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SELECTED CRITERIA FOR EVALUATING WORKING CONDITIONS – A CASE STUDY

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Purpose: The purpose of this article is to analyze the working conditions of university employees in the context of health, safety and ergonomics, with a particular focus on the challenges of computer work. In the face of dynamic technological changes, prolonged use of digital devices can negatively affect vision, musculoskeletal system and mental well-being. The survey was designed to identify areas for improvement and incorporate the perspective of employees in shaping the work environment.
Design/methodology/approach: The study was conducted using a questionnaire aimed at administrative, research and teaching staff at one of the universities. The questionnaire covered four key areas: work environment, technical equipment, ergonomics of the computer workstation and work organization. The collected data was analyzed quantitatively and qualitatively to identify strengths and problem areas.
Findings: Analysis of the results showed that while there are positive aspects of the work environment, there are also significant deficiencies in ergonomics, health and safety. Employees reported the need for better adjustment of workstations, especially in terms of ergonomics of computer equipment and more efficient organization of duties. Respondents' opinions provided valuable information that can form the basis for implementing specific improvements.
Research limitations/implications: The survey is limited to a single institution and is based on respondents' subjective evaluations. Further research could include a comparison between different universities and an expansion of the methodology to include job observation.
Practical implications: The results of the survey can be used as a basis for developing recommendations for improving working conditions, such as by implementing ergonomic solutions and systematically monitoring employee feedback.
Social implications: Improving the ergonomics and well-being of workers can positively affect their psychophysical health, work efficiency and overall quality of life.
Originality/value: The article brings new knowledge about academics' perceptions of their working conditions and highlights the value of their voices in improving the work environment.
Keywords: occupational health and safety, ergonomics, conditions of work, survey, employee.
Category of the paper: Research paper.

1. Introduction

The technical university employs its staff on various positions, ranging from administrative, scientific and technical. So the issues of safety, hygiene and ergonomics in their work environment are diverse. In addition to the analysis of selected aspects of the formation of conditions of work, the article emphasizes the link between the specificity of the work performed by employees of scientific and educational units and hardware. The research method applied involves a diagnostic survey method, and a survey addressed to the employees of a scientific and educational unit was applied as a research tool. The survey consists of several parts and is aimed at gathering the opinions and experiences of employees on aspects that shape conditions in their workplace. The survey was anonymous.

The research problem boils down to answering the following questions:

- Does the level of safety and ergonomics at a higher education institution include only the necessary recommendations, the so-called minimum health and safety requirements?
- Does the level of safety and ergonomics at the university meet staff expectations and needs?

The provision of safe and healthy conditions of work is a legal and social obligation of every employer, as well as an entrepreneur for which natural persons perform work, including those working under contracts of mandate and contract for specific work, as well as the self-employed, regardless of the basis on which this work is provided (The Labour Code Act, 1974). Occupational safety can be defined as the activity leading to the protection of the employee against accidents (or possible hazards) at work (Ejdays et al., 2010). It is implemented through the application of various technical means, appropriate organization of work and formation of appropriate human behavior during work performance, taking into account the type and intensity of potential occupational hazards occurring (Hansen, 1998). Occupational health, on the other hand, deals with the effects on humans of various harmful factors (e.g. chemical, physical or biological) present in the working environment. According to the PWN Encyclopedia, one of the main aims of the "modern occupational health is to counteract mental fatigue and the one-sided effect of work on the human body, resulting, among other things, from the negative effects of the mechanization of production and the new nature of mental work" (Popularna Encyklopedia PWN, 2020). Apart from occupational health and safety, the matter of ergonomics is an equally important aspect in fulfilling the above obligation. The law requires the employer to design and adapt the workplace for both new and existing employees (Rączkowski, 2014). The fundamental aim of ergonomics is to humanize work through such functioning of the man-machine-environment system so that human work is performed as effectively as possible and at the lowest possible physiological cost, while preserving the physical and mental comfort of the employee. Organizing work at a work station

according to ergonomic as well as hygienic and safety requirements increases productivity and efficiency of employees (The Decree of the Minister…, 2003; Shobe, 2018; Wróblewska, 2004). Globally, such as in Korea, studies have been conducted on factors affecting satisfaction with working conditions, among others, which change over time, and found that interpersonal relationships and the social environment in the workplace play an increasingly important role (Lee, Park, 2021). In addition, a study from a Brazilian university found that improving working conditions can prevent psychological problems among workers, and that detailed analysis of their factors enables better prioritization of corrective actions (Borges et al., 2023). Changes in the work environment and the introduction of ergonomic interventions in workstations positively affect productivity, as demonstrated in a study of administrative staff at another university, highlighting the role of ergonomics and anxiety reduction in improving organizational effectiveness (Baleshzar, 2022).

2. Materials and methods – methodology

A diagnostic survey method was used in this study. An anonymous survey completed by 280 technical university staff in administrative, research, research and teaching positions was the research tool. The study was conducted (in March-April 2020) at the beginning of the pandemic during a period of many university operational constraints (Łochańska, 2020).

The research survey divided employees into four groups, three of which included academic positions, i.e. research, research and teaching (professors, university professors, assistant professors, assistants, senior lecturers, lecturers, senior instructors, instructors). The administrative staff in the survey is a group of employees not included in the above-mentioned groups, mainly employees from the administrative service of the university and employees supporting the scientific and teaching group, i.e. engineering and technical staff.

The survey was distributed electronically to all university structures, i.e. the following organizational units:

- faculties,
- non-faculty units,
- central administration and other units related to the activities of the university.

The survey questionnaire consisted of several sections, grouped into sections.

The first part entitled “METRICS” - four questions, answers to which provided the database necessary to characterize the population under study. This data is relevant from a research perspective, as indicated in an earlier study conducted among administrative staff at another university, which revealed that perceptions of ergonomic working conditions have a weak negative correlation with stress levels, with factors such as age, gender, working hours and

ergonomic conditions influencing perceptions, highlighting the importance of providing appropriate working conditions for employee health and safety (Oznur et al., 2023).

The second part required respondents to indicate to what extent they agreed or disagreed with the statement indicated. The theses presented are classified into four areas (Łochańska, 2020):

- WORK ENVIRONMENT - questions relating to employees' impressions and feelings about the environment of their workplaces, including infrastructure, work area, microclimate, signage, etc.;
- TECHNICAL EQUIPMENT OF THE WORK STATION - questions concerning the impressions and feelings of employees including the equipment of the work station, i.e.: type of furniture, possibility of its arrangement, compatibility, etc.;
- COMPUTERS AND SOFTWARE ERGONOMICS - questions relating to employees' impressions and feelings about the hardware used, i.e.: suitability of the equipment to the employee's work tasks , condition of the hardware, etc.;
- WORK ORGANISATION - questions about impressions and feelings of employees about the work organization, i.e. courses, training, the way work is done, etc.

A five-point Likert's scale was used to measure the claims, where:

1 - “definitely not”,

2 - “rather not”,

3 - “neither agree nor disagree”,

4 - “rather yes”,

5 - “definitely yes.

Computer hardware as a basic tool for university work

Additional questions were also included in the second part of the survey, which served to further explore the computer hardware aspect of the work, as many employees nowadays perform their tasks in front of a computer and this is particularly apparent at the university. Computer has become an indispensable and essential working tool, affecting not only the way tasks are carried out, but also efficiency and timeliness. In a higher education institution, hardware is a necessary work tool for administrative staff during basic working hours, while research and teaching staff, conducting scientific research, using computer software, performing analyses, creating publications, preparing teaching activities (presentations, assignments, handouts, etc.) also use desktop or laptop computers. While it might seem that working with hardware is pleasant and non-tiring work, this is not the case at all, and inadequate adaptation of the computer work station to the individual (and physical inactivity, body mass index, working hours, years of office work) (Aytutuldu et al., 2020) can lead initially to discomfort, ending in serious health problems (Malińska, 2019). The ailments most commonly experienced by employees who use the computer as a work tool are:

- neck pain (Malińska et al., 2012),
- upper and lower back pain (Aytutuldu et al., 2020; Author, 2019),
- upper and lower limb pain (Aytutuldu et al., 2020; Chowdhury et al., 2018),
- indispositions of the shoulder (Author, 2019),
- nervous and cardiovascular disorders (Bartoszek et al., 2018),
- visual disorders (Coles-Brennan et al., 2019; Zalat et al., 2012).

The longer we spend in front of a screen, the worse it is for our organism, therefore it is important to adjust the equipment of our workplace and the organization of our work so that we put as little strain on our organism as possible. Many of the causes of stress on the human body are physical factors of the work environment (such as lighting, air quality, noise or microclimate in offices and administrative workplaces) and are the main areas for shaping a safe, ergonomic and optimal workplace (Chen et al., 2020; Lou, Ou, 2019; Niciejewska, Kač, 2019). On the other hand, according to some other studies, most employees assess their internal physical environment as good, identifying lack of concentration and stress (Author, 2019; Lutke Lanfer et al., 2021) and organizational and social conditions (Karamanis et al., 2019) as factors of workload in the office. In addition, building and raising awareness among employees of the risk factors present in modern office work is still necessary to promote a general improvement of conditions of work from a physical and psychosocial perspective (Lutke Lanfer et al., 2021; Coelho et al., 2015).

A computer work station should meet the requirements of both safety and hygiene as well as, or even primarily, ergonomics (Ordinance of the Minister…, 1998). It is estimated that prolonged computer work in non-ergonomic conditions and poorly designed workstations at universities leads to problems with the upper limbs and trunk, as confirmed by the results of assessments of the magnitude of physical loads by methods, i.e. RULA and REBA) (Chowdhury et al., 2018). To avoid negative consequences of working at computer work stations, the following technical conditions should be met:

- ensuring adequate lighting, both natural and artificial,
- equipping office desks with curtains or roller blinds that reduce the likelihood of daylight reflecting on the computer screen,
- the height of a desk should allow for adequate positioning of office tools at the work station,
- the height of the table and the seat should be adapted to the needs of the employee and, above all, should allow the free position of the limbs and the correct observation angle of the monitor: 20-50°,
- the surface of the desk should be matt,

- the keyboard should be a separate piece of hardware and have an adjustable angle of inclination (0-15°),
- the monitor at the work station should have an adjustable tilt angle function (Ordinance of the Minister…, 1998).

As work stations at the university may be equipped with different hardware, information on the type of equipment was verified (Table 1, Figure 1).

Table 1.
Type of hardware used at individual work stations

Work station	Work performed on:		
	desktop computer	laptop	desktop and laptop computers
Administrative	62	6	16
Research	4	4	6
Research and teaching	27	33	101
Teaching	9	3	9

Source: Own study.

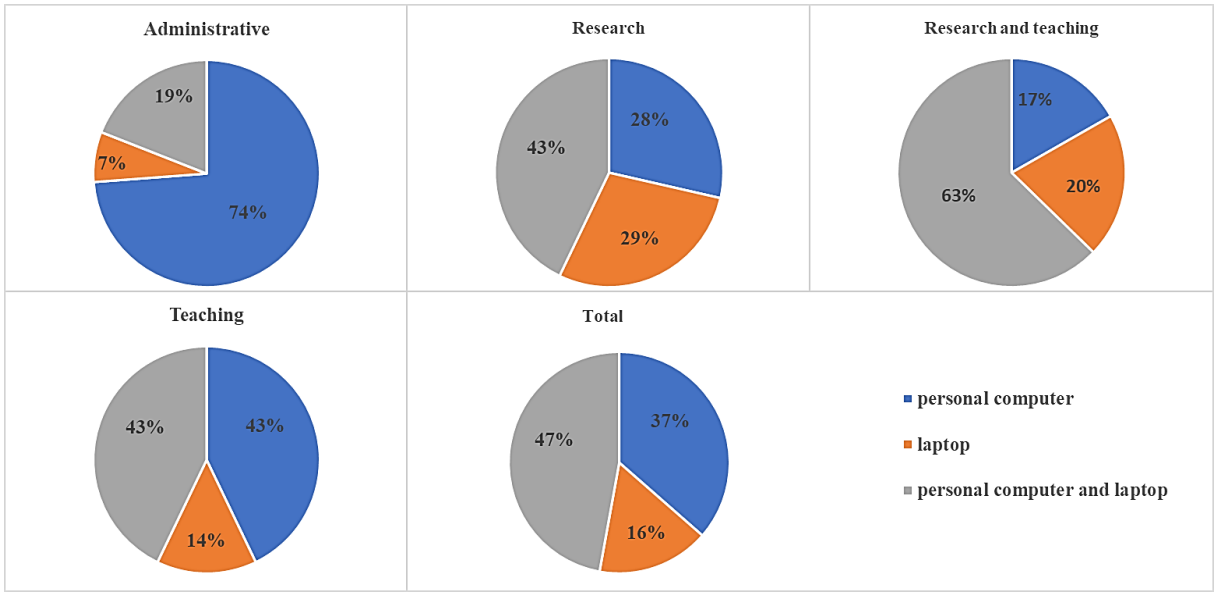

Figure 1. Type of hardware used at individual work stations.

Source: own study.

Three types of work performed by higher education staff using hardware were collated (Table 2 and Figure 2). The results obtained highlight that all positions are associated to varying degrees with the following tasks:

- office/administrative/organizational work,
- the preparation and delivery of teaching,
- preparation and conduct of scientific research.

Table 2.
The main tasks for which hardware is used in the various workplaces

Work stations	Hardware use		
	administrative and office/ organizational work	classes	research
Administrative	83	11	10
Research	9	5	14
Research and teaching	142	160	159
Teaching	18	20	15

Source: Own study.

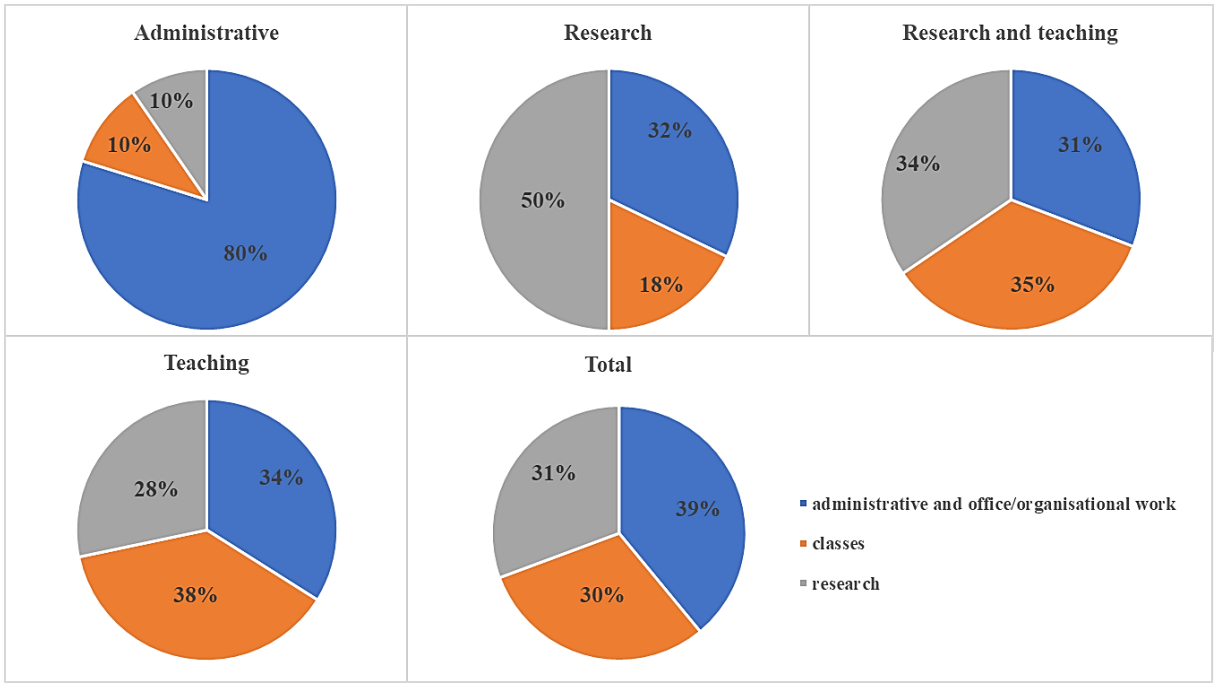

Figure 2. Types of work performed by particular groups of university employees using hardware.
Source: own study.

The employees' actual working time in front of the computer is shown in Table 3 and Figure 3. According to respondents' answers, this time is usually between 6 and 8 hours (47.1%). Working on a computer for more than 8 hours was indicated by more than 37% (including 80% of research and teaching staff).

Table 3.
Time of use of hardware by work station

Work station	Actual working time at the computer		
	up to 4 hours	between 4 and 6 hours	between 6 and 8 hours
Administrative	3	11	59
Research	3	5	5
Research and teaching	3	16	61
Teaching	3	4	7

Source: Own study.

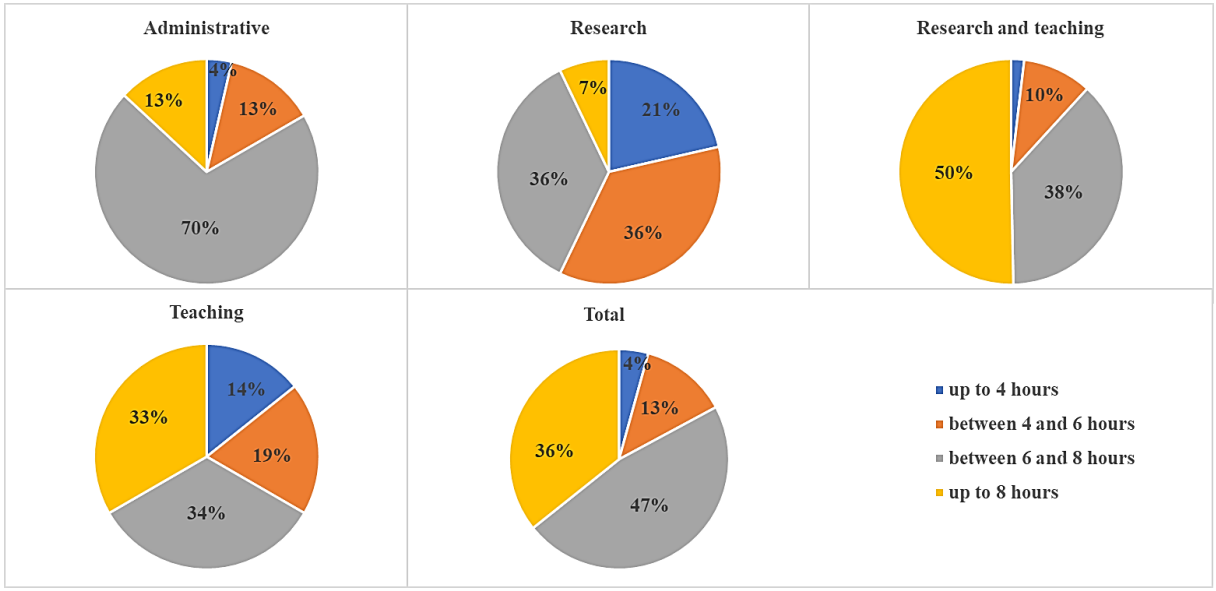

Figure 3. Percentage share of time spent working at the computer in individual workplaces.
Source: own study.

The compiled results indicate that there is a significant burden associated with prolonged computer work, especially among research and teaching staff. Such prolonged time spent in front of a screen can increase the risk of negative health effects.

3. Results

The questionnaire analyzed the level of safety and ergonomics at administrative, research, research and teaching positions, based on responses from 114 women and 166 men. The structure of the study population by age is shown in Figure 1. The largest group is between 31 and 40 years old (37.5%), these are young people but with a certain amount of work experience and seniority.

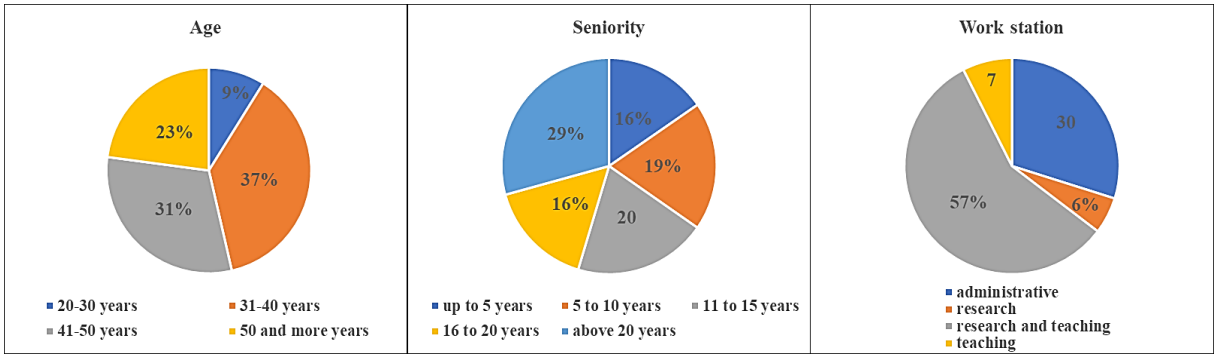

Figure 4. Percentage share of time spent working at the computer in individual workplaces.
Source: own study.

The least numerous group are people in the age bracket between 20 and 30 years (25 people). Among the respondents, employees with the longest work experience (over 20 years) constitute the most numerous group - 29.3% (Figure 4). Other groups by years worked are evenly represented in the range of 15-20%.

With regard to the diversity of staff positions held, 161 research and teaching staff (57.5%) completed the survey. Of the remaining respondents, 84 were employed in administrative positions and, in turn: 21 and 14 people - teaching and research staff (Figure 4), which is reflected in the employment structure of the university.

The second part of the survey asks about employees' impressions and feelings concerning the conditions of work within their own work stations.

3.1. Aspect - working environment

In the first instance, the questions concerned infrastructure, the area in which the sites are located, safety signage, room microclimates, lighting, noise and sanitary facilities. The results obtained are shown in Table 4 and Figure 5.

Table 4.
Respondents' answers concerning working environment

Selected aspect of the working environment	Points awarded and number of responses					Average score
	1	2	3	4	5	
Size of rooms	24	48	10	139	59	3.6
Ergonomics at the workplace	50	76	6	128	6	3.0
Room microclimate	43	77	8	123	29	3.1
Adequate lighting	14	39	6	158	63	3.8
Noise level	11	42	8	76	143	4.1
Cleanliness of the building and premises	7	13	5	161	94	4.2
Escape routes and exits	5	10	14	124	127	4.3
Cables and wires	23	41	16	134	66	3.6

Explanatory notes: 1 - “strongly disagree”, 2 - “rather disagree”, 3 - “neither agree nor disagree”, 4 - “rather agree”, 5 - “strongly agree”.

Source: Own study.

The results of the survey indicate that employees of the technical university rate the maintenance of cleanliness and tidiness in their work environment the highest (91.1% - answers "rather agree" and "strongly agree"), indicating that this increases their comfort at work. In the second place, the signage system for escape routes was located (89.7%). The above may suggest that employees value a sense of safety at work and are confident that in the event of a situation threatening their health and life, the university is prepared to counteract dangerous incidents and will provide them with appropriate protection and assistance. The correct way of marking emergency exits together with the right system of lighting the escape routes in the workplace will make it possible to evacuate the danger area quickly but safely.

The lowest rating was given to the level of ergonomics at the work station (45% of respondents answered "rather not" or "definitely not"), and it is known that optimal solutions reduce the likelihood of pain resulting from overloading the muscular-skeletal system, so it is

particularly important at work in a sitting position, where the tool used is a computer (Figure 5).

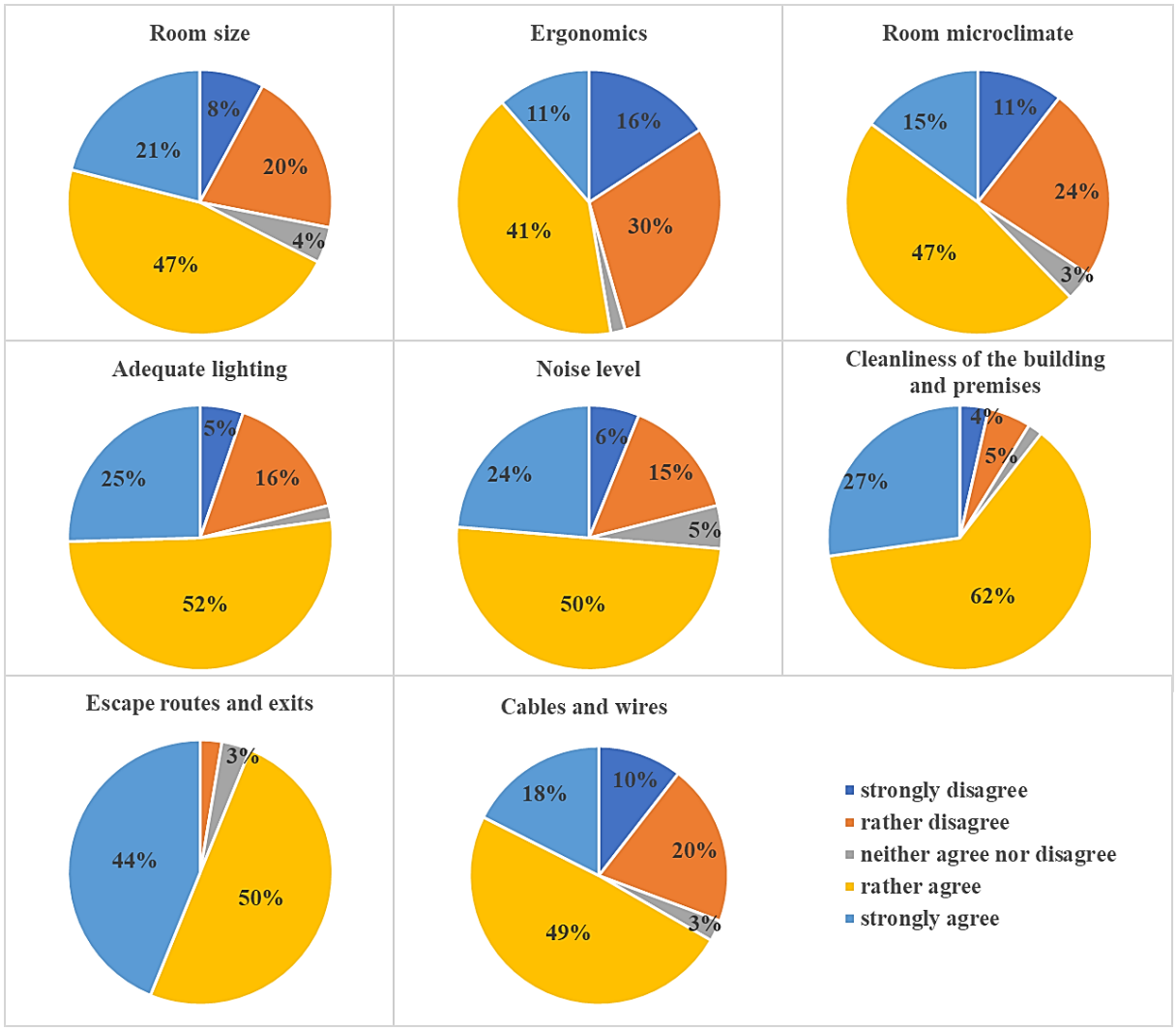

Figure 5. Structure of responses concerning the work environment.

Source: own study.

The results of the surveys carried out indicate a minimal divergence in the assessment of respondents' feelings about gender diversity.

3.2. Aspect - technical equipment of work stations

The second aspect analyzed in terms of employees' impressions and feelings are selected elements of the technical equipment of a given work station, i.e. the quality and type of furniture, the possibility of their convenient positioning, contributing to a more effective and comfortable work process. A quantitative summary of the responses is given in Table 5 with an illustration of these in Figure 6.

Respondents rated the state of window coverings in the workplace highest (81.5%), valuing comfort at work, noting that it is important for them to reduce the effects of excessive sunlight and daylight reflection on computer screens. In addition, individual work space, which allows

the necessary elements to be placed within reach of the upper limbs (76.4%), and office equipment and necessary equipment (i.e. computer, telephone, photocopying machine, printer, etc.), which have a significant impact on the quality and timeliness of the work performed (76.1% each), are highly valued. The weakest ratings were given to the seat parameters of stability and backrest height adjustment, although this is essential for reducing musculoskeletal disorders and injuries, with an average score of 3.3.

Table 5.
Respondents' answers concerning technical equipment of the workplace

Selected aspect of technical equipment at the workplace	Points awarded and number of responses					Average score
	1	2	3	4	5	
Quality of equipment	17	63	10	150	40	3.5
Workspace	15	38	12	158	57	3.7
Design of office equipment	21	34	12	133	80	3.8
Desk	27	44	7	146	56	3.6
Seat	48	54	3	113	62	3.3
Window coverings	25	22	5	99	129	4.0
Necessary equipment	17	40	10	119	94	3.8

Explanatory notes: 1 - "strongly disagree", 2 - "rather disagree", 3 - "neither agree nor disagree", 4 - "rather agree", 5 - "strongly agree".

Source: Own study.

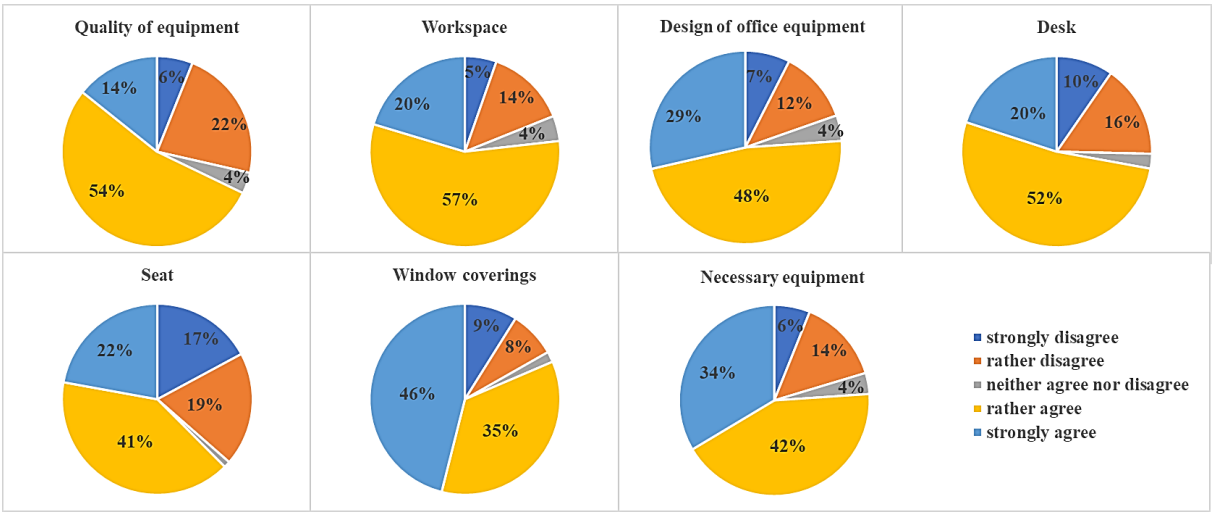

Figure 6. Structure of responses concerning the technical equipment of the workplace.

Source: own study.

After analyzing all the results of this aspect, it can be concluded that the university provides comfortable conditions of work for its employees. Employees rate the parameters related to the technical equipment of the workplace fairly positively.

3.3. Aspect - hardware and software ergonomics

Another aspect analyzed in the questionnaire in terms of employees' impressions and feelings is the computer hardware and software ergonomics, i.e.: the condition of this hardware, the quality of the software and its adaptation to the psychophysical capabilities of the employee. The results obtained are shown in Table 6 and Figure 7.

Table 6.
Respondents' answers regarding hardware and software ergonomics

Selected aspect of computer hardware and software ergonomics	Points awarded and number of responses					Average score
	1	2	3	4	5	
Monitor adjustment	25	26	11	84	134	4.0
Distance from monitor screen	7	32	7	148	86	4.0
Keyboard adjustment	61	36	29	67	87	3.3
Keyboard surface	6	7	20	98	149	4.3
Software adjustment	5	13	7	144	111	4.2
Specialized support	36	61	30	98	55	3.3

Explanatory notes: 1 - "strongly disagree", 2 - "rather disagree", 3 - "neither agree nor disagree", 4 - "rather agree", 5 - "strongly agree".

Source: Own study.

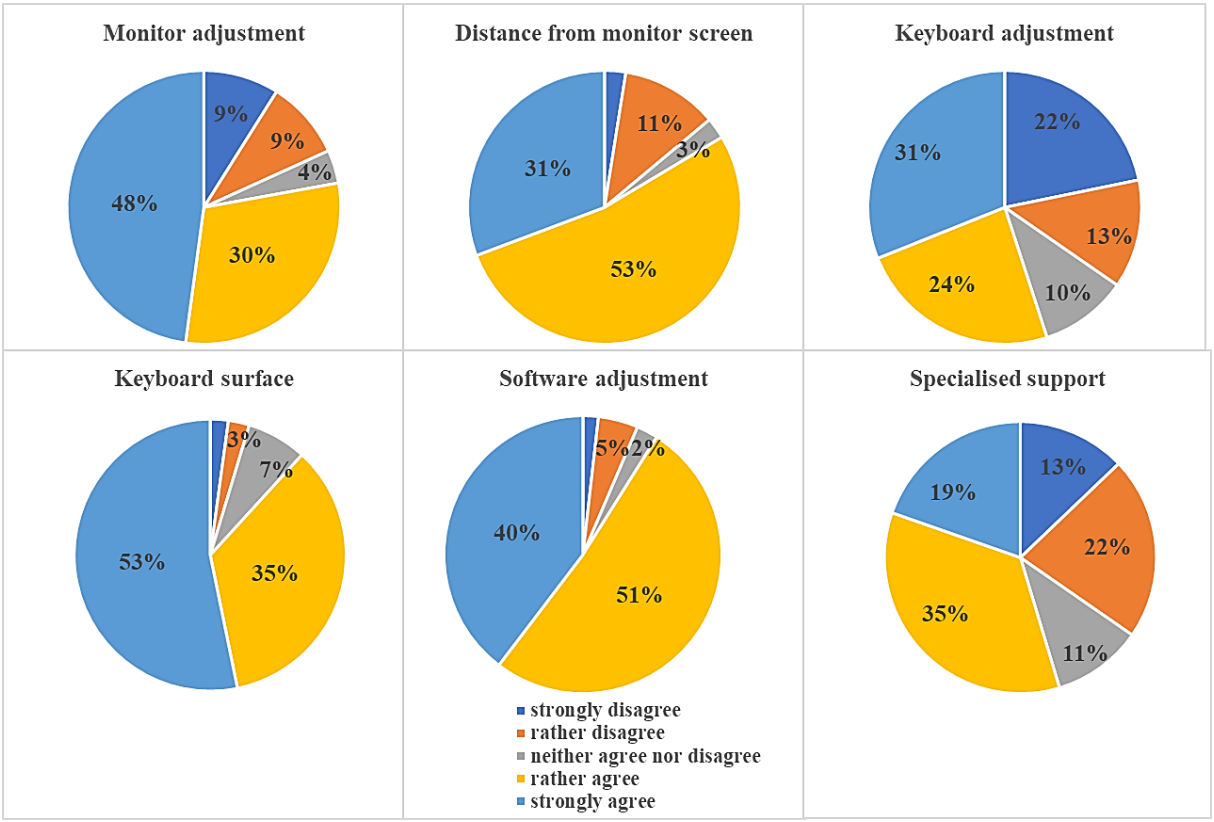

Figure 7. Structure of responses concerning computer hardware and software ergonomics.

Source: own study.

The research proves that respondents in terms of computer hardware and software facilities rated the availability of computer programs adapted to their tasks highest (91%). This is followed by the factor related to the keyboard surface and its features, i.e. matte finish, legibility of characters - 88.2% of satisfied people. The parameters related to the monitor, its adjustment and the distance between the eyes and the screen are highly rated - mark 4. The ability to adjust the keyboard angle was rated lowest by respondents (3.3 points) but most academics reported working on laptops, and here adjustment is difficult or impossible. The administrative staff mostly work on stationary equipment and here they rate their satisfaction with this parameter as good. Equally low (3.3) were assessed specialist assistance

in the event of the occurrence problems with software or computer operation. The lack of permanent support from specialists (IT specialists) may interfere, in particular, with the smooth and timely execution of tasks and research topics and contribute to stressful situations.

The analysis of the answers obtained shows that the system of computerization in the researched research and educational unit is at a very good level, but it should be emphasized that the development of technology, conducting innovative research, educating students, force constant updating and modernization of hardware and its software.

3.4. Aspect - work organization

Another aspect considered from the point of view of employees' impressions and feelings is the organization of work, which includes questions about breaks, freedom in the way they do their work, access to courses, training, conferences, and the extent of their work responsibilities and holiday periods. The results are presented in Table 7 and supported by Figure 8.

Table 7.
Respondents' answers concerning work organization

Selected aspect of organization of work	Points awarded and number of responses					Average score
	1	2	3	4	5	
Breaks at work	3	8	37	131	101	4.1
Courses, training	38	72	29	105	36	3.1
Autonomy of work	4	25	7	168	76	4.0
Business trips	29	51	23	126	51	3.4
Time of completion of tasks	47	75	21	111	26	3.0
Periods of leave	5	16	1	130	128	4.3
Variety of tasks	3	25	9	136	107	4.1

Explanatory notes: 1 - “strongly disagree”, 2 - “rather disagree”, 3 - “neither agree nor disagree”, 4 - “rather agree”, 5 - “strongly agree”.

Source: Own study.

The respondents' answers indicate that the strongest point for employees in the area of work organization is the compliance with the law on the possibility to choose the timing of annual leave (92.1% good and very good ratings) by the management team. According to the respondents, the possibility to decide how to perform their work in a given position (work autonomy - 87.1%) and breaks during work (82.8% satisfied) are at a satisfactory level. Factors that need to be improved include: ensuring greater accessibility and opportunities to participate in specialized courses, training to broaden professional skills, and adjusting the scope of responsibilities and work tasks to their specific time. It should be remembered that professional development of employees, through additional courses/workshops, influences greater commitment to work, although it consumes more working time, but it can support the prevention of routine, monotony or occupational burnout (Grala, 2020).

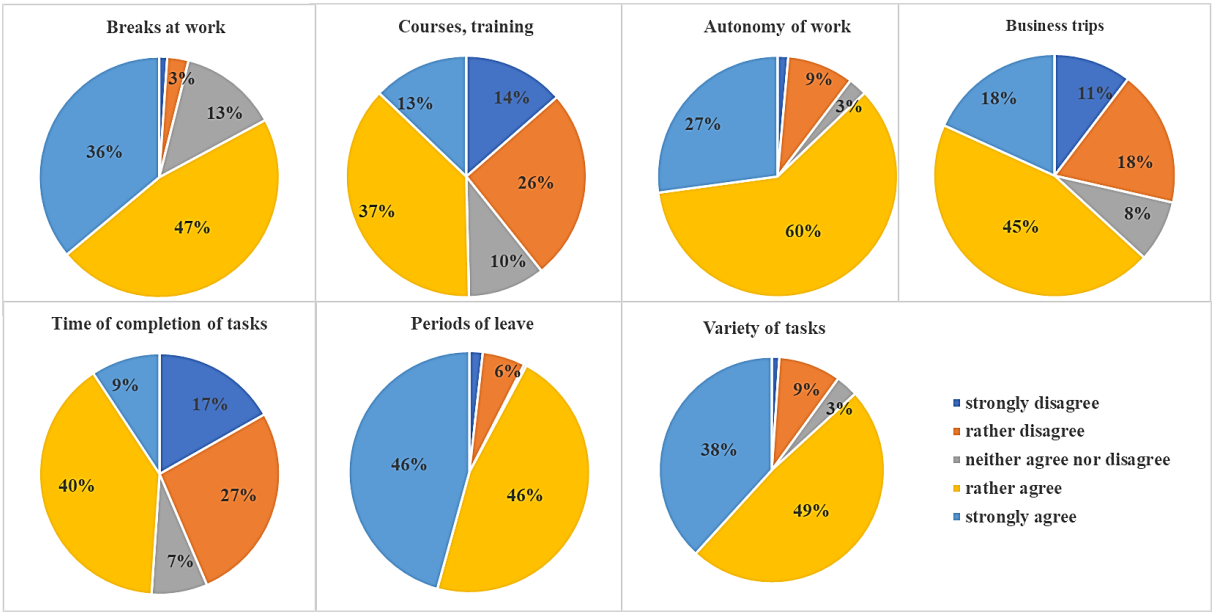

Figure 8. Structure of responses concerning the work organization.

Source: own study.

Irrespective of gender, respondents are negative about the time taken to complete duties and tasks (men: 2.8 and women: 3.3 points - representing 33.6% dissatisfied). Task and courses/training completion time is the issue least rated by teaching and research and teaching staff (below 3 points). These are people who teach both full-time and part-time students, so they do their work during the week and at weekends. The survey was conducted in the early days of the Covid-19 related pandemic and the work at the university was done remotely - this presented a major challenge for the teaching staff, involving more time spent preparing for such a form of work. Only for the group of people employed in administrative positions are additional professional development events (courses, training, etc.) rated as satisfactory.

4. Discussion and conclusions

The article thoroughly analyses the problem of working environment conditions for employees of a technical university as a scientific and educational unit. The main focus was to identify areas for analysis of the design of conditions of work, with particular emphasis on aspects of work with hardware, in administrative, research, research and teaching positions. The analysis was based on the impressions and feelings of the employees themselves, as expressed in the survey carried out.

The management of health and safety at work is an extremely important process in any institution, including a research and teaching unit, and requires a great deal of commitment from the employer to ensure an adequate level of protection from hazards and their effects on both the physical and mental health of employees. The questions asked in the survey made it

possible to determine the level of satisfaction and dissatisfaction of employees with the state of safety and ergonomics at their work stations and to identify aspects for improvement. It appears that safety and ergonomics are important for employees, as adequate levels reduce the likelihood and severity of physical ailments and increase comfort at work, productivity and work satisfaction.

The most significant conclusions of the research and analysis include:

1. In each of the indicated areas of conditions of work, there are aspects to be improved: work environment - ergonomics at the work station (average score of 3.0 out of maximum 5.0), technical equipment of work stations - seating (3.3), hardware and software ergonomics - keyboard adjustment and specialized support (3.3), and work organization - task completion time (3.0).
2. The highest rated employees were: work environment - escape routes and exits (mean score of 4.3), technical equipment of workplaces - window coverings (4.0), hardware and software ergonomics - keyboard surface (4.3) and work organization - holiday periods (4.3).
3. The results obtained regarding the use of hardware and the organization of the computer work station, which, because the study was conducted at the beginning of the pandemic, reflected the state and level of the working environment at the university during its normal operation. Surveys carried out afterwards would not have been able to establish the actual state of safety and ergonomics in the opinion of the employees interviewed, as they worked for a longer period of time in a remote system.

To summarize, the level of safety, including the condition of ergonomics, at the surveyed higher education institution requires some changes, first of all in the aspects indicated by employees and regular monitoring of employee opinion on conditions of work.

Continued research in the coupling of satisfaction and existing complaints due to existing conditions of work may provide suggestions for prioritizing preventive measures in the workplace from an early stage in the design of computer-friendly work stations at the university. In the future, it is planned to carry out a comparison of the actual working conditions at the workstations with current Polish and EU legal standards, which will allow the nature of any shortcomings to be identified more accurately. In addition, the extension of the research to other universities and the inclusion of work observations will enable an even more complete assessment of factors affecting employee comfort and health, also in the context of pandemic-related changes.

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