Acta of Bioengineering and Biomechanics
Vol. 24, No. 4, 2022

Original paper
DOI: 10.37190/ABB-02210-2023-02

Consequences of prolonged sedentary work during the COVID-19 pandemic

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Purpose: The COVID-19 pandemic has reduced physical activity and increased the time spent sitting. Combined with the lack of ergonomics at home workplaces, the risk of discomfort has increased, especially around the cervical spine and upper limbs. Evaluation of the mentioned problem is the subject of the study. *Methods*: The study used an original questionnaire based on the Nordic Musculoskeletal Questionnaire. The analysis used responses from people who reported discomfort in the form of tingling or numbness in the cervical spine, shoulder, elbow and wrist during the pandemic. Statistical analysis of the results was carried out to formulate conclusions. In addition, individual data were presented as percentages. *Results*: Considering the working time exceeding 8 hours a day, discomfort in the wrist joint area was most often reported among people working remotely (15.1%). Shoulder complex discomfort was the most common symptom (22%) reported by people working more than 8 hours a day, under the age of 31. In young people, the risk of discomfort in the shoulder, hand and cervical spine area increased. *Conclusions*: Extended working time is conducive to the appearance of symptoms within the hands. In future studies, it will be necessary to analyze the ergonomic factors responsible for this phenomenon.

Key words: *COVID-19, sitting work, work at home, stationary work, musculoskeletal system, ergonomics in the workplace*

1. Introduction

In the current reality, another, fourth industrial revolution is taking place, the elementary components of which are the progressive computerization and specialization of processes, as well as cybernetic data exchange and the significant development of biological sciences and linking them with exact sciences. This is, among other things, the emergence of artificial intelligence. Attempts to use it in practice, combined with the development of electronics and IT technology, led to a decrease in the demand for physical work. The activities of many professions are limited to the professionalization of production or the provision of services by operating machines and computers [31].

Such a significant development and dissemination of IT technology has led to a situation in which mental work is associated with work at a desk using a computer. In light of ergonomics, such work usually requires a sitting position. Unfortunately, it is generally static and maintained for a long time.

Daily energy expenditure in a sedentary lifestyle is small. The metabolic equivalent task for desk work is only ≥1.5 METs [35]. This coefficient was defined as the resting metabolic rate, and its measure allows us to determine the intensity of physical activity [17], [35].

Although sedentary work is not an intense effort, it cannot be classified as a healthy lifestyle. It increases the risk of obesity, type 2 diabetes and cardiovascular diseases, which may result in ischemic stroke [8], [12], [22], [37]. However, the main problem of long-term sitting remains musculoskeletal discomfort or pain [1], [4], [12]. In extreme cases, reduced physical activity and prolonged sitting are associated with an increased risk of sarcopenia, i.e., atrophy of skeletal muscles and loss of function [11].

The sitting position is maintained for about two-thirds of the time during 8 hours of work [3]. In addi-

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Received: March 3rd, 2023
Accepted for publication: April 17th, 2023

tion, many societies have an increasing trend towards a sedentary lifestyle. The percentage of such people varies depending on where they live. Among European countries, Poland is in the "half of the pack" in this respect. As many as 18% of Poles spend more than 7.5 hours a day in a sitting position. Similar figures characterize German society (19%) [21]. Prolonged sitting in front of a desk increases the risk of adverse symptoms. This can be caused by adopting a stiff and uncomfortable body position while working. Overloading caused by prolonged sitting time leads to discomfort and pain in the area of the head, cervical spine, and shoulder complex [12].

In the pre-pandemic period, the most frequently reported problem with prolonged sitting was cervical spine, shoulder and lower spine pain [1], [4]. The frequency of symptoms in the area of the shoulder complex and cervical spine among office workers was between 40–80%. In turn, shoulder pain was the third most frequently reported symptom. In addition, people working with a computer are often exposed to discomfort or pain in the cervical spine area, and the pressure pain threshold is much lower [12].

In addition, musculoskeletal disorders correlate with ergonomic factors such as uncomfortable posture and unsuitable equipment and lack of sitting breaks [12]. Various institutional solutions can significantly reduce the feeling of discomfort from the musculoskeletal system and reduce the risk of chronic diseases. These may be, e.g., taking frequent breaks with getting up, stretching exercises and modifying the workplace with an adjustable desk and appropriate equipment [4], [12], [23], [25]. Companies providing favorable changes in work ergonomics reduce the risk of pain symptoms in their employees, impacting their increased productivity [4]. Sometimes the employer provides the opportunity to work at home using information and communication equipment (including a computer). This makes work more flexible, increases effectiveness, and allows employees to reconcile professional and family life (work–life balance) [6], [26]. However, the employer does not provide the employee with an ergonomic workplace, which may potentially cause physical and mental discomfort [34].

The announcement by the WHO on March 11, 2020 of the COVID-19 pandemic caused a complete change in the current lifestyle of people around the world. The disease caused by the SARS-CoV-2 virus and transmitted by droplets manifests itself in varied way. The mild course of the disease includes symptoms such as fever, muscle pain, weakness and shortness of breath. On the other hand, severe course results in lowering oxygen saturation below 94%, respiratory failure, multi-organ failure and, consequently, death [15]. Other effects of the disease caused by the SARS-CoV-2 virus include acquired weakness, polyneuropathy and myopathy. The exact pathophysiology of these phenomena is mostly unknown. However, in a review made by Hasan et al. [14] was noticed that the cause of myopathy may be the overproduction of cytokines, which induces, e.g., damage to the microcirculation. In turn, the causes of polyneuropathy include systemic inflammation caused by the release of cytokines, nitric oxide and free radicals in the way of hypoxia. Other suggested causes of polyneuropathy, myopathy, and myalgia include hypoxia due to respiratory failure, inflammatory response of the airways, and therapy with certain medications for COVID-19.

After the outbreak of the pandemic, social distancing was introduced. Many people have been delegated to work at home. Some of them did not return to stationary work mode despite the weakening of restrictions. An estimated 81% of jobs had to adapt to the new conditions [24]. Companies were not able to provide all employees with appropriate office furniture to ensure ergonomic work. In addition, spending most of their time at home, employees did not separate work from private life [34]. With a significant increase in COVID-19 cases, a ban on leaving the house was also introduced, leading to decreased physical activity [7], [36]. This contributed to the extension of the time spent in a sitting position. Consequently, the risk of developing musculoskeletal disorders and chronic diseases increased [7], [24]. The pandemic has increased the number of people reporting cervical spine pain [30].

There are no detailed studies on changes in the occurrence of discomfort in the form of a subjective sense of tingling or numbness in the musculoskeletal system of computer users in the period before and after 2 years of the COVID-19 pandemic. The purpose of this article is to confirm or refute the hypothesis that the pandemic has caused a significant increase in the number of people reporting such discomfort and to assess in which area of the body the above-mentioned symptoms are most often reported, depending on the age of the respondents, the time of their work and its mode. In order to analyze the frequency of the study feeling of discomfort, the answers from the survey, which were given by participants performing sedentary work, were used. The conducted study took into account the dependence of the form of work performed, age and time spent behind the desk on the occurrence of symptoms in the area of peripheral joints, cervical and lower spine.

2. Materials and methods

2.1. Participants

When collecting the questionnaires, the focus was on collecting as many answers as possible, without considering the exclusion criterion. At a later stage, when analyzing the collected information, the answers were removed to create a homogeneous group. The study involved 205 respondents of Polish and German nationality, aged 22–77. Questionnaires whose answer regarding the working time at a desk was 0 h were excluded. The exclusion criterion also included people aged below 20 and above 60, working in a hybrid form, and who had undergone surgery to correct scoliosis in the past or were diagnosed with autoimmune diseases.

The study group included people aged 22–60 who declared working in front of a desk, both remotely and stationary.

2.2. Methods

The study was conducted from May to June 2022. It consisted of voluntarily completing and returning the CAVI questionnaire as a tool available via the Internet on the Google Forms website. The electronic form of the survey helped to quickly reach more people without being exposed to physical contact during the COVID-19 pandemic. At the same time, the online survey allowed us to verify which people ultimately use a computer at work and are able to use it.

The survey consisted of three parts. The first one contained 14 closed questions and 6 open-ended questions with short answers. In this part, the necessary data on age, diseases, physical activity as well as the time and form of work have been collected. The working time includes the time spent at the desk sitting.

The next two parts of the questionnaire consist only of closed questions. They were created on the basis of the Nordic Musculoskeletal Questionnaire modified by the form of the question, time and detail of the answer, and extended by questions about the sense organs. The first 10 questions concerned the time before the pandemic. These were questions about tingling, pain, or tingling sensations in the thigh, neck, lower back or the shoulder, elbow, hip, knee, and wrist joints, respectively. In addition, they were asked about hearing and vision problems.

In the last part of the form, the same questions were asked as in the second part, but they related to current symptoms.

This way, research material was collected for further analysis, including data on demographic and social affiliation, information on the way and length of work of study participants, and whether their health status changed before and after 2 years of the COVID-19 pandemic.

2.3. Statistical analysis

Statistica software, version 13.3.721.1 64-bit (PL), was used for statistical analysis. The McNemar statistical test (2×2) for contingency tables was used for qualitatively assessing the dependent samples. Responses regarding symptoms before and after 2 years of the pandemic were compared and then grouped accordingly. The grouping factors were the form of work (remote or stationary), working time (less than 8 hours or more than 8 hours) and age (under 31 or over 31).

Only those responses in which symptoms of discomfort appeared during the pandemic were selected for further research. This allowed for a simple statistical presentation of the frequency of discomfort in the group who did not show any symptoms in the study areas before the pandemic. From this information, the relative number of people reporting a given symptom expressed as a percentage was calculated. The study did not look at the worsening of symptoms of discomfort since the beginning of the pandemic. For this reason, the answers of people whose health status has not changed and the answers indicating that they have maintained their pre-pandemic health status (in relation to the feeling of discomfort) have been excluded from further analyses.

In the last stage, statistically significant differences and dependencies from the group of people confirming the occurrence of discomfort only during the pandemic were determined. The result was confirmed when the number of responses was more significant than 0 ($n > 0$), and the probability p-value for the test was less than 0.05 ($p < 0.05$).

3. Results

The analysis included the answers given by 170 respondents. Data summarized in terms of age and working time are presented in Table 1. Judging from the collected responses, a significant number of re-

spondents (62%) worked at a desk for more than 8 hours a day. The largest group of respondents were people over 31 years of age. Out of 61 workers at home under the age of 31, only 37.8% worked less than 8 hours a day. In turn, from the group of people aged over 31, as much as 66.7% reported working more than 8 hours a day. However, among people working stationary, younger people more often worked more than 8 hours a day.

Table 1. Basic data analysis

Working time	Age [years]	The form of work performed during the pandemic	
		work at home [*n*]	stationary [*n*]
Over 8h	under 31	38	9
	over 31	48	11
Less than 8h	under 31	23	2
	over 31	24	15
	Total	133	37

n – number of people.

From the study of the dependence of symptoms such as tingling or tingling in a given area (comparing the period before the pandemic and the first two years of the pandemic), it is concluded that they most often occurred in the upper limb and cervical spine. For this reason, the article analyzes the relationship between discomfort – localization in the cervical spine, shoulder complex, elbow joint and wrist.

In Table 2, the results of an analysis of the occurrence of "negative changes" in study participants who declared doing sedentary work at home and the appearance of these complaints after the onset of the pandemic are presented, and statistical significance calculations are also provided whereas "negative change" means the appearance of symptoms that did not occur before the pandemic.

Among people working more than 8 hours a day, 15.1% of the respondents confirmed an adverse change in the area distal to the wrist. Symptoms of discomfort appeared more often in the group of people under 31 (14.8%). However, from the group of people working remotely for less than 8 hours, only 8.5% of people were affected by this joint.

The impact of working time on the appearance of symptoms in the neck area is of low significance. Ailments in the group of people working a day shorter (14.9%) were more common than among people working a day longer than 8 hours (14%). In both cases, symptoms were higher in the age group under 31 years. In Figure 1, the percentage of participants working remotely who noticed discomfort in the cervical spine, shoulder, elbow or hand area during the pandemic is presented. It can be noticed that the largest group reporting a problem in the neck are people under the age of 31, who constitute as much as 18%. This area turned out to be the most frequently reported place of discomfort among young workers. In addition, the data in the table also shows that the cervical spine had the most requests in the group of people working at home during the pandemic.

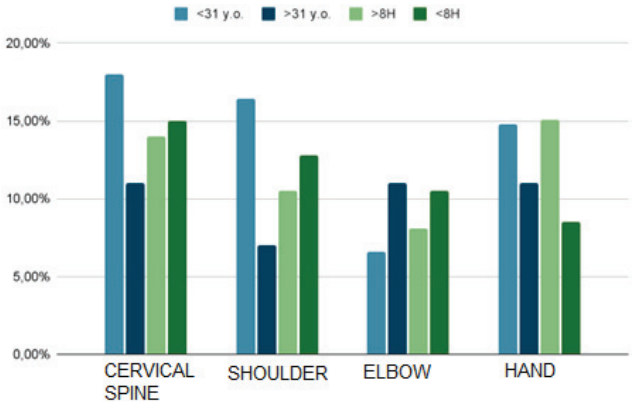

Fig. 1. Percentage presentation of the frequency of discomfort in the cervical spine, shoulder, elbow and hand area, broken down by age and working time in people working remotely

When comparing people under the age of 31, it was noticed that an adverse change in the area of the shoulder girdle was confirmed by as many as 22% of

Table 2. The results of the analysis of the emergence of symptoms during the pandemic in people working remotely in passive mode

Working time	Age [years old]	Cervical spine		Shoulder		Elbow		Hand	
		n	*p*	*n*	*p*	*n*	*p*	*n*	*p*
Over 8h	under 31	5	0.752	4	0.752	4	0.724	6	0.773
	over 31	7	0.182	5	0.450	3	0.248	7	0.182
Less than 8h	under 31	3	0.617	1	0.480	4	0.134	2	1
	over 31	4	0.371	5	0.724	1	1	2	0.617

n – number of people who reported symptoms during the pandemic, *p* – significance score.

participants working less than 8 hours a day. The same problem was indicated by 13% of people over 31 years old. This is a difference by 9 percentage points. However, the frequency of symptoms in the group of people working more than 8 hours and those over 31 years old differed by four percentage points in to the group working less than 8 hours a day. Taking only the work time into account, a greater tendency to the occurrence of ailments was registered in people working less than 8 hours. The percentage of these people is 12.8% of all participants in this group.

Symptoms of discomfort in the form of tingling or tingling in the area of the elbow joint were reported by 8.1% of all surveyed patients working longer than 8 hours, of whom 8.3% were over 31 years of age. In turn, from the group of people over 31 and working less than 8 hours, the complaints were confirmed by 16.7% of people. You can see from the graph that when comparing only the age of the participants, the elbow joint is the only area that is less likely to cause discomfort to younger people.

Any statistical analysis showed no differences in the frequency of the analyzed symptoms when comparing the period before and after 2 years of the pandemic. The hypothesis that the COVID-19 pandemic increased the number reported by study participants has not been confirmed. Nevertheless, there was a trend toward an increase in the number of reported negative percentage changes. This may mean that statistical significance could show a difference with more study participants.

The study also included people working stationary, the results of which are presented in Table 3. Discomfort in the locomotor system, which occurred only during the pandemic, was reported by 6 people working in the office. This is 18% of the study participants working stationary. An unfavorable change in the shoulder area was experienced by 1 person (9%) aged over 31 who worked more than 8 hours a day in front of a desk.

In the group of people over the age of 31 who worked less than 8 hours a day, symptoms occurred in each of the study areas. The hand had the most answers that indicate the negative impact of the pandemic (13%).

The answers of people working in the office are not included in the further discussion due to their unreliability. Too few questionnaires submitted should not significantly impact on the comparative conclusions with the results of related studies found in the literature.

As in the case of people working at home, among stationary employees, no statistically significant difference was found in all the studied groups.

4. Discussion

In the available literature, no studies were found that would take into account the variability of discomfort in peripheral joints or the spine, analyzed over the two years since the outbreak of the COVID-19 pandemic in sedentary workers. The studies already published covered a much shorter period of the impact of the pandemic solely on the subjective perception of pain. Thus, this is the first study to take into account such a long time and to include in the analysis the average daily working time and the age of the participants.

Due to the pandemic and the resulting social distancing, the study was based on an online survey. In this way, the scope of the study was extended to include the results of people living in different parts of Europe. At the same time, by completing the survey via the Google Forms application, anonymous participants were positively verified in terms of work using a computer. The questionnaire consisted of a modified Nordic Musculoskeletal Questionnaire. The same type of tools was used in the earlier period of the COVID-19 pandemic to study the occurrence of musculoskeletal dysfunctions [27].

The results on which this article is based suggest that the incidence of symptoms such as tingling or numbness in the hand area is influenced by the in-

Table 3. The results of the analysis of the emergence of symptoms during the pandemic in people working stationary in sedentary mode

Working time	Age [years old]	Cervical spine		Shoulder		Elbow		Hand	
		n	*p*	*n*	*p*	*n*	*p*	*n*	*p*
Over 8h	under 31	0	0.248	1	1	0	–	0	–
	over 31	0	1	0	1	0	–	0	1
Less than 8h	under 31	1	0.617	1	0.480	1	1	2	0.480
	over 31	0	–	0	–	0	–	0	–

n – number of people who reported symptoms during the pandemic, *p* – significance score.

creased number of hours of working from home in a sedentary position and the younger age of the subjects. Similarly, Larrea-Araujo et al. [20], in a study in Ecuador, showed that hand discomfort increased when working at home where the space was not adequately adapted to work in front of a computer. He also noted that ⅓ of employees reported a problem in the upper limb, half of which were people aged 25–34. It is worth noting that these observations concerned the place of work and age, but there is no differentiation of the analyzed material due to the time spent at the desk. During the research conducted for the purposes of this work, no other studies analyzing the impact of sedentary work time on the occurrence of subjective feelings of discomfort in young employees performing remote work were found.

Although stationary workers were excluded from the analysis in this work, the results of the survey conducted by Feng et al. [10] among stationary workers in China, their analysis showed a high incidence of Carpal Tunnel Syndrome among young workers, resulting in constant pain at work. The authors also found that the reason for symptoms is prolonged use of the computer and the lack of breaks at work.

After the analysis, it can be concluded that the occurrence of symptoms of shoulder discomfort significantly increases in people working remotely under the age of 31 (twice as much as in the group of people over 31), especially among those employees who work less than 8 hours a day (22%). No studies have been found in the literature regarding the relationship between age, working time and shoulder dysfunction in people working from home. So does Yoshimoto et al. [38] in his study, he also noticed the relationship between age and the severity of symptoms in remote workers. People who showed increased pain in the area of the shoulder, cervical and lower spine were younger.

According to Salameh et al. [29] as many as 82% of students were forced to switch to online learning during the Pandemic. They spent more than 6 hours a day in front of the computer. Using an online questionnaire, the authors verified the frequency of shoulder pain in a group of medical students. As many as 2/3 of the analyzed answers showed pain in the shoulder or cervical spine. Studies suggest that the wrong posture taken during online classes in front of the computer has a large impact on the occurrence of symptoms from the musculoskeletal system.

In the presented study, most reports referring to discomfort in the form of tingling or numbness, without classification by age and working time, concerned the cervical spine area of employees working at home. It is worth recalling that the presented study covered the period of two years of the pandemic. However, Gupta et al. [13] assessed in his study the occurrence of pain over a period of 2 months during the pandemic. His analysis shows that musculoskeletal symptoms were most common in the cervical spine. The frequency of reporting them increased by 4 percentage points compared to the time before the survey. It follows that 16% of people only experienced symptoms during the pandemic. Thus, Gupta showed a change in the frequency of symptoms similar to that presented in this paper. In another work by Roggio et al. [28] showed that during the year of remote classes during the pandemic, almost half of the students from two universities in Italy reported pain in the cervical spine, which was associated with reduced physical activity. In turn, Dzakpasu et al. [9] noted a strong relationship between time spent in front of the computer and an increased risk of cervical spine and shoulder pain, and reducing the time spent in front of the computer potentially reduces pain, especially in this area.

The conducted research shows that people over 31 years of age dominated only in one of the examined areas. This group of people most often reported a problem in the elbow joint. No information was found in the available sources regarding the impact of remote work during the pandemic on symptoms in this area. As mentioned earlier, the change of working mode was often associated with an "improvised" and ergonomically inadequately organized workplace at home. In her work, Beckel et al. [2] mentions this phenomenon. It also confirmed that work performed in such conditions is associated with an increased risk of dysfunction of the musculoskeletal system and psychosocial disorders. In addition, according to work created by Sousa-Uva et al. [33] a significant part of employees used a laptop instead of a desktop computer. The results also indicated that some people had incorrect knowledge about ergonomics [33].

In a study conducted by Juul-Kristensen et al. [18] on office workers using a computer in their work, it was found that a screen below eye level significantly increased the risk of problems in the elbow joint. Of the people who did not report pain in the elbow joint at the beginning of the study, 10% of the participants eventually confirmed this symptom.

A separate problem is the more frequent use of the laptop in remote work, because using them contributes to long-term pressure on the elbow. This may be a risk of ulnar nerve neuropathy, which results in changes in the subjective feeling of the joint area [19]. Nevertheless, as a result of previous searches, it can be stated that this article was the first to show the negative

impact of sedentary work on discomfort in the elbow joint in people over 31 years of age.

After the forced beginning of remote work, sourcing the appropriately adapted equipment was not guaranteed by the employers, but only by the individual choice of the employee. This had a significant impact on the ergonomics of sitting work. In 2012, Sonne et al. [32] created the Rapid Office Strain Assessment (ROSA) checklist, which makes it easy to assess the risk of overloading caused by an unsuitable workplace for people working in the office. Then, in 2022, based on the ROSA method, Barry et al. [5], together with Sonne as a co-author, used a tool to assess differences in office workload before and after their ergonomic intervention. The anthropometric data of the study participants and their workplaces were measured by one physiotherapist. ROSA scores were between 6–8 points, which means a high level of risk of overloading. For the experimental group, the workplace was modified, which resulted in a significant decrease in ROSA scores. The study suggests that this method is an appropriate tool for workplace assessment and evidence-based ergonomics planning, and shows the importance of ergonomics for office workers, especially during the COVID-19 pandemic.

In this article, most of the questionnaires were sent by participants living in Poland. Another study evaluating Poles in terms of activity, ergonomics and pain episodes during the pandemic was the study by Janc et al. [16]. They took into account the answers of students and employees of universities in Łódź in the period from October 2020 to until June 2021. Using an online survey consisting of the IPAQ, the ROSA and the NMQ questionnaires, the authors concluded that during remote work, the time spent in front of the computer was increased, and the time for breaks, physical activity and sleep was reduced. In addition, a correlation between increased levels of stress and the occurrence of headaches was noted. During this period, there was an increase in musculoskeletal symptoms of employees and university students, which resulted from non-ergonomic work, limited physical activity and impaired regeneration, which was a direct result of reduced sleep time.

Future research should focus on the causes of cervical spine and upper limb disorders in people working remotely. Particularly in young workers, the level and quality of ergonomics used at work and physical activity in leisure time should be examined. It may turn out that employees working in inappropriate conditions and using unsuitable equipment, without sufficient preventive knowledge, will take sick leave more often. It may be interesting to check the impact of using the touchPad in laptops on the incidence of discomfort in the wrist area. To sum up, due to the lack of sufficient research in this direction, the research should be extended to people working from home, as this is an increasingly large group of employees.

Limitations

However, the article has some limitations. The biggest problem turned out to be the number of completed questionnaires. The fewest forms were sent by people working stationary, which confirms the thesis that most people worked remotely during the pandemic. However, this prevented a reliable assessment of symptoms in this group of people.

On the other hand, a relatively small number of analyzed answers from people working at home resulted in no differences in the statistical test. Therefore, more responses should be collected in subsequent studies to determine statistical significance. Then, the analysis could show greater importance in the calculations and increase the study's credibility.

Another limitation was the research form. The pandemic forced social distancing and the only safe form of testing was an online survey. Only some participants in the study answered the open-ended questions correctly, which sometimes resulted in the removal of the entire form from the scope of the analysis. There was also no possibility of objectively assessing the understanding of the question and physically examining the indicated dysfunctions. In the analysis, the level of severity of symptoms in individual peripheral joints and the spine was omitted. It focused only on discomfort during the two years of the pandemic

5. Conclusions

To protect the health, many workplaces have been reorganized during the pandemic. White-collar workers were obliged to start working remotely, from their own apartments. After the lockdown, the way to work on foot, by public transport, by car or by bicycle has been severely limited or even eliminated. This resulted in subjective musculoskeletal discomfort in the form of tingling or numbness.

The analyzed results may suggest a lack of sufficient education on preventing musculoskeletal system dysfunctions and work ergonomics, or not using the knowledge acquired in this topic.

In subsequent studies, it seems necessary to examine the ergonomic factors affecting the frequency of the symptoms studied in this article. In this case use

of ROSA methodology proved to be an effective and reliable method for identifying computer use risk factors related to discomfort. Scoring examples include: chair height, chair depth, setting the armrest, backrest or monitor, but also location of telephone, mouse and keyboard. Research has shown a correlation between discomfort level and increasing ROSA scores.

Author contributions

The preparation of the research program: P.L., P.L.; The execution of research: P.L.; The statistical analysis: P.L.; The interpretation of data: P.L.; Preparation of the manuscript: PL, P.L.; Obtain financing: P.L. All authors have read and agreed to the published version of the manuscript.

Institutional review board statement

The study was not rated as a medical experiment. The decision was approved by the Bioethics Committee of the Medical University of Karol Marcinkowski in Poznań.

Statement of informed consent

Informed consent to participate in the study was the submission of a form, which the participants were informed about before completing it. Informed consent was hereby obtained from all subjects involved in the study.

Data availability statement

The data is not publicly available. They may be made available with the consent of the author.

Conflict of interest

The authors did not indicate any conflict related to the research, authorship or publication of this article.

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