Work 71 (2022) 395–405
DOI:10.3233/WOR-210490
IOS Press

Telework during the COVID-19 pandemic: Ergonomic and psychosocial risks among Brazilian labor justice workers

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Received 26 March 2021
Accepted 24 September 2021

Abstract.
BACKGROUND: The imposition of telework by the COVID-19 pandemic represented a challenge for companies and workers with regard to the management and organization of the workplace at home.
OBJECTIVES: To evaluate the ergonomic risks, psychosocial factors and musculoskeletal symptoms as well as the relationships between these variables in employees of a Brazilian labor judiciary unit.
METHODS: A cross-sectional study was carried out with 55 employees who had their workstations evaluated by means of the Rapid Office Strain Assessment (ROSA-Br) and answered a questionnaire of sociodemographic and occupational characterization, the dimensions of workstation and posture of the Maastricht Upper Extremity Questionnaire (MUEQ-Br-revised), the short version of the Job Stress Scale and the Nordic Musculoskeletal Questionnaire (NMQ).
RESULTS: The workstations evaluations by ROSA-Br and MUEQ-Br-revised showed a strong correlation between themselves and to body posture, but they were not related to the occurrence of musculoskeletal symptoms. Body posture and demands were correlated to each other and with to occurrence of musculoskeletal symptoms. Shoulders, neck and wrists / hands were the most affected body regions.
CONCLUSIONS: Companies that adopt teleworking for their employees must be aware of working conditions at home, including the workload, and offer adequate support in order to prevent the occurrence of musculoskeletal problems.

Keywords: Occupational health, ergonomics, occupational stress, musculoskeletal pain, teleworking, COVID-19

1. Introduction

The COVID-19 pandemic, a disease caused by the new coronavirus (Sars-CoV-2), imposed on companies and public institutions the adoption of alternatives to in-person work as a measure capable of simultaneously favoring the maintenance of service provision and social isolation, a sanitary measure necessary to preserve the health of the workers. However, many workers did not have adequate working conditions at their homes and most of the companies were not able to properly monitor the occupational risks in this context [1].

The adoption of information and communication technologies that allow work to be performed at a distance, characterize the telework [2]. Within the scope of the Brazilian judiciary system, telework became possible due to previous implementation of the electronic judicial process (PJe) and had already been regulated and implemented since 2016. Thus, up to 30% of the approximately 230,000 employees were already able to do telework prior to the pandemic,

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ISSN 1051-9815/$35.00

based on planning referring to the productivity goals, organization of the workplace, and personal and family dynamics [3–5].

Although telework is generally seen by the employees as having a potential positive effect on their health and well-being due to the greater flexibility in working hours and the longer time spent with the family, possible problems related to the configuration of the workplace and to the isolation of the co-workers can be pointed out [6, 7]. In view of the need for social isolation and the sudden way in which teleworking was imposed on most of the employees, at least at the beginning of this period there was no time for the home workplace to be organized, nor were aspects related to its management, which can involve greater occupational risk to the employees, especially ergonomic and psychosocial [8].

The adequacy of the home workplace can be related not only to the prevention of musculoskeletal problems, but also to general satisfaction with telework and even with increased self-reported productivity [9]. However, the physical working conditions can be neglected especially in this context in which the employees were not able to prepare properly and the environment and the workstation were not set up or supervised directly by the employer. Thus, the occurrence of musculoskeletal symptoms, especially in the column and upper limbs, which is known to be related to work involving the intensive use of a computer [10–13], can be even more prevalent when workstation presents poor ergonomic conditions [14–16].

Inadequate ergonomic conditions and exposure to risk factors such as repetitive movements, inadequate postures and an inappropriate workstation can be associated with the occurrence of musculoskeletal pain in workers who make intensive use of computers [17]. The configuration of the workstation that favors correct body alignment, such as adjusting the height of the table and chair and the proper positioning of the keyboard and mouse, can be related to the reduction in the occurrence of musculoskeletal complaints in the lumbar and cervical spine, as well as in the upper limbs [18].

Studies that evaluated the ergonomic conditions of teleworkers during the COVID-19 pandemic point to some adverse conditions that can be related to the occurrence of musculoskeletal problems. The exclusive use of the notebook by most of the workers, with the screen in a very low position, and the use of inappropriate chairs, without adequate lumbar support, are among the main problems observed [19, 20].

On the other hand, considering the multifactorial etiology of work-related musculoskeletal disorders (WMSDs), which involves individual characteristics, biomechanical and psychosocial factors at work, there are studies that indicate that the ergonomic adequacy of the workstation alone is not able to modify the occurrence of musculoskeletal symptoms in workers who make intensive use of computers [21–23]. Therefore, preventive interventions must be developed with the participation of the workers, also taking into account the psychosocial risk factors of work for them to be more effective [24–26]. In fact, some studies indicate that workers exposed to biomechanical and psychosocial risk factors report musculoskeletal symptoms more commonly than workers exposed to only one of the risk factors [27], and both physical work overload and high emotional and psychological demands, in addition to low social support, are predictors of musculoskeletal pain [28].

Telework can increase the workload and affect the relationship with the colleagues when carried out in a more intensive manner, reducing the socialization of the employee and with the possibility of leading to an increase in the stress levels [29], but it can also increase the workers' autonomy over the performance of their tasks due to the greater flexibility of schedules and also lead to a reduction in occupational stress, as long as there is adequate organizational support [30–33]. However, in the context of social isolation, greater autonomy can be affected by the need to share space with family members and care for children, especially those of school age [34].

As this is a relatively recent work modality, especially in the public service, there are few publications in the national and international literature dealing with this topic, especially with regard to the ergonomic risk factors in telework [35]. Considering the inseparability between the ergonomic and psychosocial factors at work in relation to the occurrence of musculoskeletal symptoms in the work context [36, 37], the objective of this study was to evaluate how these occupational risk factors promoted by telework in the context of the COVID-19 pandemic were related to the musculoskeletal problems in employees of a Brazilian labor judiciary unit.

2. Method

This is a descriptive and cross-sectional study with a quantitative approach conducted with the employees of a Regional Labor Court allocated to a Labor

Forum composed of 12 lower labor courts (first instance units).

2.1. Subjects

The employees who were teleworking specifically because of the need for social isolation were invited to participate. The employees who were on vacation or on sick leave at the time of data collection or who were already teleworking before March 2020 were not included.

2.2. Data collection

The employees were invited to participate in the research through an institutional e-mail. Data collection was carried out in the months of November and December 2020. Video calls were made using Google Meet, and the self-administered instruments were made available via the Internet using the SurveyMonkey online questionnaire and survey platform.

2.3. Data collection instruments

2.3.1. Sociodemographic and occupational characterization questionnaire

The sociodemographic and occupational characterization questionnaire included diverse information regarding the participants' age, gender, marital status, number of children, working time at the institution, position, current role and effective weekly workload.

2.3.2. Rapid Office Strain Assessment (ROSA)

Video calls were made with the participants to assess the workstation using the Brazilian version of the *Rapid Office Strain Assessment* (ROSA-Br). The participants were initially requested to display their workstations in detail and then to position the camera to the side of the workstation at the height of the table for approximately 10 minutes while they were working.

The ROSA-Br is an instrument built for the ergonomic assessment of the workstation with the use of a computer through an observational evaluation and presents acceptable levels of reliability, accuracy and validity for assessments both in person [38] and through images of the workstation [39]. Its validation for Brazilian Portuguese (ROSA-Br) was carried out by Rodrigues and collaborators [40], whose results demonstrated the validity of its use in research studies involving ergonomic evaluation of the workstation using the computer.

The ROSA allows observers to quickly quantify risk factors related to office computer work and provide information on future workplace interventions. Risk factors were grouped into the following three sections: chair (section A), monitor and telephone (section B), and keyboard and mouse (section C). Section A has four sub-sections: seat pan height, seat pan depth, arm supports and backrest. The risk factors were diagrammed and coded as increasing scores from 1 to 3. ROSA final scores ranged in magnitude from 1 to 10, with each successive score representing an increased presence of risk factors. The research on the ROSA established a ROSA final score of 5 as a cut-off value for the recommended ergonomic intervention [38, 40].

2.3.3. Maastricht Upper Extremity Questionnaire (MUEQ)

The participants' workstation and posture were assessed using the Brazilian version of the Maastricht Upper Extremity Questionnaire (MUEQ-Br-revised). The MUEQ is a questionnaire developed in the Dutch language [41] and had its Brazilian version validated by Turci and collaborators [42]. It is an instrument that investigates the occupational risk factors and the occurrence of musculoskeletal symptoms in the neck and upper limbs in computer users.

In this study, only the physical work risk factors discriminated in the "workstation" and "posture" domains of the MUEQ-Br-revised were evaluated using this instrument. These domains assess the participants' condition in making adjustments to the furniture and computer equipment and the positioning of the vertebral column and upper limbs during the work activity. The workstation domain has six questions, with a maximum score of 6 points, while the body-posture during work domain has 6 questions and ranges from 0 to 18 points. For both domains, higher results represent worse ergonomic and posture conditions, respectively [42].

2.3.4. Job Stress Scale (JSS)

The psychosocial aspects of work were assessed using the Brazilian version of the Job Stress Scale [43], in the reduced version of the questionnaire originally prepared by Karasek and developed in Sweden by Theorell (1988). The JSS contains 17 questions divided into three domains: five to assess demands, six to assess control, and six to assess social support at work. The three domains include aspects such as time and speed of work, the conflict between different requirements, the use and development of skills, the

authority to make decisions about the work process, and the relationships with colleagues and management.

For the dimensions of demands and control, the answer options are presented on a Likert-type scale (1-4), ranging from "frequently" to "never/almost never", resulting in scores varying from 5 to 20 and from 6 to 24, respectively. The social support dimension contains six questions with four answer options on a Likert-type scale (1–4) with variation between "strongly agree" and "strongly disagree", resulting in a score from 6 to 24. In the model proposed, the results for each of the dimensions were presented in such a way that higher results in demands and lower results in control and social support represent greater risk of occupational stress [43].

Also, according to the model, the median scores are allocated in four quadrants so as to express the relationship between demands and control. The coexistence of high psychological demands with low control over the work process generates high wear out in the workers, with harmful effects on their health. The situation with low demands and low control (passive work) can also be harmful, depending on the individual characteristics of the worker. On the other hand, in situations of high demands and high control, the individuals experience the work process actively. The situation of low wear out combines low demands and high control of the work process [43].

2.3.5. *Nordic Musculoskeletal Questionnaire (NMQ)*

The occurrence of musculoskeletal symptoms was assessed using the Nordic Musculoskeletal Questionnaire (QNSO). This instrument was created by Finnish researchers in order to standardize the evaluation of the musculoskeletal symptoms in the occupational context [44] and was culturally adapted to the Portuguese language by Barros and Alexandre [45]. The QNSO is composed of questions regarding the presence of symptoms in the neck, shoulder, elbow, wrist and hand, dorsal, cervical, lumbar spine, hips, thighs and buttocks, knees, ankles and feet in the last 12 months and in the last seven days. The results were presented in relation to the proportion of employees with complaints in each body region and in relation to the number of body regions with complaints for each employee. In order to adapt the assessment to the employees' teleworking period, the symptoms were investigated in the 6 months prior to data collection and in the last seven days.

In summary, the use of quantitative instruments to assess ergonomic and psychosocial risks sought to establish correlations with musculoskeletal problems. The ROSA-Br provides objective information about the workstation and the MUEQ-Br-Revised through the worker's own perception. The JSS is a widely used instrument to assess psychosocial factors, while the NMQ points out the main body regions affected.

2.4. *Data analysis*

Descriptive analyses were performed from the elaboration of frequency tables with absolute (n) and percentage (%) values, measures of position (mean, median, minimum and maximum) and of dispersion (standard deviation and Interquartile Range – IQR) for all the variables. The Kolmogorov-Smirnov test was used to verify the distribution of the data, which did not present normal distribution. The quantitative variables were related using Spearman's correlation coefficient. Correlations between 0.10 and 0.29 were considered as satisfactory but weak; between 0.30 and 0.49 as moderate, and equal to or greater than 0.50 as strong. The comparisons between the groups according to the ergonomic risk presented by ROSA-Br were performed using the Mann-Whitney test. P-values < 0.05 were considered statistically significant and the SPSS software, version 22.0, was used for the analyses.

2.5. *Ethical aspects*

This study was conducted in accordance with CNS Resolution 466/12 and complementary resolutions. The research project was authorized by TRT's management and obtained consent from the union representing public servants. It was submitted to the Research Ethics Committee (CEP) of the University of Campinas (Unicamp) and approved under opinion 4.327.241/2020. The participants were only able to join the study and had their data used in accordance with a free and informed consent form presented on the research homepage, without which access to the data collection instruments would not have been possible.

3. Results

Among the 65 employees working at the Labor Forum who did not do teleworking prior to the COVID-19 pandemic, two were on sick leave and

Table 1
Descriptive analysis of sociodemographic and occupational characteristics ($n = 55$)

Variable	*n* (%)	Mean (SD*)	Median (IQR**)	Variation
Age (years)		42.6 (7.5)	42.0 (10.0)	29.0–64.0
Gender				
Female	37 (67.3)			
Male	18 (32.7)			
Marital status				
Single	19 (34.5)			
Married	31 (56.4)			
Divorced	3 (5.5)			
Widower	2 (3.6)			
Number of co-residences				
0	9 (16.4)			
1	21 (38.2)			
2	12 (21.8)			
3	13 (23.6)			
Number of children				
0	34 (61.8)			
1	12 (21.8)			
2	9 (16.4)			
Role				
Executor	2 (3.6)			
Judicial technician	43 (78.2)			
Judicial analyst	10 (18.2)			
Working time (years)		10.3 (6.9)	9.0 (6.0)	2.0–33.0
Weekly workload (hours)		38.1 (3.7)	40.0 (5.0)	25.0–48.0

*SD = Standard Deviation; **IQR = Inter-Quartile Range.

one was on vacation at the time of data collection. The other 62 employees were invited by means of an institutional e-mail, among which 55 accessed the research link and agreed to participate in the study by agreeing to the free and informed consent form. Therefore, a response rate of 88.7% was obtained, with the participation of employees from the 12 units of the Labor Forum.

The mean age of the participants was 42.6 (7.5) years old and the mean working time at the institution was 10.3 (6.9) years. Nearly two thirds of the participants were female (67.3%), most were married and had no children. Only 16.4% of the employees lived alone, 78.2% occupied the position of judicial technician and the mean weekly workload was 38.1 (3.7) hours (Table 1).

The assessment of the workstation using the ROSA-Br presented a mean of the total score of 4.8 (1.6), close to the upper limit of what is considered to have an ergonomic risk and the need for immediate adaptation. This result was largely determined by the evaluation score of section A (chair), which also obtained a score of 4.8 (1.6), while sections B (Monitor/Telephone) and C (Mouse/Keyboard) presented scores of 1.5 (0.6) and 3.6 (1.4), respectively. The evaluation of the workstation by the MUEQ-Br-revised showed a result of 1.0 (1.1) and the mean posture score was 6.7 (2.5). As for the psychosocial factors, demands presented a mean of 13.9 (3.5), control 13.9 (3.5) and social support 21.7 (2.4). In the last 6 months, the employees reported, on average, musculoskeletal problems in little more than 3 body regions, while in the last seven days, they reported problems in little more than one body region (Table 2).

Passive work, with low demands and low control concentrated the largest number of participants, while the smallest group presented low demands and high control (Table 3).

As for the proportion of musculoskeletal problems in each body region, shoulders, neck and wrists/hands were the regions with the most complaints both in the last 6 months and in the last seven days. With regard to the limitation to perform tasks and the need to consult a health professional, the problems in the lumbar spine overcame the problems in wrists/hands (Table 4).

The results of the workstation evaluations using ROSA-Br and MUEQ-Br-revised showed a strong correlation with statistical significance, especially the result of section A (chair). Both assessments of the workstation also showed significant correlations of lesser magnitude with the assessment of posture by the MUEQ-Br-revised. The results of posture and

Table 2
Ergonomic risk, psychosocial factors and musculoskeletal symptoms ($n = 55$)

Variable	Mean (SD*)	Median (IQR**)	Variation
ROSA-Br			
Total score (1–10)	4.8 (1.6)	4.0 (3.0)	3.0–9.0
Section A – Chair (1–10)	4.8 (1.6)	5.0 (3.0)	3.0–9.0
Chair height (1–5)	2.0 (1.0)	2.0 (2.0)	1.0–4.0
Pan depth (1–3)	1.6 (0.7)	1.0 (1.0)	1.0–3.0
Armrest (1–5)	2.3 (0.9)	2.0 (1.0)	1.0–4.0
Backrest (1–4)	2.2 (1.1)	2.0 (2.0)	1.0–4.0
Section B – Monitor/telephone (1–9)	1.5 (0.6)	1.0 (1.0)	1.0–3.0
Section C – Mouse/keyboard (1–9)	3.6 (1.4)	3.0 (2.0)	2.0–7.0
MUEQ-Br-revised			
Workstation (0–6)	1.0 (1.1)	1.0 (2.0)	0.0–4.0
Body posture during work (0–18)	6.7 (2.5)	6.0 (4.0)	1.0–13.0
JSS			
Job demands (5–20)	13.9 (3.5)	14.0 (5.0)	6.0–20.0
Job control (6–24)	17.6 (2.3)	18.0 (3.0)	8.0–22.0
Social support (6–24)	21.7 (2.4)	22.0 (4.0)	15.0–24.0
NMQ			
Problems in the last 6 months (0–9)	3.2 (1.7)	3.0 (2.0)	0.0–7.0
Impediments in the last 6 months (0–9)	0.6 (1.1)	0.0 (1.0)	0.0–4.0
Consultation in the last 6 months (0–9)	0.7 (1.4)	0.0 (1.0)	0.0–5.0
Problems in the last 7 days (0–9)	1.3 (1.4)	1.0 (2.0)	0.0–5.0

*SD = Standard Deviation; **IQR = Inter-Quartile Range.

Table 3
Prevalences according to Karasek's demand/control model ($n = 55$)

Demand-control model		*n* (%)
Low job strain	Low demand/high control	9 (16.4)
Passive work	Low demand/low control	21 (38.2)
Active work	High demand/high control	11 (20.0)
High job strain	High demand/low control	14 (25.5)
Total		55 (100.0)

Table 4
Distribution of musculoskeletal complaints by body region ($n = 55$)

	Problems in the last 6 months *n* (%)	Impediments in the last 6 months *n* (%)	Consultation in the last 6 months *n* (%)	Problems in the last 7 days *n* (%)
Neck	30 (54.5)	5 (9.1)	5 (9.1)	14 (25.5)
Shoulders	33 (60.0)	6 (10.9)	7 (12.7)	12 (21.8)
Upper back	22 (40.0)	2 (3.6)	5 (9.1)	8 (14.5)
Elbow	10 (18.2)	3 (5.5)	3 (5.5)	4 (7.3)
Wrists/hands	30 (54.5)	4 (7.3)	4 (7.3)	11 (20.0)
Lower back	24 (43.6)	5 (9.1)	7 (12.7)	10 (18.2)
Hip/thighs	7 (12.7)	2 (3.6)	2 (3.6)	3 (5.5)
Knees	9 (16.4)	2 (3.6)	2 (3.6)	3 (5.5)
Ankles/feet	9 (16.4)	2 (3.6)	4 (7.3)	5 (9.1)

demands showed a statistically significant correlation with each other and with the occurrence of musculoskeletal problems (Table 5).

As for the ergonomic risk pointed out by ROSA-Br, 47.3% of the participants presented a score greater than or equal to 5, when considering the need for immediate intervention. When the participants were separated into two groups according to this risk, a significant difference was observed in the results of the workstation evaluated by the MUEQ-Br-revised, with no differences regarding the results of posture and the occurrence of musculoskeletal problems according to the ergonomic risk (Table 6).

4. Discussion

This study evaluated the ergonomic risk, the psychosocial factors and the occurrence of musculoskeletal symptoms, as well as the relationships between these variables in employees of the Brazilian labor judiciary system who were teleworking specifically because of the need for social isolation resulting from the COVID-19 pandemic. Telework was imposed abruptly and for an indefinite period of time, which hindered the adequacy of the workplace and its organization. More recent studies have pointed to inadequate ergonomic conditions among office workers during this period, with an increase in musculoskeletal complaints [19, 20]. In this context, our hypothesis was that the ergonomic and psychosocial risks could be higher, which may be related to the occurrence of musculoskeletal symptoms.

Table 5
Spearman's correlation coefficient between ergonomic risks, psychosocial factors and musculoskeletal problems ($n = 55$)

Variable	Workstation (MUEQ-Br)	Posture (MUEQ-Br)	Musculoskeletal problems in the last 6 months	Musculoskeletal problems in the last 7 days
ROSA-Br – Total score	0.64**	0.27*	0.05	0.03
ROSA-Br – Section A	0.70**	0.23	–0.11	–0.05
ROSA-Br – Section B	0.26	0.20	0.26	0.06
ROSA-Br – Section C	0.49**	0.10	–0.08	–0.07
Workstation – MUEQ-Br	–	0.34*	–0.06	0.01
Posture – MUEQ-Br	0.34*	–	0.35**	0.29*
Job demands	0.11	0.41**	0.21	0.27*
Job control	–0.06	–0.05	–0.18	0.00
Social support	–0.07	–0.19	–0.08	–0.23

*$p < 0.05$; **$p < 0.01$.

Table 6
Association between ergonomic factors and musculoskeletal problems according to ROSA-Br score ($n = 55$)

Variable	ROSA-Br	n	Median (IQR)	Variation	p-value*
Workstation – MUEQ-Br	< 5	29	0.5 (0.7)	0.0–2.0	0.00
	≥5	26	1.7 (1.2)	0.0–4.0	
Posture – MUEQ-Br	< 5	29	6.0 (3.0)	1.0–11.0	0.14
	≥5	26	6.5 (4.0)	3.0–13.0	
Musculoskeletal problems in the last 6 months	< 5	29	3.0 (2.0)	0.0–6.0	0.86
	≥5	26	3.0 (2.0)	0.0–7.0	
Musculoskeletal problems in the last 7 days	< 5	29	1.0 (3.0)	0.0–4.0	0.83
	≥5	26	1.0 (2.0)	0.0–5.0	

*Mann-Whitney test.

The originality of this study was the inclusion of the ergonomic assessment of the workstation by means of video calls with teleworkers. In view of the growth in telework, especially driven by the context of the COVID-19 pandemic, new ways of monitoring the working conditions and occupational health must be considered.

Among the instruments available and validated for Brazilian Portuguese to assess the workstation in activities that require intensive computer use, in this study we chose to use an instrument that depends on the observation of the workstation by the researcher and that could be performed by means of a video call (ROSA-Br) and an instrument that allowed this assessment in a manner reported by the workers themselves (MUEQ-Br-revised). In this way, we sought to relate the results of both workstation evaluations. The results of the two instruments showed a strong correlation with statistical significance. In the same sense, the results of the workplace evaluated by the MUEQ-Br-revised showed a statistically significant difference when comparing the groups according to the ergonomic risk by ROSA-Br, with the group that presented the highest ergonomic risk by ROSA-Br (score ≥ 5) also presenting higher risk by MUEQ-Br-revised.

The results of the evaluations of the employees' workstation by ROSA-Br showed, on average, reduced ergonomic risk, with most of the participants having a score below 5. This result was very close to that presented in the study by Besharati et al. [11], in which 46.2% of the participants in face-to-face work presented high ergonomic risk (≥5) according to ROSA. In a study also carried out under live working conditions, Rodrigues et al. [46] observed a higher ergonomic risk assessed through ROSA-Br in administrative workers in relation to our study, both among the workers who did not present musculoskeletal complaints (5.9) and among those with some complaint (6.7). On the other hand, this same study observed a lower ergonomic risk when evaluated through the workstation dimension of MUEQ-Br-revised in relation to our study.

Although all the participants were surprised by the imposition of telework, this study was carried out approximately eight months after the beginning of the COVID-19 pandemic. We think that this period could may have been sufficient for a better adaptation

of the home workplace, since some ergonomic guidelines were remotely provided by the institution. Some studies indicate that both direct ergonomic interventions in the workstation and ergonomic guidelines for the workers are able to reduce the ergonomic risk assessed by ROSA, and improve the posture during work [47–49]. Considering that the results of body posture during work according to the MUEQ-Br-revised can vary from 0 to 18, a maximum score of 13.0, with a mean of 6.7, should represent a reduced risk for the occurrence of musculoskeletal symptoms. These results are similar to those obtained in other studies that evaluated this dimension in Brazilian workers who used computers in the in-person modality [46, 50].

As for the psychosocial factors of work, the positive influence of the social support dimension stands out, with a mean of 21.7 (2.4), while demands and control showed intermediate results. This result for the social support dimension was surprising in the sense that teleworking has the potential to affect the relationship with the colleagues and the management due to the difficulty of communication, especially in a context of social isolation [8, 29]. Although the productivity goals have been maintained, the suspension of desk services and face-to-face hearings may also have favored the results of the psychosocial factors [5]. Only a quarter of the participants were classified as having high-strain work, while the highest prevalence was for the passive work group.

In our study, the employees presented, on average, problems in 3.2 (1.7) and 1.3 (1.4) body regions in the 6 months and in the seven days prior to data collection, respectively. Shoulder, neck and wrist/hand problems were the most prevalent, both in the last 6 months and in the last seven days. Although to a lesser extent, as for the most affected body regions, these results are similar to the study carried out three years earlier with 1st instance civil servants from the same institution in face-to-face work [51] and to the study by Besharati et al. [11] with administrative workers. Specifically, in telework during the COVID-19 pandemic, Gerding et al. [20] noted levels of moderate to severe discomfort in more than 40% of the workers in the eyes/neck/head, upper back/shoulders, and lower back regions. In this study, only 21.5% of the participants stated they experienced moderate to severe discomfort in at least one body region while working in their normal office before the COVID-19 pandemic. Other studies that used the NMQ as an instrument to assess musculoskeletal symptoms pointed out the lumbar spine among the most affected body regions in workers who make intensive use of computers in face-to-face work [12, 13, 52, 53]. Although lumbar spine problems are not among the three most prevalent in our study, they appear in the fourth position and are among the most related to limitations in the daily activities and appointments with health professionals.

Considering that the mean weekly workload among the participants of our study was 38.1 (3.7) hours, varying between 25.0 and 48.0 hours, these results were similar to the studies that pointed to an increased risk for the occurrence of musculoskeletal symptoms in neck, upper limbs and lumbar spine according to the time of computer use at work [54–57]. In this context, musculoskeletal overload is related to the physical factors of work, to individual factors and to psychosocial factors [58]. According to the systematic review by Keown et al. [59], specifically cervical pain related to work with the use of a computer depends on the interaction between workload, ergonomic aspects and psychosocial factors.

Unlike other studies that assessed the relationship between the results of the workstation evaluations using ROSA or MUEQ with the occurrence of musculoskeletal symptoms in face-to-face work [11, 38, 46, 47], our study did not point to these relationships on teleworking employees. Both assessments of the workstation presented significant correlations with the posture dimension of MUEQ-Br-revised, although no difference was observed regarding the posture result when comparing the groups according to the ergonomic risk by ROSA-Br. With regard to the psychosocial factors, the demands dimension presented a significant correlation with posture and with the occurrence of musculoskeletal symptoms. The study by Rodrigues et al. [46], on the other hand, did not observed significant differences for the results of posture and demands assessed by MUEQ-Br-revised between workers with and without musculoskeletal complaints in face-to-face work.

Differently from in-person work, teleworkers have greater autonomy to decide on taking breaks and making changes to their work station, aiming at comfort and pain relief. This can explain the absence of correlation between the results of the workstation and the number of musculoskeletal complaints in our study.

Despite the unfavorable context of telework in social isolation, the results regarding the ergonomic and psychosocial risks and the occurrence of musculoskeletal problems did not present themselves in a high proportion in our study. It can be assumed that, even in this atypical period, the benefits of telework

for the employees in this sample have prevailed over the possible risks. Greater autonomy in carrying out work activities at home with regard to alternating postures, taking rest breaks and organization of the workday can be related to the lack of correlation between the ergonomic adequacy of the workstation and the occurrence of musculoskeletal symptoms. In addition to that, the previous experience of the institution and its managers with regulated telework in recent years may have favored adequate organizational support even in the context of a pandemic [60]. These results are in agreement with the study by Rodríguez-Nogueira et al. [61], who observed a reduction in musculoskeletal complaints in the period of telework in social isolation due to the COVID-19 pandemic among administrative workers.

Among the limitations of this study, only workers in the labor judiciary were evaluated, who perform a specific activity related to processing and procedural analysis. Studies carried out with workers from different activities should provide additional information about the risks of teleworking. Additionally, data collection was carried out only eight months after the onset of the COVID-19 pandemic, which may have led to a better adequacy of the workplace at the homes.

Finally, we highlight its cross-sectional design as a limitation, which, despite allowing analysis through correlations and comparisons between variables, does not make it possible to establish cause and effect relationships. We suggest that longitudinal studies with a larger number of participants be carried out in order to better assess how the ergonomic and psychosocial risk factors are related to the occurrence of musculoskeletal problems in telework.

5. Conclusion

The ergonomic risk factors represented by the adequacy of the workstation, especially when assessed by ROSA-Br, indicated inadequate working conditions at the homes of many workers during the COVID-19 pandemic. With the continuity of teleworking, companies must pay attention to the working conditions of their employees, including the workload, with a view to preventing musculoskeletal problems.

Conflict of interest

None to report.

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