

Musculoskeletal symptoms in professors: implications of the COVID-19 pandemic

Sintomas osteomusculares em docentes do ensino superior: implicações da pandemia de covid-19

Síntomas musculoesqueléticos en docentes de educación superior: implicaciones de la pandemia de la covid-19

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ABSTRACT | During the COVID-19 pandemic, non-essential services, such as universities, started working from home, making professors adapt to spending more hours in front of screens and sitting down. As a result, the new routine has triggered pain, poor posture and stress points, as well as affecting mental health. Therefore, this study aimed to estimate the prevalence of musculoskeletal symptoms in 60 professors at a Higher Education Institution, whose work routine has changed due to the COVID-19 pandemic. This was an original cross-sectional study carried out between February and May 2022, which used the Sociodemographic Questionnaire and the Nordic Musculoskeletal Questionnaire, as well as the Sit and Reach and Third Finger on the Ground tests to assess flexibility and hamstring muscles, in addition to the postural assessment software (SAPO). The most notable results revealed the prominent occurrence of pain or discomfort in the cervical and lumbar regions, in agreement with the most common postural deviations, such as the neck, shoulders, pelvis and legs. This correlation can be attributed to the high incidence of sedentary lifestyles due to the pandemic, which has resulted in longer hours sitting. Social isolation and working from home have led to musculoskeletal disorders even among physically active professors. Physical activity should therefore be increasingly encouraged for a

better quality of life and continued well-being, as well as breaks from work and time for leisure.

Keywords | Work-Related Musculoskeletal Disorders; Pandemic; COVID-19; Faculty.

RESUMO | Durante a pandemia de covid-19, os serviços não essenciais, como universidades, passaram a atuar em *home office*, fazendo com que os professores tivessem de se adaptar ao maior número de horas em frente às telas e à postura sentada. Dessa forma, a nova rotina desencadeou problemas como dores, má postura e pontos de tensão, além de afetar a saúde mental. Portanto, o presente trabalho teve como objetivo estimar a prevalência de sintomas osteomusculares em 60 docentes de uma Instituição de Ensino Superior que tiveram a sua rotina de trabalho alterada devido à pandemia de covid-19. Tratou-se de um estudo original e de delineamento transversal realizado entre fevereiro e maio de 2022, o qual utilizou o questionário sociodemográfico e o nórdico de sintomas musculoesqueléticos, bem como os testes de sentar e alcançar e terceiro dedo ao solo para avaliar a flexibilidade e a musculatura isquiotibial, além do *software* de avaliação postural (SAPO). Os resultados mais notáveis revelaram a ocorrência proeminente de dores ou desconfortos

Study conducted at the President Tancredo de Almeida Neves University Center (UNIPTAN) – São João del-Rei (MG), Brazil.

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nas regiões cervicais e lombares, em concordância com os desvios posturais mais comuns, como pescoço, ombros, pelve e pernas. Essa correlação pode ser atribuída à alta incidência de sedentarismo decorrente da pandemia, que resultou no prolongamento das horas passadas em postura sentada. O isolamento social e o *home office* geraram, mesmo nos docentes ativos, distúrbios osteomusculares. Assim, deve-se motivar cada vez mais a prática de atividade física, para uma melhor qualidade de vida e um bem-estar contínuo, bem como as pausas no trabalho e o tempo reservado para o lazer.

Descritores | Distúrbios Osteomusculares Relacionados ao Trabalho; Pandemia; COVID-19; Docentes.

RESUMEN | Durante la pandemia de la covid-19, la realización de los servicios no esenciales, como las universidades, empezó a ser por teletrabajo, lo que llevó a los docentes a adaptarse a la mayor cantidad de horas frente a las pantallas y la postura sentada. Esta nueva rutina les desencadenó problemas como dolor, mala postura y puntos de tensión, además de afectar a la salud mental de ellos. Este estudio tuvo como objetivo estimar la prevalencia de

síntomas musculoesqueléticos en 60 profesores de una Institución de Educación Superior que sufrieron cambios en su rutina laboral a causa de la pandemia de la covid-19. Se trata de un estudio transversal, realizado entre febrero y mayo de 2022, que utilizó el cuestionario sociodemográfico y nórdico de síntomas musculoesqueléticos, así como las pruebas sentarse y alcanzar y el tercer dedo al suelo para evaluar la flexibilidad y los músculos isquiotibiales, además del *software* de evaluación postural (SAPO). Los resultados sobresalientes revelaron la aparición destacada de dolor o molestias en las regiones cervical y lumbar, de acuerdo con las desviaciones posturales más comunes, como en el cuello, hombros, pelvis y piernas. Esta correlación se puede asociar a la alta incidencia del sedentarismo en la pandemia, que ha llevado a que las personas pasen más horas sentadas. El aislamiento social y el teletrabajo generaron, incluso en docentes activos, trastornos musculoesqueléticos. Hay que motivar la práctica de actividad física cada vez más para una mejor calidad de vida y un bienestar continuo, además de descansos en el trabajo y el tiempo reservado para el ocio.

Palabras clave | Trastornos Musculoesqueléticos Relacionados con el Trabajo; Pandemia; COVID-19; Docentes.

INTRODUCTION

As a result of the COVID-19 pandemic, which began in March 2020, non-pharmacological interventions (NPI), such as social distancing, the use of masks, the closure of places that promote crowding, and lockdown, were recommended¹. Services considered non-essential proceeded remotely, such as schools and universities, adopting a remote work regime².

The general population, but especially educators, had to adapt to the online environment and the long hours sitting in front of a computer screen, mobile phone, or tablet, thus decreasing their interactive routines with certain degrees of movement, with a consequent increase in sedentarism^{3,4}. Thus, the pandemic has triggered problems such as lower back and upper limb pain, poor posture, and tension points, in addition to affecting mental health and causing musculoskeletal disorders⁵.

In this context, one must consider the anatomy of the locomotor system, which is formed by the skeletal, articular, and muscular systems⁶. This complex may present some disorders, which are consequences of diseases, changes in the body and/or in the individual's routine. Among these disorders, one can observe the presence of: (1) senescence, in which the individual loses muscle and

bone mass⁷; (2) work-related musculoskeletal disorders (WMSD), caused by repetitive efforts⁸; (3) shortening of the hamstring muscles, due to long periods sitting and muscle tension⁹; and (4) scoliosis, which is a deformity of the vertebral spine¹⁰.

Thus, this study aimed to estimate the prevalence of musculoskeletal symptoms in professors of a Higher Education Institution (HEI) who had their work routine changed due to the COVID-19 pandemic.

METHODOLOGY

Study design

This study followed the recommendations of Resolution no. 466/2012 of the National Health Council (CNS) for studies with human beings.

It was a study with quantitative approach and cross-sectional design. The studied population comprised the professors of a Higher Education Institution, which had, at the time, a total of 13 undergraduate courses: Administration, Accounting Sciences, Law, Physical Education, Nursing, Civil Engineering, Production Engineering, Physical Therapy, Medicine, Nutrition,

Dentistry, Pedagogy, and Psychology. The tests were performed in the offices of the institution.

Study population

The sample consisted of professors who met the inclusion criteria, namely: being active in the period of data collection (without any type of license) and having no history of orthopedic, rheumatological, and/or neurological

disease related to the lower limbs, pelvis, or lumbar spine. Pregnant professors were excluded from the study, as well as those who did not sign the informed consent form or who did not agree to participate in the study.

In the study period, the HEI under study had 185 professors, distributed in the 13 courses available. However, it was possible to forward the inclusion questionnaires to only 85; 25 of them did not respond and the sample comprised a total of 60 professors (Figure 1).

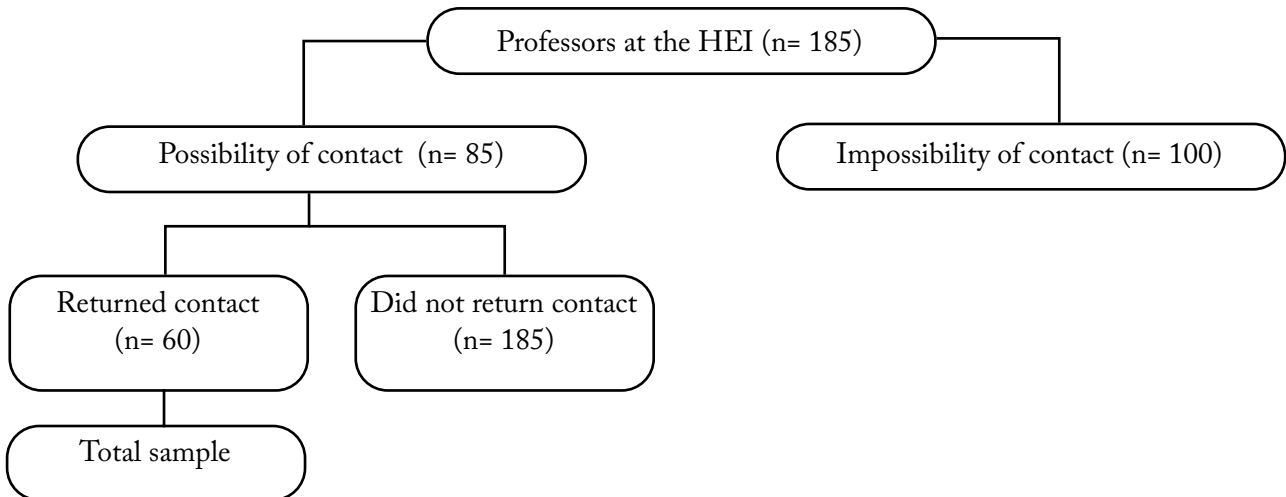


Figure 1. Flowchart of participants

Data collection instruments

Because it is an evaluative research that took place during the pandemic period, there was a need to be carried out in person. Face-to-face classes returned at the institution in February 2022, a period still considered pandemic, but after vaccination of the population.

All safety measures for the prevention of COVID-19 and biosafety protocols were met, with the use of personal protective equipment for research collaborators, use of alcohol 70%, and distancing. Moreover, the tests were carried out individually, so that there was no crowding in the physical space. The equipment was also properly sanitized after each measurement.

The data collection conducted between February and May 2022 initially used a sociodemographic questionnaire, adapted from Almeida et al.¹¹, containing the variables: sex, age, work time, daily workload, work-related discomfort, and physical activity during remote work.

Then, the Brazilian adaptation of the Nordic Musculoskeletal Questionnaire (NMQ), validated by Pinheiro, Tróccoli, and Carvalho¹² was applied. This

questionnaire is one of the main instruments used to analyze musculoskeletal symptoms in ergonomics and occupational health scenarios, demarcating the painful points and the level of pain in the last 12 months and in the last seven days¹².

Starting with the physical assessment based on tests, the professors were divided into two groups: sedentary and active. The first was composed of those who did not practice physical activity and the second by those who practiced activities from two to seven times a week¹³.

The test used to evaluate the flexibility of the hamstring muscles and lumbar spine was the modified sit and reach test (SRT), proposed by Wells and Dillon¹⁴. The individual should extend the knees, overlap the hands and align the middle fingers to flex the torso and reach as far as possible on the measuring tape. Three attempts were given to each professor, so that the best result, in centimeters, was recorded. The results and, consequently, the groups evaluated were divided into four categories, namely: low, below average, average, and high¹⁵.

The second test chosen was the fingertip to floor test. The professors, upright, with feet together and shoes

removed, brought their hands towards their feet, keeping their knees, arms, and fingers fully extended. Three attempts were given to each professor, so that the best result was recorded, that is, the shortest distance obtained between the third finger and the ground¹⁶.

For both tests, measurements were performed by the same researcher.

Finally, the postural assessment software (SAPO, version 0.68), was used. Participants were marked with small Styrofoam balls at specific anatomical points (four spinous processes from C7 to L5, ear, sternum, acromion, lateral epicondyle of the humerus, styloid process of the radius, anterior superior iliac spine, posterior-superior iliac spine, greater trochanter of the femur, patella, gastrocnemius, lateral and medial malleoli of the tibia and fibula, and back of the foot), and then instructed to position themselves at the marked position, where they were photographed in the rear, right side, and left side views. After obtaining the images of the postural evaluation with a camera, always by the same evaluator, the analysis was performed by the software.

Statistical analysis

The values obtained were tabulated electronically with the help of Excel 2013 (Microsoft Corporation, Redwood, WA, USA) and submitted to statistical analysis by the Jamovi program (2022, version 2.3)^{17,18}. The significance level used as a criterion for acceptance or rejection in the statistical tests was 5% ($p < 0.05$).

To test the association between the variables, Student's t-test was used, and, since Jamovi does not have a "direct window" for tests that consider nonparametric variables, the normality test was conducted in all cases. For variables whose normality test had a value lower than 0.05, the Mann-Whitney or Mann-Whitney U test was performed¹⁹, which is useful for evaluating nonparametric variables²⁰. Another test used was the chi-square test (χ^2), to evaluate a significant association between categorical variables²¹.

RESULTS

Sociodemographic Questionnaire and Nordic Musculoskeletal Questionnaire

60 professors from the University Center answered the questionnaires and performed the clinical evaluations, of

whom 36 were women (60%) and 24 men (40%). The ages of those evaluated ranged from 24 to 51 years old (mean 38.65 years), with a standard deviation of 6.51 years. For females, the mean age was 38.25 years (minimum of 24 and maximum of 49 years), with a standard deviation of 5.8. Males had a mean age of 39.33 years (26–51 years) and a standard deviation of 7.42 (Table 1).

Table 1. Sociodemographic characteristics, life habits, and occupational aspects of the participants

Sex	Total	Age (mean $\pm$ standard deviation)	Sitting hours (>8h)	Physical activity (active/sedentary)
Female	36	38.25 $\pm$ 5.8	12	Active: 26 / Sedentary: 10
Male	24	39.33 $\pm$ 7.42	8	Active: 17 / Sedentary: 7

Regarding the time in which the participants remained in sitting, during the pandemic, mainly to work, 20 (33.3%) remained more than eight hours a day. Of these, 12 (60%) were women and eight (40%), men. For participants who worked eight hours or less, the data are presented in Table 1. No association was found between working time sitting per day and sex ($p = 0.426$).

When asked about the practice of regular physical activity, 43 (71.7%) participants declared themselves active, 26 (72.2%) being women and 17 (70.83%), men. Of the 17 (28.3%) sedentary participants, 10 (27.8%) were female and 7 (29.17%) were male (Table 1). No association was observed between being active/sedentary and sex ($p = 0.907$).

The Nordic Musculoskeletal Questionnaire allows the comparison with results of other epidemiological studies on the subject¹². Regarding presence of pain or discomfort related to the work performed and the posture used, 51 (85%) of the professors answered yes to this question. Considering women, 33 (91.7%) had pain/discomfort and only 3 (8.3%) did not. For men, 18 (75%) reported these discomforts and 6 (25%) reported the absence of pain or discomfort.

Analyzing the group as a whole, lumbar spine – 74.51% ($n = 38$) – and cervical spine – 68.63% ($n = 35$) pain prevailed. For females, the prevalence was 75.76% ($n = 25$) for low back and 66.7% ($n = 22$) for neck. For males, the ranking had similar results, with 72.2% for low back pain and also for cervical pain, but shoulder pain was added with an index of 55.5% ($n = 10$). Table 2 shows the places of pain or discomfort of the participating professors.

Table 2. Body parts with pain or discomfort in participants

Body part	Group % (n)	Female % (n)	Male % (n)
Neck	68.63%(n=35)	66.7%(n=22)	72.2%(n=13)
Shoulders	49.02%(n=25)	45.5%(n=15)	55.5%(n=10)
Elbows	13.72%(n=7)	12.12%(n=4)	16.7%(n=3)
Fists and hands	37.25%(n=19)	39.4%(n=13)	33.3%(n=6)
Thorax	17.65%(n=9)	18.2%(n=6)	16.7%(n=3)
Low back	74.51%(n=38)	75.76%(n=25)	72.2%(n=13)
Hips/thighs	9.8%(n=5)	9.1%(n=3)	11.1%(n=2)
Knees	19.61%(n=10)	15.15%(n=5)	27.8%(n=5)
Ankles and feet	19.61%(n=10)	15.15%(n=5)	27.8%(n=5)

Sit and reach test (SRT) and fingertip to floor test (FTF)

For the SRT, a one-meter measuring tape and adhesive tape were used so that the evaluated person, barefoot, sat on it with the zero point between the legs and the 38cm near the heels, which were 30.5 cm apart (15.25 cm on each side). The individual should extend the knees, overlap the hands and align the middle fingers to flex the torso

and reach as far as possible. The SRT is made according to sex and age, based on pre-prepared normative tables²².

For the final classification, three attempts were made and the best result was recorded. Overall, 34 (56.7%) individuals are in the population average¹⁶, followed by 12 (20%) who are below average, 8 (13.3%) with low result, and 6 (10%) with high. In both the women's and men's groups, most professors presented results equivalent to the average, with 18 (50%) and 16 (66.7%), respectively (Table 3).

Table 3. Sit and reach test and fingertip to floor test results

Classification	SRT (min and max in cm)				FTF				
	Low	Below average	Average	High	Excellent	Very Good	Good	Reasonable	Bad
Group % (min-max)	13.3% (0-29)	20% (18-38)	56.7% (28-50)	10% (44-62)	8.3% (palm)	41.7% (third finger)	25% (1-9cm)	23.3% (11-20cm)	1.7% (24cm)
Female % (min-max)	16.7% (23-29)	25% (25-38)	50% (37-50)	8.3% (50-62)	11.1% (palm)	47.2% (third finger)	22.2% (1-8cm)	19.4% (10-20cm)	0%
Male % (min-max)	8.3% (0-15)	12.5% (18-30)	66.7% (28-47)	12.5% (44-56)	4.2% (palm)	33.3% (third finger)	29.2% (2.5-9cm)	29.2% (11-20cm)	4.2% (24cm)

TFG: third finger to ground test; SRT: sit and reach test; Max: maximum; Min: minimum.

There was no association of the SRT variable with sex ($p=0.418$), nor with the active or sedentary variable ($p=0.746$).

The fingertip to floor test assists in the analysis of the patient's posterior chain flexibility, allowing the calculation of total, pelvic, and lumbar flexion. This evaluation has great metric properties and low cost-benefit, contributing to the diagnosis and treatment of various pathologies^{17,23}. To measure, the professors had to be upright, with feet together and shoes removed, bringing their hands towards their feet, keeping their knees, arms, and fingers fully extended. The vertical distance was measured with a flexible tape measure in centimeters, between the tip of the middle finger and the floor.

In the SRT results, 25 participants (41.7%) presented a very good index, 15 good (25%), 14 reasonable (23.3%),

5 excellent (8.3%), and 1 (1.7%) bad. The rates of both the female and male groups showed that the majority presented a "very good" classification, with 17 (42.2%) women and 8 (33.3%) men with such results. The results of this test are presented in Table 3.

SRT was not associated with sex ($p=0.418$), nor with the active or sedentary variable ($p=0.746$).

Postural assessment software (SAPO)

Finally, the postural assessment software was used; it is a computer program that has free access via the internet and can be used by health professionals. It uses a protocol with marking points and measurement of angles and body distances. Thus, it requires digitized images of the patient, allowing it to be calibrated and enlarged,

serving as a fundamental component for physical therapy monitoring, treatment conduct, and evolution analysis²⁴. To use this program, the patient had to be photographed in the anterior, posterior, and right and left lateral views so that, then, the necessary points were marked and the postural evaluation could be performed²⁵.

SAPO allowed us to identify a higher prevalence of postural disorders in the pelvis and body (vertical) with 59 individuals (98.3%), head with 57 (95%), and shoulders and legs with 56 (93.3% each). It was observed that both the group of women and men presented results extremely similar to the general indices (Table 4).

Table 4. Body parts with postural disorders

Body part	Group % (n)	Female % (n)	Male % (n)
Head	95% (n=57)	97.2% (n=35)	91.7% (n=22)
Shoulders	93.3% (n=56)	94.4% (n=34)	91.7% (n=22)
Hips	86.7% (n=52)	83.3% (n=30)	91.7% (n=22)
Pelvis	98.3% (n=59)	100% (n=36)	95.83% (n=23)
Difference in length of lower limbs	56.7% (n=34)	58.3% (n=21)	54.2% (n=13)
Legs	93.3% (n=56)	91.7% (n=33)	95.83% (n=23)
Upright body	98.3% (n=5)	100% (n=36)	95.83% (n=23)

DISCUSSION

When analyzing the findings of this study, conducted during the pandemic period, of the 60 professors evaluated from a University Center, there was a sample of 36 women and 24 men with a mean age of 38.65 years old. It was observed that about 33.3% spent more than eight hours a day sitting, and 71.7% declared themselves active in physical activities. The prevalence of work-related pain was high, especially in the lumbar and cervical regions. There was no association between sitting time, physical activity, and sex. Moreover, postural evaluation tests were used, including the fingertip to floor test and a postural evaluation software. The software identified a high prevalence of postural disorders, mainly in the pelvis and body, with similar results for men and women.

Regarding the statistical prevalence of females, similar information was observed in the article by Tacon et al.⁹, which also evaluated musculoskeletal symptoms in higher education professors in the city of Anápolis, obtaining a rate of 70% of female professors. In fact, the

United Nations Educational, Scientific, and Cultural Organization (UNESCO) conducted a survey in 2016 and identified that the teaching profession is an area with predominance of females²⁶, which confirms the prevalence found in our study.

In another similar study, 84 professors from public institutions were evaluated by Bortolan et al.²⁷. The authors identified a mean age of 41 years old, the minimum age being 26 and the mode 35. These findings corroborate this study, since an average of 38.65 years old was observed, with a minimum of 24 and a maximum of 51. According to 2022 data from the Brazilian Institute of Geography and Statistics (IBGE), the average age of the worker in Brazil is 40 years old, proving the findings of this research²⁸. There is a contemporary trend of late entry of professors into the labor market, influenced by the increase in the number of specializations and graduate degrees, especially master's and doctoral degree courses²⁹. However, it is important to note the decrease in the rate of more experienced professors. In a country where 26% of the population is over 50 years old, employment opportunities in this age group are still limited, with the participation of this group not exceeding 10% in many companies, according to a study by the Maturi relocation platform in partnership with EY Brasil³⁰.

In the study of García-Salirrosas and Sánchez-Poma³¹, 110 professors were evaluated during the COVID-19 pandemic, finding that 39.09% spent more than 10 hours in deskwork, 35.45% sat between 8 and 10 hours, 22.73% between 6 and 8 hours, and 2.73% less than 6 hours. The following topics can be related regarding the remote work period: (1) >10h equivalent to >8h of this study; (2) 8-10h similar to 8h; (3) 6-8h similar to 6h; (4) >6h equal to >6h. Based on this correspondence, our results resemble the previously mentioned study. This indicates that the classes, which were previously taught while standing, began to be conducted in a sitting position, which results in an increase in the total time in this posture.

In this sense, during deskwork, the upper limb (UL), used for typing and writing, and the lumbar spine, due to staying in the same position for many hours, are extremely affected³², in addition to the impairment of the shoulder girdle and cervical region, due to the inclination for one to be closer to a computer, mobile phone, or papers³³. Prolonged sitting during life and, especially, at work, can also cause shortening of the hamstring muscles. This decrease is due to the tension of the semitendinosus, biceps femoris, semimembranosus, and gluteal muscles, as well as pelvic retroversion, horizontalization of the sacral angle,

rectification of lumbar lordosis, and increased compression on the intervertebral disc. For this reason, it is believed that the shortening of the hamstrings is one of the causes for the constant low back pain of professionals⁹.

The work-related musculoskeletal disorders (WMSD) have multifactorial causes, and the ones that entail greater risks to the worker are precisely the biomechanics (repetitive movement and static posture), the environment (workplace without some comfort to accommodate), the psychosocial (pressure on oneself), and the organizational factor (workload, lack of intervals, and fast pace)³⁴; causes that were aggravated by the COVID-19 pandemic.

In the study by Guimarães et al.³⁵, 140 professors from the Federal Institute of Santa Catarina were evaluated based on a sociodemographic questionnaire that mainly contained questions related to remote work in the pandemic. The authors identified that 94.7% of the participants felt pain related to work, being more prevalent in those who use the computer for more than 20 hours a week, especially sitting, corroborating the findings of this study, which found a total of 85% of professors with pain and discomfort during the pandemic. The findings of this research are also in agreement with the study of Barbosa³⁶, in which, of the 59 professors of the Federal University of Juiz de Fora (UFJF) submitted to the analysis, 61% (n=36) had pain in the lumbar region and 52.5% (n=31) in the cervical spine (neck), that is, the majority of them.

The literature points out that the change in routine, from social isolation and lockdowns, makes individuals, especially women, more tense and stressed. With this, the body reacts in negative ways, with bodily discomforts, associating emotional issues with ergonomics, such as the deficit of working conditions³⁷.

Another important fact to be highlighted is the double working day for women, who also perform their domestic activities after hours, reducing the time needed to replenish their energy, have leisure, and rest, thus increasing their fatigue continuously. This causes an increase in the production of corticosteroids and blood pressure, leaving the body more tense and uncomfortable and generating more pain and/or discomfort³⁸.

Thinking about the concepts previously addressed, it is possible to mention that an increase in the intensity and/or duration of the practice of physical activity is indicated for those who spend long periods in a sitting position, thus avoiding sedentary behavior. Moreover, this can preserve professors from further sequelae, such as work disability and/or pain and discomfort³⁹.

Regarding the practice of physical activity in this study, similar prevalences were also found in the study by Sanchez et al.⁴⁰, which identified that of the 284 university professors evaluated by a sociodemographic questionnaire, 72.5% (n=206) declared themselves active and 27.5% (n=78), sedentary. This finding shows that, even with studies developed before⁴⁰ and during the pandemic, the rates of active individuals remained high, compared to those who did not practice physical activities.

An active individual is one who practices at least 150 minutes of moderate aerobic physical activity or 75 minutes of high intensity aerobic activity per week, stimulating the cardiovascular, respiratory, and musculoskeletal systems, bringing a sense of well-being⁴¹. On the other hand, sedentary behavior, a concept adopted by the scientific community, is characterized by any activity with energy expenditure lower than 1.5 metabolic equivalent (MET - unit of quantification of physical activity intensity), in addition to being sat or reclined⁴². Although no statistically significant correlation was found between the physical activity index and the SRT, it is noteworthy that the majority of participants self-reported as active. This data suggests that many professors who consider themselves active also obtained good results in both SRT and FTF.

The study by Silva et al.⁴³ also used the SRT to assess flexibility, but using the Wells bench. In their study, it was observed that 60.9% of the 41 professors evaluated presented themselves as “very weak” or “weak,” equivalent to the “below average” and “low” classifications of our study. Nevertheless, the findings, in addition to being from a survey prior to COVID-19, do not corroborate the current one, in which most participants were classified as “average”.

The authors Moraes et al.⁴⁴ also evaluated flexibility, in this case of 19 professors, using the fingertip to floor test, finding that, prior to the treatment applied by them, the results of the participants were classified as “good,” which differ from our results in which most of the evaluated professors were identified as “very good” by the FTF. This result can be attributed to the increased search for physical activities during the pandemic, even those carried out at home. This is due to the fact that the search for online personal trainers was a viable alternative to maintain and encourage exercise among the population^{45,46}.

Flexibility is the ability to move a joint through its full range of motion (ROM)⁴⁷. Flexibility, then, is composed of: (1) mobility, which is the degree of freedom of movement; (2) elasticity, or elastic stretch of the musculature; (3) plasticity, characterized by the temporary deformation

of the associated structures; and (4) malleability, which are the tensions of the skin to accommodate⁴⁸.

Although the level of physical activity considers the weekly frequency and the intensity and duration of the activity, the findings in the literature suggest there is no difference in the levels of flexibility of active and very active subjects, but only between sedentary and active subjects⁴⁹. Another point to be considered is that women usually have a higher flexibility index, due to anatomical, hormonal, and/or behavioral issues. The hormonal issue can be explained by the release of relaxin and estrogen, the first relaxes ligaments, stretches fibrocartilages, and increases synovial fluid, while the second accumulates relaxin in the hip joints⁵⁰. However, over the years, this characteristic tends to decrease in both sexes, which can cause low back pain, for example⁵¹.

Finally, it is also possible to mention the study by Chesani et al.⁵², which evaluated 15 professors from an educational center and found that the greatest postural changes of the participants were in the lumbar region, followed by the cervical, dorsal/thoracic, and shoulders. Despite being a not so recent study, one can observe that the postural patterns of professors are maintained over the years, either in pre- and post-pandemic periods, especially when also considering the places with reports of pain.

CONCLUSIONS

This study aimed to estimate the prevalence of musculoskeletal symptoms in professors of a Higher Education Institution. The most common symptoms were pain and/or discomfort in the cervical and lumbar spine, in addition to postural deviations in the neck, shoulders, pelvis, and legs.

Social isolation and remote work, triggered by the COVID-19 pandemic, generated, even in individuals considered active, several musculoskeletal disorders in university professors, either due to sitting posture or working time per day.

It is worth noting that, in summary, the limitations of this study were represented by the lack of interest shown by some professors and the difficulties encountered in establishing contact. Despite this, high levels of musculoskeletal symptoms were found. Furthermore, the evaluation instruments used were low cost and elementary, able to be performed by students without major difficulties, which reflects on the accuracy of execution and replicability.

It is also evident that the results found corroborate the literature of studies within the same theme of the current research. These indications present the real consequences of the posture used to work in a context and environment without prior ergonomic preparation.

Therefore, attention is drawn especially to the importance of physical activity and regular breaks in remote work regimes, associating them with stretching, so that it is possible to minimize certain consequences for the body.

ACKNOWLEDGMENTS

The authors thank all the professors who voluntarily devoted their time and efforts to collaborate with the project. Their contributions were essential for the development of this study and reflect the collective commitment to the search for knowledge and scientific innovation.

REFERENCES

1. Malta DC, Szwarcwald CL, Barros MBA, Gomes CS, Machado IE, et al. A pandemia da COVID-19 e as mudanças no estilo de vida dos brasileiros adultos: um estudo transversal. *Epidemiol Serv Saúde*. 2020;29(4):e2020407. doi: 10.1590/S1679-49742020000400026
2. Brito LMS, Lima VAD, Mascarenhas LP, Mota J, Leite N. Physical activity, eating habits and sleep during social isolation: from young adult to elderly. *Rev Bras Med Esporte*. 2021;27(1):21-5. doi: 10.1590/1517-8692202127012020_0061
3. Macedo RM. Direito ou privilégio? Desigualdades digitais, pandemia e os desafios de uma escola pública. *Estud His (Rio J)*. 2021;34(73):262-80. doi: 10.1590/S2178-149420210203
4. Silva DRPD, Werneck AO, Malta DC, Souza Júnior PRB, Azevedo LO, et al. Changes in the prevalence of physical inactivity and sedentary behavior during COVID-19 pandemic: a survey with 39,693 Brazilian adults. *Cad Saúde Pública*. 2021;37(3):e00221920. doi: 10.1590/0102-311X00221920
5. Szwarcwald CL, Damacena GN, Barros MBA, Malta DC, Souza Júnior PRB, et al. Factors affecting Brazilians' self-rated health during the COVID-19 pandemic. *Cad Saúde Pública*. 2021;37(3):e00182720. doi: 10.1590/0102-311X00182720
6. Araújo APS, Bertolini SMMG, Martins Júnior J. Alterações morfofisiológicas decorrentes do processo de envelhecimento do sistema musculoesquelético e suas consequências para o organismo humano. *POBS*. 2014;4(12). doi: 10.25242/8868412201442
7. Fachine BRA, Trompieri N. O processo de envelhecimento: as principais alterações que acontecem com o idoso com o passar dos anos. *Inter Science Place*. 2012;1(20):106-32. doi: 10.6020/1679-9844/2007

8. Brasil. Ministério da Saúde. Política Nacional de Atenção Básica. Brasília, DF: Ministério da Saúde; 2012 [cited 2025 Jun 18]. Available from: https://bvsmis.saude.gov.br/bvs/publicacoes/politica_nacional_atencao_basica.pdf
9. Tacon KCB, Costa WS, Vento DA, Vilar WDB, Fernandes VLS, et al. Avaliação da dor lombar correlacionada ao encurtamento dos isquiotibiais em docentes de uma instituição de Ensino Superior. *Rev Soc Bras Clin Med*. 2017;15(1):56-66. Available from: <https://www.sbcm.org.br/ojs3/index.php/rsbcm/article/view/246>
10. Marchetti BV, Raupp E, Sedrez JA, Ribeiro RP, Candotti CT. Importância da experiência clínica para a mensuração da curva escoliótica de crianças pela técnica de Cobb. *Fisioter Pesqui*. 2019;26(3):241-6. doi: 10.1590/1809-2950/18001826032019
11. Almeida TEM, Ferreira REA, Bezerra LÂ, Pereira TMM. Analysis of the prevalence of musculoskeletal disorders and occupational stress in professors of a higher education institution in the state of Pernambuco. *Rev Bras Med Trab*. 2019;18(3):274-9. doi: 10.47626/1679-4435-2020-542
12. Pinheiro FA, Tróccoli BT, Carvalho CV. Validação do Questionário Nórdico de Sintomas Osteomusculares como medida de morbidade. *Rev Saúde Pública*. 2002;36(3):307-12. doi: 10.1590/S0034-89102002000300008
13. Brasil. Ministério da Saúde. Guia de atividade física para a população brasileira. Brasília, DF: Ministério da Saúde; 2021. Available from: https://bvsmis.saude.gov.br/bvs/publicacoes/guia_atividade_fisica_populacao_brasileira.pdf
14. Wells KF, Dillon EK. The sit and reach – a test of back and leg flexibility. *Res Q Am Ass Health*. 1952;23(1):115-8. doi: 10.1080/10671188.1952.10761965
15. American College of Sports Medicine. Programa de condicionamento físico da ACSM. São Paulo: Manole; 1999.
16. Perret C, Poiraudeau S, Fermanian J, Colau MML, Benhamou MAM, et al. Validity, reliability, and responsiveness of the fingertip-to-floor test. *Arc Phys Med Rehabil*. 2001;82(11):1566-70. doi: 10.1053/apmr.2001.26064
17. R Core Team. R: a Language and environment for statistical computing. (Version 4.1) [Computer software]. 2021. Available from: <https://cran.r-project.org> (R packages retrieved from MRAN snapshot 2022-01-01).
18. Jamovi. The jamovi project. (Version 2.3) [Computer Software]. 2022. Available from: <https://www.jamovi.org>
19. Fay MP, Malinovsky Y. Confidence intervals of the Mann-Whitney parameter that are compatible with the Wilcoxon-Mann-Whitney test. *Stat Med*. 2018;37(27):3991-4006. doi: 10.1002/sim.7890
20. Silva MA, Wendt GW, Argimon IIL, Lopes RMF. Técnicas de correção do teste qui-quadrado para amostras não normais. *Aval Psicol*. 2018;17(4):407-16. doi: 10.15689/ap.2018.1704.13238.01
21. Lopes ACB, Leinioski AC, Ceccon L. Testes t para comparação de médias de dois grupos independentes. Curitiba: UFPR; 2015. Available from: http://www.leg.ufpr.br/lib/exe/fetch.php/disciplinas:ce001:bioestatistica_testes_t_para_comparacao_de_medias_de_dois.pdf
22. Cardoso JR, Azevedo N, Cassano C, Kawano M, Âmbar G. Confiabilidade intra e interobservadora da análise cinemática angular do quadril durante o teste sentar e alcançar para mensurar o comprimento dos isquiotibiais em estudantes universitários. *Braz J Phys Ther*. 2007;11(2):133-8. doi: 10.1590/S1413-35552007000200008
23. Sacco ICN, Aliberti S, Queiroz BWC, Pripas D, Kieling I, et al. A influência da ocupação profissional na flexibilidade global e nas amplitudes angulares dos membros inferiores e da lombar. *Rev Bras Cineantropom Desempenho Hum*. 2009;11(1):51-8. doi: 10.5007/1980-0037.2009v11n1p51
24. Souza JA, Pasinato F, Basso D, Corrêa ECR, Silva AMT. Biofotogrametria e confiabilidade das medidas do protocolo de software para avaliação postural (SAPO). *Rev Bras Cineantropom Desempenho Hum*. 2011;13(4):299-305. doi: 10.5007/1980-0037.2011v13n4p299
25. Santos LM, Souza TP, Crescentini MCV, Poletto PR, Gotfryd AO, et al. Avaliação postural por fotogrametria em pacientes com escoliose idiopática submetidos à artrodese: estudo piloto. *Fisioter Mov*. 2012;25(1):165-73. doi: 10.1590/S0103-51502012000100016
26. Organização das Nações Unidas para Educação, a Ciência e a Cultura. Perfil dos professores brasileiros: o que fazem, o que pensam, o que almejam. São Paulo: UNESCO; 2004 [cited 2024 Nov 29]. Available from: <https://unesdoc.unesco.org/ark:/48223/pf0000134925>
27. Bortolan GMZ, Santos FANV, Domenech SC, Ferreira MGG. Análise da experiência do trabalho remoto em home office de professores do ensino superior. *Ergodesign HCL*. 2021;9(2):141-57. doi: 10.22570/ergodesignhcl.v9i2.1612
28. Instituto Brasileiro de Geografia e Estatística. Panorama do Censo 2022. Brasília, DF: IBGE; 2022 [cited 2024 Nov 29]. Available from: <https://censo2022.ibge.gov.br/panorama/>
29. Carvalho MAA, Moura DL. A entrada na carreira docente: uma revisão sistemática. *Rev Bras Educ*. 2023;28:e280022. doi: 10.1590/S1413-24782023280022
30. Estadão Conteúdo. Profissional com mais de 50 anos passa a ser alvo de empresas; entenda. *Infomoney*. 2022 Aug 23 [cited 2024 Nov 29]. Available from: <https://www.infomoney.com.br/carreira/profissional-com-mais-de-50-anos-passa-a-ser-alvo-de-empresas-entenda/>
31. García-Salirrosas EE, Sánchez-Poma RA. Prevalencia de trastornos musculoesqueléticos en docentes universitarios que realizan teletrabajo en tiempos de COVID-19. *An Fac Med*. 2020;81(3):301-7. doi: 10.15381/anales.v81i3.18841
32. Gomes JM, Barbosa DS, Perfeito RS. Identificação e ocorrência de ler/dort em profissionais da saúde. *Rev Carioca Educ Fis*. 2018;13(1):62-76. Available from: <https://revistacarioca.com.br/revistacarioca/article/view/52/65>
33. Martins JGL. Perfil dos funcionários do setor administrativo de companhia de energia em relação à flexibilidade, força de preensão manual e IMC [undergraduate thesis]. Curitiba: Universidade Tecnológica Federal do Paraná; 2014 [cited 2024 Nov 29]. Available from: <https://repositorio.utfpr.edu.br/jspui/handle/1/7832>
34. Lopes AR. Prevalência e fatores associados a sintomas osteomusculares em profissionais que trabalham predominantemente na postura sentada [thesis]. São Paulo: Universidade de São Paulo; 2019 [cited 2024 Nov 29]. Available from: <https://dspace.unila.edu.br/handle/123456789/6083>
35. Guimarães B, Chimenez T, Munhoz D, Minikowski H. Pandemia de COVID-19 e as atividades de ensino remotas: riscos ergonômicos

- e sintomas musculoesqueléticos dos docentes do Instituto Federal Catarinense. *Fisioter Pesqui.* 2022;29(1):96-102. doi: 10.1590/1809-2950/21020229012022PT
36. Barbosa MNB. Ergonomia no home office: Análise das condições de trabalho de professores da UFJF [undergraduate thesis]. Juiz de Fora: Universidade Federal de Juiz de Fora; 2021 [cited 2024 Nov 29]. Available from: <https://www2.ufjf.br/engenhariadeproducao/files/2021/06/mateusnogueirabelabarbosa.pdf>
 37. Mattos JGS, Castro SS, Melo LBL, Santana LC, Coimbra MAR, et al. Dores osteomusculares e o estresse percebido por docentes durante a pandemia da COVID-19. *Researc Soc Develop.* 2021;10(6):e25110615447. doi: 10.33448/rsd-v10i6.15447
 38. Ribeiro IQB. Fatores ocupacionais associados à dor músculo-esquelética em professores [dissertation]. Salvador: Universidade Federal da Bahia; 2009 [cited 2024 Nov 29]. Available from: <https://repositorio.ufba.br/handle/ri/31781>
 39. Pereira GP, Silva CMGD. Prática de atividade física e qualidade de vida no trabalho do docente universitário: revisão bibliográfica. *Braz J Develop.* 2020;6(10):74997-5013. doi: 10.34117/bjdv6n10-067
 40. Sanchez HM, Sanchez EGM, Barbosa MA, Guimarães EC, Porto CC. Impacto da saúde na qualidade de vida e trabalho de docentes universitários de diferentes áreas de conhecimento. *Ciênc Saúde Coletiva.* 2019;24(11):4111-23. doi: 10.1590/1413-812320182411.28712017
 41. Cabral JCO, Cintra AS, Freitas LA, Fernandes B, Garcia FS, et al. Prevalência do sedentarismo como fator de risco para doenças cardiovasculares em professores de um Centro Universitário de Uberlândia/MG. e-RAC [Internet]. 2018 [cited 2024 Nov 29];7(1). Available from: <http://www.adsunix.unitri.edu.br/erac/index.php/e-rac/article/view/786>
 42. Delfino LD. Fatores associados ao padrão de comportamento sedentário em professores da rede pública de ensino [dissertation]. Presidente Prudente: Universidade Estadual Paulista; 2018 [cited 2024 Nov 29]. Available from: <https://repositorio.unesp.br/server/api/core/bitstreams/fe9b4f9d-d5ec-40a2-9de2-ald6c7f85b95/content>
 43. Silva LCS, Lima NMV, Santana LA. Convivência escolar, qualidade de vida e flexibilidade de professores de uma escola pública do Distrito Federal. *Fisioter Bras.* 2016 [cited 2024 Nov 29];17(2):99-106. Available from: https://docs.bvsalud.org/biblioref/2018/01/877625/convivencia-escolar-qualidade-de-vida-e-flexibilidade-de-profes_4ZuevHV.pdf
 44. Moraes AAC, Almeida CP, Ferreira TCR. Efeitos imediatos e tardios do cinesioalongamento nas dores musculoesqueléticas, na flexibilidade e na qualidade de vida em professoras de um município do interior da Amazônia. *Rev Ciênc Saúde.* 2020 [cited 2024 Nov 29];5(2):28-35. Available from: <https://www.revistaeletronicafunvic.org/index.php/c14ffd10/article/view/182/160>
 45. Santos J. Atuação do personal trainer durante e pós-pandemia. Faculdade Laboro; 2023 [cited 2024 Nov 29]. Available from: <https://laboro.edu.br/blog/atuacao-do-personal-trainer-durante-e-pos-pandemia/#:~:text=Durante%20o%20per%C3%ADodo%20de%20distanciamento,Personal%20Trainer%20em%20suas%20interven%C3%A7%C3%B5es>
 46. Miguel H, Lima LEM, Campos MVA, Santos D. Impactos da COVID-19 sobre o personal trainer. *InterAm J Med Health.* 2020 [cited 2024 Nov 29];3:e202003030. Available from: <https://iajmh.emnuvens.com.br/iajmh/article/download/111/143/697>
 47. Achour Júnior A. Mobilização e alongamento na função musculartoarticular. Barueri: Manole; 2016.
 48. Dantas EHM. Alongamento e flexionamento. 6. ed. Barueri: Manole; 2019.
 49. Ribeiro CCA, Abad CCC, Barros RV, Neto TLB. Nível de flexibilidade obtido pelo teste de sentar e alcançar a partir de estudo realizado na Grande São Paulo. *Rev Bras Cineantropom Desempenho Hum.* 2010;12:415-21. doi: 10.5007/1980-0037.2010v12n6p415
 50. Bezerra ES, Martins SL, Leite TB, Paladino KDV, Rossato M, et al. Influência da modificação do teste de sentar e alcançar sobre o indicador de flexibilidade em diferentes faixas etárias. *Motricidade.* 2015;11(3):3-10. doi: 10.6063/motricidade.2336
 51. Limas RC, Lima WA. Comparação da força e flexibilidade para membros inferiores em homens e mulheres de acordo com os valores considerados como saudáveis. *RBPFX.* 2017;11(65):196-208. Available from: <http://www.rbpfex.com.br/index.php/rbpfex/article/view/1091>
 52. Chesani FH, Demétrio C, Almeida EB, Barreta C, Faial NB, et al. Análise ergonômica em professores de um CEI - Centro de Educação Infantil. *Rev Extens Socied.* 2016;5(2):36-45. Available from: <https://periodicos.ufrn.br/extensaoesociedade/article/view/8840>