,2], which is an interaction of psychological, emotional, behavioral, and social factors. The same group defines chronic pain as pain that is persistent or intermittent for more than three months[1]. The individual with acute or chronic pain may present mild to agonizing discomfort, causing changes in sleep, appetite, and libido patterns, manifestations of irritability, decreased concentration, and decreased activities of daily living[3]. The painful stimulus can also cause neuronal dysregulation and hyperexcitability of the central nervous system, a physiological phenomenon known as central sensitization (CS), which consists of hypersensitivity between noxious and non-harmful impulses[4], resulting in even greater painful sensations. Pain can still come through catastrophizing, a set of negative thoughts that generate pain stimuli, real or not, with the perception of intolerance to pain and the individual's inability to deal with it[5]. Catastrophizing is a cumulative negative cognitive-affective process and is an important predictor of pain-related outcomes[6].

In this sense, pain is frequently involved in the profession of educators, whether of a physical or even emotional nature. Educa-

tion professionals must deal with constant challenges that can affect their mental and physical health, such as multiple and interactive demands with students, parents, coworkers, and administrative issues related to work[7]. Brazil is known for the low pay of its primary school teachers[8], working an average of 32.5h per week in only one school network and with an average hourly salary of R$21.20, which indicates that this average is lower than that of other professionals with college degrees in the country[9]. The fact that they teach many classes a week leads to a lack of time for teachers to study and update themselves, compromising the organization and planning of their work, making the profession more precarious, and leading to professional suffering[8].

With the pandemic of the new coronavirus (SARS-CoV-2), adverse effects such as fear and insecurity, which occur due to the social distancing from family members, friends, and other work colleagues, fear of unemployment, and other uncertainties, have caused widespread stress in the population, as well as mental health problems[10,11], which may have increased the conditions of pain, including in educators. Several teachers found themselves away from their face-to-face work activities due to the interruption of classes or the adaptation into remote teaching. The teacher's job has become similar to that of office workers, who spend several hours sitting in front of a computer; these have a high prevalence of pain due to multiple factors (psychological distress, fear and avoidance beliefs, low quality of life, and job dissatisfaction)[12].

A study carried out with 140 teachers from the Catarinense Federal Institute (*Instituto Federal Catarinense)* during the pandemic, when evaluating ergonomics and musculoskeletal symptoms, observed that 94.7% of the teachers reported pain associated with the workload and ergonomic conditions[13]. Another study carried out with professors at the Cerrado University Center (*Centro Universitário do Cerrado* - UNICERP) showed that 45.1% of the participants perceived stress above average, which was directly related to the presence of musculoskeletal disorders in the neck and shoulders[14]. In a study conducted only in the state of Minas Gerais, 58% of school teachers reported back pain due to daily life changes during the pandemic[15].

Therefore, teachers may have increased levels of pain associated with behavioral changes, increased risk of CS, catastrophizing, and reduced quality of life, which may be associated with working conditions and environment during the SARS-CoV-2 pandemic. All of these affections have a direct impact not only on the professional's life, but also on the quality of education. As no study at national level was found, the aim of the present study was to evaluate chronic pain scenarios in teachers from the primary education network in the country during the pandemic period, identify the degree of catastrophizing and CS of pain, and the variables that associate and/or impact pain.

METHODS

A cross-sectional analytical observational study approved by the Research Ethics Committee of the Federal Institute of Education, Science and Technology of São Paulo (*Instituto Federal de Educação, Ciência e Tecnologia de São Paulo)*, under protocol

38406820.0.0000.547. Teachers from the primary education network (kindergarten, elementary and high school) from the municipal, state, federal, public and private spheres, from all regions of the country were invited to participate. Higher education teachers (undergraduate and graduate) were excluded. The disclosure was made through education groups on Facebook and Instagram, with an explanatory invitation about the project.

The teacher interested in participating in the research should respond to the publication by informing his or her e-mail address. When reporting interest in participating, the professional received via e-mail the Free and Informed Consent Term (FICT). Once the FICT was signed and returned, the professional received a copy signed by the researcher and the questionnaires that were applied in the study. In total, 200 teachers showed interest in participating and their data were collected, without identification of the institution, from different regions, during the isolation period from October 2020 to February 2021.

The participants were evaluated using a semi-structured online form that gathered personal information such as age, gender, race and color, socioeconomic questions (education, salary, sphere - state, municipal, public or private, remote working during the pandemic) and the conditions of the work environment (hours in front of the computer, time spent sitting, practice of physical activities, comfort of furniture, internet access, intensity and location of pain). A pain intensity scale from zero to 10 was also applied.

The Central Sensitization Inventory (CSI) was used to assess the degree of CS, a tool validated and translated into Portuguese[16], consisting of a two-part questionnaire, with questions about feeling tired, sleep, anxiety, pain, difficulty in concentrating, among others. To measure pain catastrophizing, the Pain Catastrophizing Scale (PCS) was used, a self-applied instrument composed of thirteen items, scaled from zero (almost never) to 5 points (almost always), with sentences that described different feelings and thoughts related to pain, such as: the fear of not being able to continue, fear that the pain will not get better, the desire that the pain will disappear, among others. The total score is the sum of the items, divided by the number of items answered. The higher the score, the greater indicative of catastrophizing thoughts. The instrument was originally proposed in 1995[17] and validated and translated into Portuguese[17] in 2012.

To minimize bias, before the forms were sent to the participants, instructions were sent to clarify any doubts, and they also had contact information of one of the researchers so that, if any other doubts arose, they could be clarified.

SPSS v20® and GraphPad Prism v5.0® software was used for tabulation, creation of figures, and statistical data analysis. The Shapiro-Wilk test was used to verify the distribution and normality of quantitative data. The analysis and comparison between variables was done through the comparison tests between two or more groups (unpaired t test or One-Way ANOVA). The significance level adopted was a p-value less than 0.05.

RESULTS

The sample of the present study consisted of 200 teachers, with ages ranging from 23 to 60 years (40.5 ± 9.5 years). Distribu-

ted by region, most of the respondents were from the Southeast region (44%), followed by the Northeast region (19%), Center-West region (15%), South region (14%), and North region (7.5%). As for gender, 77.5% were female and 22% male, and 0.5% chose not to answer. As for the skin color, 48.5% declared themselves white, 38% brown, 9% black, 1.5% yellow, and 3% did not want to declare it. As for the level of education, the majority had a lato sensu specialization degree (54%), followed by undergraduate degrees (21.5%), master's degrees (15%), doctorates (6%), and post-doctorates (3.5%). As for the education network, 87.6% taught in the public network and 12.4% in the private network. The majority had an income of R$1000 to R$3000 (49.5%), followed by R$3000 to R$6000 (39.5%) and the minority received R$6000 to R$9000 or more than R$9500 (6% in both salary ranges). Most teachers worked 21 to 40 hours per week (57%), followed by 26.5% who worked more than 40 hours, 13.5% who worked up to 20 hours per week, and 3% who reported not working during the pandemic period.

Work structure during the pandemic

When asked if they are working through remote teaching during the pandemic period, the majority said yes (94.5%), 3.5% have worked but are no longer working, and 2.5% have never worked. Table 1 summarizes the responses according to working conditions and structures during the pandemic. Most teachers classified the state of their working environment and conditions as regular (37.5%). Regarding the comfort (physical structure) of their working environment while teaching remote classes (desk, chair, computer, etc.), most participants rated their working environment as not very comfortable (40%) (Ta-

Table 1. General considerations about the working environment and conditions of primary education network teachers during remote teaching in the COVID-19 pandemic

	Frequency (n)	Percentage (%)
Great	9	4.5
Very good	30	15.0
Good	59	29.5
Regular	75	37.5
Very bad	20	10.0
Terrible	6	3.0
Blank answer	1	0.5
Total	200	100.0

Table 2. Comfort of the work environment of primary network teachers while teaching remote classes during the COVID-19 pandemic

	Frequency (n)	Percentage (%)
Very comfortable	9	4.5
Comfortable	66	33.0
Not very comfortable	80	40.0
Uncomfortable	40	20.0
Blank answer	5	2.5
Total	200	100.0

Table 3. Reported pain scale according to body area

Body area	Mean	Standard deviation
Abdomen	2.50	3.110
Lumbar spine	6.39	3.208
Thoracic spine	4.81	3.425
Elbow	2.49	3.334
Fingers	3.76	3.825
Toes	1.89	3.004
Knee	3.77	3.676
Hands	4.27	3.766
Shoulder	5.04	3.719
Foot	3.39	3.598
Legs	4.72	3.430
Neck	5.65	3.164
Wrist	4.53	3.663
Hip	3.93	3.723
Thorax	3.01	3.365
Ankle	2.41	3.316

ble 2). Regarding the use of information and communication technologies in teaching, more than half rated it as satisfactory (61%) and 85.5% reported having no difficulty with internet access. About 34.5% spent from 3 to 4 hours in front of the computer performing academic activities, 15% more than 8 hours, and only 2% spent less than 1 hour.

Central sensitization and pain catastrophizing

The body area where teachers reported the highest pain intensity was in the lumbar spine (6.39±3.2), followed by the neck (5.65±3.16) and the area with the least pain complaints was the toes (1.89±3.0) (Table 3). Most patients reported pain intensity = 8 (16.6%, mean 5.05±3.25). Intensity zero - 15.5%, one - 8%, two - 0.6%, three - 12.1%, four - 4%, five - 10.1%, six - 6%, seven - 14.1%, nine - 6%, and intensity 10 - 7%. The overall mean value for CS was 42.8±20.6 and for catastrophizing was 15.2±11.7.

The comparison between the results of the pain sensitization and catastrophizing questionnaires according to the teachers' profile was performed and these data are presented in table 4. It was possible to observe that teachers with an income of R$3000 to R$6000 had a high tendency to CS (46.4±21.9) in comparison with teachers who earned more than R$9500

Table 4. Level of central sensitization and pain catastrophizing according to working conditions of primary education teachers in remote education during the COVID-19 pandemic

	Central Sensitization (CSI)			Catastrophizing (PCS)		
	Mean	Standard deviation	P-value	Mean	Standard deviation	P-value
Wage income						
R$1000-3000	42.15	20.52	0.003	16.25	12.07	0.15
R$3000-6000	46.04	21.89		14.99	11.63	
R$6000-9000	41.25	13.77		14.67	11.32	
> R$9500	28.00	10.05		7.75	6.744	
Teaching activities in front of the computer						
2 hours or less	35.41	20.42	0.001	8.895	9.653	<0.0001
3 to 4 horas	41.67	20.68		16.03	10.61	
5 to 6 horas	42.86	19.17		14.8	11.94	
7 to 8 horas	40.32	17.13		13.5	10.91	
More than 8 hours	55.81	20.24		22.81	12.18	
Comfort of work environment						
Very comfortable	20.11	20.4	<0.0001	7.556	11.45	0.0003
Comfortable	38.15	17.57		11.9	10.62	
Not very comfortable	43.17	20.82		16.31	11.71	
Uncomfortable	55.44	18.36		20.25	11.41	
Difficulties in accessing the internet						
No	41.55	20.6	0.03	14.56	11.58	0.04
Yes	50.24	19.4		19.78	11.83	
Working hours						
Not working	34.33	20.86	0.44	11	11.63	0.83
Working more than 40 hours per week	42.96	19.86		15.63	11.67	
Working up to 20 hours a week	38.48	18.8		14.89	11.75	
Working from 21 to 40 hours a week	44.16	21.38		15.22	11.81	

(Level of significance p≤0,05).

(28.0±10.1) (p = 0.03). There was no significant difference between incomes in catastrophizing.

Teachers who worked for 2h or less per day (35.4±20.4) showed fewer CS symptoms compared to those who worked for 7 to 8h (40.3±17.1) or more than 8 hours per day (55.8±20.2) (p=0.001). As for pain catastrophizing, teachers who worked more than 8 hours (22.8±12.2) had more catastrophizing feelings compared to those who worked 2 hours less (8.8±9.7) (p=0.001).

Teachers with the environment classified as uncomfortable (55.4±18.4) had CS scores above all other levels (p=0.0001). A similar result occurred for catastrophizing, where teachers in an uncomfortable environment (20.3±11.4) catastrophized more than those whose environment was very comfortable (7.5±11.5) or comfortable (11.9±10.6) (p=0.0001). Teachers who had less difficulty with internet access showed lower sensitization (41.5±20.6), than those who had some difficulty (50.2±19.4) (p=0.03). Similarly, in catastrophizing, teachers with difficulty access (19.78±11.8) catastrophized more than those without difficulty (14.6±11.6) (p=0.04). There was no significant difference for CS (p=0.44) or catastrophizing (p=0.83) pain between teachers with different work schedules (Figure 1).
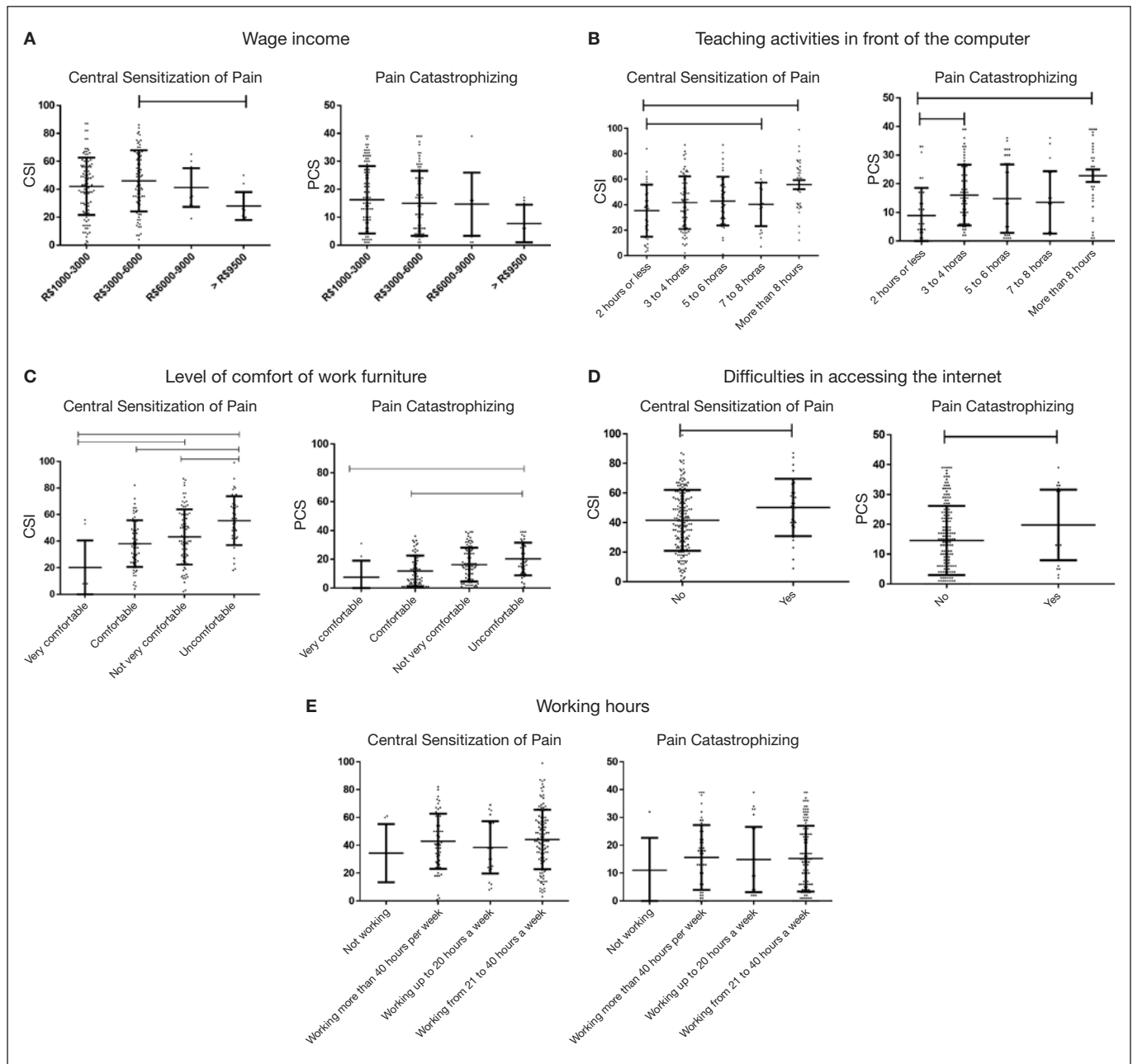

Figure 1. Level of central sensitization and pain catastrophizing according to the working condition variables of teachers during the COVID-19 pandemic.

A- According to salary income. B- According to the number of hours of teaching activities performed in front of the computer. C- According to the comfort level in the work structure. D - According to the level of difficulty in accessing the Internet. E- According to the working hours.

DISCUSSION

This study evaluated the level of CS and pain catastrophizing in the primary education network teachers during remote teaching as a result of the COVID-19 pandemic. Overall, most of the participants in this study were female, caucasian, from the southeast region, with lato sensu specialization, working in public teaching institutions, with income between R$1000 and R$3000 and with a workload of 21 to 40 hours per week and, with remote teaching, most reported difficulties to access the internet. It was observed that teachers with low salary, uncomfortable environment, more working hours dedicated to remote teaching and with difficulty in accessing the Internet had a greater tendency to CS and pain catastrophizing. Most teachers reported pain intensity equal to eight and the most affected body area was the lumbar spine.

In the study[18], carried out with Brazilian teachers with chronic pain, the body area that bothered most were upper limbs, head, lower limbs, and lumbar spine. In addition, head pain was the most persistent and the cases with low back pain presented a greater amount of time off work over 30 days compared to those with pain in other body areas.

The authors[19] also reported that the musculoskeletal area with the highest prevalence of pain was the neck. In the present study, the neck area was the second highest. Pain disrupts the quality of life of teachers and, at the same time, when they are absent from their activities, it may hinder the learning process of students, and the institution has to look for new alternatives to hire substitute teachers or ways to replace classes. As reported by the study[20], the absence of a permanent teacher can have negative effects on teaching and learning, such as disrupting school daily routines, lowering grades, and lack of interpersonal relationships with students, impairing the evaluation of learning on a daily basis and, for the institution, financial loss, breach of the proposed work plan, adaptation of the new teacher with the school and with the students, among others.

Teachers had a high tendency for pain CS, especially when compared to lower salaries. Low salaries contribute to the occurrence of illness, generating factors such as identity crisis, feelings of impotence, and discontentment, leading to future dysfunctions related to the mental health of these teachers[21]. A study[22], through a bivariable regression, observed that monthly income may be associated with cases of low back pain. It is interesting to notice that most of the articles analyzing teachers in other countries do not evaluate the salary as a predisposing factor for pain. However, in Brazil, low salaries bring complex issues not only as a professional, but as an individual. The study[23] reported that low salaries make the teaching profession unattractive, besides affecting the teacher as an individual, with little professional improvement, an intense work day that compromises extra-class activities, absenteeism, and that the standard of remuneration is inversely proportional to the occurrence of Burnout syndrome.

As for remote teaching, educators have performed their work activities at home; however, there is no appropriate infrastructure, compromising the ergonomics and physical disposition of teachers. It is worth remembering that pain, in a not so intense or frequent form for a stipulated time, has a predisposition to directly affect routine situations of an individual, causing disabilities and impairing well-being[14]. In this study, the teachers spent more than 7 hours performing academic activities in front of the computer, showed more signs of pain chronification and catastrophizing, and stated that their workplace was not comfortable. In the study[22], 25.6% of the teachers sat for a prolonged time due to curricular activities, and the average time per day was 2.8 (± 2.3) hours. On the other hand, the study[24] showed no association between sitting hours and pain prevalence, but found that the lack of support at work, absence of supervision and the lack of physical exercises are risk factors associated with the incidence of low back pain in teachers. In the present study, there was apparently no difference between the number of hours of the teachers' working days. The authors[24] also found similar results, showing that perhaps other factors are more important for the manifestation or chronification of pain.

The study[25] found that catastrophizing is an important predictor for low back pain in school teachers.

In addition, other psychosocial factors, such as fear beliefs regarding movement and in work activities, anxiety, depression, and somatization were important predictors of pain in teachers. However, the study found that work-related factors were not considered predictors, except for weight lifting over 25kg. The present study observed that teachers with greater work-related difficulties during the pandemic were more likely to catastrophize pain-related events than those in a satisfactory setting. During the period of social withdrawal, individuals with chronic pain had an increase in pain intensity by 8% and an increase in interference with pain already installed, which can be attributed to the longer period of sitting and/or the greater catastrophizing of pain. The belief is that this can generate a reduction in the work potential, consequently reflecting on the teacher's quality of life and even on the students' learning.

The present study has some limitations that must be commented on. This project was a cross-sectional study, and the ideal would have been to follow these 200 teachers for at least one semester and re-evaluate them, in order to have a better follow-up profile of their activities during the remote teaching. Another limitation is that only primary school teachers were recruited, and higher education teachers (Undergraduate and Graduate) were excluded. The expectation was that the number of participants would be much larger, however, according to the stipulated period, only the 200 responses were obtained. Based on the findings of the present study, it is possible that institutions can provide better actions to support teachers, since knowing these conditions obtained during remote teaching can help prevent pain crises and reduce absences.

CONCLUSION

Thus, it can be concluded that remote teaching during the COVID-19 pandemic impacted physical and emotional changes in teachers in the primary education network. The professionals perceived that their furniture was not the most adequate for the high amount of time they had to work on teaching activities on the computer (in general, over 40 hours a week), they repor-

ted increased pain, especially in the lumbar spine and neck, they presented higher levels of CS to pain, which was influenced by low salary income, and, in sum, teachers with a greater feeling of discomfort catastrophized more, which reflects the physical and emotional damage that pain can cause. All these affections tend to reduce the teachers' quality of life and, consequently, affect the teaching and learning process.

AUTHORS' CONTRIBUTIONS

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Statistical Analysis, Funding Acquisition, Data Collection, Conceptualization, Research, Methodology, Writing - Preparation of the Original
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Statistical Analysis, Conceptualization, Writing - Preparation of the Original, Supervision
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Stephanya Covas da Silva
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