ORIGINAL ARTICLE

Musculoskeletal discomfort associated with remote work conditions of professors during the COVID-19 confinement in Colombia

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Abstract

Remote working led to organizational and adaptive processes at workplaces, with ergonomic and psychosocial risk factors being present that could be associated with musculoskeletal symptoms. This study identifies musculoskeletal discomfort developing in this setting among university professors working remotely because of the COVID 19 pandemic, evaluates risk levels associated with this workplace, and estimates the need for remedial action. The study had a quantitative, observational, cross-sectional design and used a secondary source of information. Statistical analysis used Jamovi software. Professors reported primarily neck discomfort, followed by discomfort in the dorsal or lumbar region. A statistically significant association was found between the category "requires action" and those who reported dedication to occupational activities more than eight hours per day. Work at home conducted by the professors is related to discomfort on the neck and dorsal or lumbar region. Risk assessment shows that, under these conditions, the professors required timely action to avoid worsening discomfort, functional limitation, and work absenteeism.

El trabajo a distancia generó procesos de organización y adaptación de los lugares de trabajo, con presencia de factores de riesgo ergonómicos y psicosociales que podrían provocar la aparición de síntomas musculoesqueléticos. El estudio identifica molestias musculoesqueléticas, evalúa el nivel de riesgo asociado al ámbito laboral, estima la necesidad de actuación y las asociaciones existentes en los docentes universitarios que realizaron trabajo remoto debido a la pandemia del COVID-19. El estudio contó con diseño cuantitativo, observacional, transversal y fuente de información secundaria, con análisis estadístico a través del software Jamovi. Los profesores reportaron molestias en el cuello, seguido de la región dorsal o lumbar; se encontró asociación estadísticamente significativa entre la categoría "requiere acción" con aquellos que relataron dedicación a actividades ocupacionales > 8 h/día. Se concluye que el trabajo en casa realizado por los profesores estuvo relacionado con molestias en el cuello y región dorsal o lumbar; la evaluación de riesgos muestra que en esas condiciones los profesores requerían una actuación oportuna para evitar que se agudizaran las molestias, la limitación funcional y el ausentismo laboral.

Key words: Musculoskeletal pain, Ergonomic evaluation, Professor, Working conditions, Pandemic, COVID-19

Introduction

Remote work at home was a guideline established by the Colombian national government within the framework of the health emergency as a mitigation strategy to counteract the spread of COVID- 19. According to Legislation 2121 of 2021, this mode of working indicates that a job can be conducted in any physical space, with the approval of the Labor Risk Administrator (ARL, for the term in Spanish) as established in a work contract and carried out by using information and communications technology (ICT).[1] For professors, this strategy, implemented by Universidad de los Llanos as a safeguard measure, implied transforming the pedagogical dynamics to a model characterized by ICT-mediated synchronous remote meetings.[2] This work modality was associated with long days in front of the computer, increased study hours and preparation to respond to demands, decreased physical activity, and decreased rest time. These features constitute a psychosocial risk factor, and which – according to Molina and Valencia[3] – lead to feelings of overburdening, exhaustion, and burnout and the appearance or exacerbation of musculoskeletal symptoms. Prolonged maintenance of inappropriate sitting postures,[4] as reported, cause greater static load on the structures, in the absence of pertinent strategies to decrease risks.

Garcia Salirrosas[5] and Rosario Amézquita[6] define musculoskeletal discomfort as a set of disorders of the locomotor system associated with structural and functional conditions of the joints and associated structures, including muscles, fascia, tendons, ligaments, and nerves. The most-frequent symptom is pain associated with inflammation, loss of muscle strength, and functional limitation. These types of discomfort can affect every individual, at any age, especially actively working people.[7] Another element that affects the onset of musculoskeletal discomfort is physical inactivity. According to the World Health Organization (WHO),[8] lack of physical activity and sedentary lifestyle affects the individual's muscle status, bone health, and functional status. The university professors' exposure to prolonged static loads and inappropriate postures added to pre-existing health problems and constitute risk factors for the onset of musculoskeletal discomfort.[9]

It is important to note that the ergonomic conditions of the workplace because of the use of the computer, mouse, and work station are factors that affect the onset or worsening of musculoskeletal discomfort.[10] Such discomfort occurs principally in upper extremities due to repetitive movements and uncomfortable postures in wrists and hands and discomfort in neck and back associated with an incorrect sitting posture or lack of back support.[11]

The aim of this study was to measure musculoskeletal discomfort, determine the level of risks associated with the workplace, estimate the need for action, and evaluate the possible association between musculoskeletal discomfort and the need for action in university professors who engaged in remote work during the COVID–19 pandemic.

Methods

A quantitative, observational, cross-sectional study was conducted, using a secondary data source. The secondary data stemmed from a study on the characterization of musculoskeletal symptoms and description of risks in the workplace, elaborated by the researchers during the COVID-19 pandemic confinement period (2nd semester of 2020). The study was performed with full-time professors at the Universidad de los Llanos. Non-probabilistic convenience sampling was used. Google Forms were distributed to 170 full-time professors with an invitation to participate in the research in a voluntary but guided manner. The link to the form was shared through the institutional e-mail web server to guarantee exclusive access by the professors; other

institutional channels were used (phone call, social media, and e-mail) to notify the professors about the research and encourage their participation. Responses were obtained from 61 professors, with 35.8% participation.

The form consisted of three parts: the first collected data on variables of interest such as age, sex, relationship time, maximum level of training, hours dedicated to teaching, housework and training studies, dominant laterality, previous disability, and diagnosis of common and occupational disease. The second part was the application of the Nordic Questionnaire by Kuorinca that permitted the study participants to self-report the perception of musculoskeletal symptoms or discomfort by body segments.[12 -13] The third part corresponded to the application of the instrument denominated ROSA (Rapid Office Strain Assessment) method, which through a designed verification list quickly quantifies the potential risks that may be associated with office work.[11] To determine the risk level of professors with the ROSA method, it was considered that the worker remains in a sitting posture in front of a surface, and manages information equipment with a data visualization screen.[14] The evaluation kept in mind the most-common elements in these work stations, chair, work surface, screen, keyboard, mouse, and other peripherals. As a result of its application, an assessment of the risk was measured and an estimate of the need to act to reduce the level of risk was obtained. For the purposes of this article, the results obtained from the risk assessment will be categorized as follows: levels 0 and 1were grouped into the new minimum action category and levels 2, 3, and 4 were grouped into the necessary action category (Table 1).

Table 1. Risk and ROSA level of action

Score	Risk	Level	Action	Modified Action
1	Inappreciable	0	No action is necessary	Minimum action
2 - 3 - 4	Improvable	1	Some elements of the workplace can be improved	Minimum action
5	High	2	Action is necessary	Necessary action
6 - 7 - 8	Very High	3	Action is required as soon as possible	Necessary action
9 – 10	Extreme	4	Action is urgently necessary	Necessary action

Note. Source: prepared by the authors based on the original table of Diego-Mas, JA. (2019), Evaluation of Office Positions using the ROSA Method. Ergonauts, Polytechnic University of Valencia, 2019.

The database was organized prior to statistical analysis, guaranteeing the completeness of all records. The statistical analysis was performed with the Jamovi software, version 2.2.5 Solid. For descriptive statistical analysis, the study used absolute and relative frequencies for the qualitative variables. Quantitative variables were described according to the type of distribution presented, as per the normality test (Shapiro-Wilk), determining mean with standard deviation or median with interquartile range. Associations between variables of interest were analyzed using Chi Square tests or Fisher's exact test, according to the expected frequencies in the contingency tables.

The study was endorsed by external evaluators of the internal call by Universidad de los Llanos "Strengthening Research Groups" and by the Institutional Ethics Committee; for its part, the database had the Informed Consent from participating teachers.

Results

Characterization of the participants

For all the participants, 42.6% were male and 57.4% were female, ranging between 32 and 65 years of age, with a mean age of 49.1 (±8.52) years. The median duration of seniority as professor was 11 years; 23% of the professors were studying in graduate programs (Master's or PhD) when they participated in the research. 62.3% of the participants reported spending more than eight hours per day in front of a computer. 14.8% of the professors indicated that in the year prior to the study they had had a medical disability due to a diagnosis of musculoskeletal origin. Finally, 21.3% had a pathology related to a musculoskeletal

disorder, and 11.5% reported a prior occupational osteo-diagnosis (Table 2).

Table 2. Characteristics of the participants

Age (Mean ± SD)	49.1 (8.52)	
Number of years working [Median (Q3-Q1)]	11(16-6)	
	Male	**Female**
Maximum Formation		
Undergraduate	1 (3.8)	0
Specialization	7(26.9)	4(11.4)
Master's	15(57.7)	23(65.7)
PhD	3(11.5)	8(22.9)
Dominant laterality		
Right handed	26 (100)	34(97.4)
Left handed	0	1(2.9)
Previous occupational osteo-diagnosis		
Yes	2(7.7)	5(14.3)
No	24(92.3)	30(85.7)

Musculoskeletal discomfort

Of all the professors participating, 83.6% reported having had pain in some part of the body. Upon assessing the musculoskeletal discomfort reported in Table 3, zoned discomfort was observed in neck, shoulders, elbows, wrists, or hands and in the dorsal-lumbar region during the six months prior to the study. Of the body regions inquired, neck pain was the most-often reported (67.2%), while dorsal or lumbar pain was second (62.3%), and pain in wrists or hands third (49.2%). According to pain intensity, in the strong and very strong category, the most-affected zone reported by the participants was the dorsal or lumbar region with 34.4%, followed by the neck zone with 27.9%. Pain intensity in the wrists or hands was reported between slight and moderate by 36.1%.

The time during which professors were prevented from carrying out their work due to the most-often reported musculoskeletal pain was from 1 to 7 days in 33.3% of the professors who reported discomfort in the wrists or hands, in 19.7% of those with pain in the dorsal or lumbar region and in 19.5% of those who reported neck discomfort.

Of all the participants, 73.8% reported musculoskeletal discomfort on some body segment during the week prior to the study (last seven days). Only 9.8% of the professors consulted and received treatment for the discomfort reported.

Table 3. Discomfort self-perceived by professors by body segment

	Neck	**Shoulder**	**Elbow or forearm**	**Wrists or hands**	**Dorsal or Lumbar**
Discomfort last six months					
Yes	41 (67.2)	23(37.7)	13(21.3)	30(49.2)	38(62.3)
No	20(32.8)	38(62.3)	48(78.7)	31(50.8)	23(37.7)
Intensity of pain					
Slight	11(18)	7(11.5)	5(8.2)	12(19.7)	8(13.1)
Moderate	13(21.3)	8(13.1)	4(6.6)	10(16.4)	9(14.8)
Strong	13(21.3)	6(9.8)	2(3.3)	4(6.6)	10(16.4)
Very strong	4(6.6)	2(3.3)	2(3.3)	4(6.6)	11(18)
Time of impediment					
1 day	22(53.6)	19(82.6)	9(69.2)	19(63.3)	19(50)
1 to 7 days	8(19.5)	3(13)	2 (15.4)	10(33.3)	12(31.6)
1 to 4 weeks	2(4.9)	1(4.35)	0	0	2(5.3)
Had no impediment	9(21.9)	0	2(15.4)	1(3.3)	5(13.2)

Level of risk at the home workplace

Using the ROSA instrument, data shown in Table 4, 94.7% of the participants reported pain in the last six months, and 84.2% manifested pain in the last seven days. 76.3% of the professors who reported work duration of more than eight hours daily were classified in the "necessary action" category. 60.9% of professors in the "minimum action" category work more than eight hours daily in a sitting posture in front of a screen; 34.8% and 43.5% do not report pain during the periods inquired. The "requires action" category was

statistically significantly associated with the presence of pain in the last seven days, as well as with duration of teaching per day and with change of position.

Table 4. Risk level of professors during remote work at home ROSA score

	Minimum Action	*Necessary action*	Total	p value
Sex				
Female	10(43.5)	25(65.8)	35(57.4)	0.088
Male	13(56.5)	13(34.2)	26(42.6)	
Pain last six months				
Yes	15(65.2)	36(94.7)	51(83.6)	0.004*
No	8(34.8)	2(5.3)	10(16.4)	
Pain last seven days				
Yes	13(56.5)	32(84.2)	45(73.8)	
No	10(43.5)	6(15.8)	16(26.2)	0.033*
Hours of teaching /day				
< 8 h	14(60.9)	9(23.7)	23(37.7)	
> 8 h	9(39.1)	29(76.3)	38(62.3)	0.04
Required change of workplace				
Yes	7(30.4)	25(67.6)	32(53.3)	
No	16(69.6)	12(32.4)	28(46.7)	0.005

Note*:* *The p value obtained corresponds to Fisher's exact test

Of note, the percentage of women requiring action was 64.8% with respect to 34.2% for men. However, Chi square testing did not show these differences to be statistically significant.

Discussion

During the mandatory confinement during the COVID-19 pandemic, university professors reported the onset or worsening of musculoskeletal discomfort occasioned by the ergonomic conditions of a home workplace. This agrees with the report by Vallejo *et al*.,[4] who found that virtual working is associated with the onset of musculoskeletal symptoms.

Our study found 83.6% of the participants reporting pain in some body segment associated with sitting postures working at video terminals, a similar result to that reported in the research by Garcia Salirrosas,[5] who, under the same study conditions, found that 100% of the professors participating had musculoskeletal discomfort. The musculoskeletal discomfort associated with work conditions is the result of postural biomechanical alterations characterized by accumulated static muscle tension, especially in the neck and lower back muscles, as well as repetitive movements in wrists and hands, as stated by Vernaza-Pinzon & Sierra Torres.[14]

The areas with the greatest presence of pain reported by the professors participating in the study were the neck (67.2%), the dorsal or lumbar region (62.3%), and wrists or hands (49.2%), similar results to those published by Gutierrez & Diaz[9] who indicated presence of pain in 85.5% of the participants in the following segments: neck (81.9%), dorsal or lumbar (72.3%), and wrists or hands (45.8%).

Regarding the time dedicated to remote work activities at home, duration more than eight hours was associated with the need to implement action measures. There was also evidence that posture, static load, and repetitive movements were supplement to time in front of the computer in terms of risk. In relation to identifying the level of risk, the study results show that 94.7% of the participants who reported pain were placed in the category of necessary action, an important condition to intervene to avoid the onset of occupational diseases. This finding is higher than that found by Vallejo, where 50% of the people placed in the category of necessary or immediate action.

These results highlight the importance of studying the management of ergonomic risk by the professors, as well as training the professors on the prevention of occupational risks in work conducted with video terminals, the importance of active breaks to allow rest and comfort for stressed muscles. A low participation by professors is a limitation of the study, which hinders extrapolating the results to the entire population.

Conclusion

The ergonomic conditions of the workplace adopted during work at home by professors during the confinement period are associated with the onset or worsening of musculoskeletal discomfort, especially in the neck, dorsal-lumbar region, and

wrist-hand area; the situation was aggravated in professors who reported a work shift lasting more than eight hours and required adaptations to their home workplace.

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