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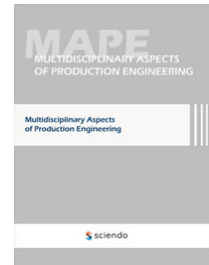
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## INTRODUCTION

The coronavirus (COVID-19) pandemic is one of the most impactful events of the 21st century. The COVID-19 epidemic began on November 17, 2019 in Hubei Province, in the city of Wuhan in central China. It was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. The COVID-19 epidemic has changed the daily work organization of many companies. Whenever possible, the companies delegated their employees to work in the home office. Due to the growing number of COVID-19 cases in Poland and Europe, employers were forced to take quick steps to minimize the spread of the virus, ensure continuity of work and business operations (Cockburn, 2020; WHO's guide, 2019).

The COVID-19 epidemic in Poland resulted in the necessity to introduce and apply sanitary rigours. The national legislator obliged employers to provide employees with disposable gloves or hand disinfectants. An obligation was introduced to maintain a distance between workstations of at least 1.5 m, and in the absence of such a distance the use of personal protective equipment was ordered. Customer service stations should be regularly disinfected. Subsequent government guidelines have introduced an obligation to cover mouth and nose with disposable masks or visors. The Polish government has developed special procedures to ensure the greatest possible safety for employees in enterprises, recommending that: avoiding the infection of employees with the COVID-19 virus by strangers, limiting the number of physical contacts within the company, creating small work teams, use of non-contact temperature measurement employees and guests before entering the premises, ensuring the protection of the faces and hands of all employees, limiting the use of common spaces, change in rest hours.

The COVID-19 epidemic has put entrepreneurs up against the need to deal with a previously unknown reality overnight. On the one hand, they must ensure continuity of work/production, on the other hand, they must remember about the health and safety of employees as well as customers and contractors. Managers were not prepared to manage in such turbulent conditions. The developed procedures for dealing with unusual situations often contained guidelines – in the worst case scenario, how to act in times of war. However, none of the companies were ready to act during the epidemic. So far published teleworking studies were not conducted in such an urgent and dangerous situation as the world epidemic (Robelski, 2019; Ruíz Castilla et al., 2019).

Well-being has become a key concept in the new trend of ergonomics and positive psychology, exploring factors influencing the sense of human satisfaction in various areas of human functioning. One of the most important activities of an adult is his or her professional work, thus the sense of well-being in the workplace has a fundamental impact on the overall sense of well-being of an employee (Fredrickson, 2004; Di Fabio, 2017). The well-being of an employee can be considered in three aspects (Orben and Przybylski, 2019; Kim et al., 2017; De Vos and Witlox, 2017; Helgeson et al., 2018; Taylor et al., 2017; Wamsler et al., 2018):

- psychological – subjective psychological well-being (e.g. job satisfaction, self-esteem and abilities, diversity of performed tasks, matching the difficulty of performed tasks to the capabilities and skills of the employee, support and assistance of the superior in the situation of difficulties in the performed work, sense of importance of professional role);
- physical safety at work, observance of employee work, health care;
- social – relations with other people, including family relations (including cooperation with other employees, with superiors, contacts with other people and the degree of their formalisation).

Faced with COVID-19 companies had to adapt to the new reality overnight, they could not afford to delay, such circumstances created a previously unknown background for research. Many companies decided to send their employees to work from home, considering it the safest solution. Analyzing the literature contained in the Web of Science, Scopus or Google Scholar databases, a research gap was identified in the field of research related to the well-being of workers sent to remote work during the COVID-19 pandemic. The aim of this research was to determine whether the remote work imposed on workers during the COVID-19 epidemic has an impact on their well-being and, if so, how.

## **METHODS**

The research material consisted of the results of a survey conducted among the employees referred to remote work in connection with the announced state of the epidemic in Poland. The research was conducted in the period from July 31 to August 19, 2020. The respondents answered the questionnaire questions.

The respondents answered the questions in a 5-point Likert scale (Likert, 1932), where 1 meant a definitely negative answer, 3 meant a neutral answer, and 5 meant a definitely positive answer. During the research, data was collected on the gender and age of the respondents, the sector of the company's activity (public, private) and the size of the company (small company with up to 49 employees, medium-sized company with up to 249 employees, large company with more than 249 employees), the place of residence of the respondents (house, apartment), number and age of children. The survey, due to the still valid restrictions on direct communication, was distributed on industry forums by means of social media.

Questionnaire questions:

- Q1. How do you assess the lack of direct contact with other employees while working remotely?
- Q2. Do you find it difficult to focus your attention while working from home?
- Q3. Do you have problems separating your private life from work?
- Q4. How do you assess your home workstation in terms of comfort?
- Q5. How do you assess your motivation during remote working?
- Q6. How do you assess your effectiveness during remote working?
- Q7. Do you feel free to work remotely?
- Q8. Does remote working give you a sense of independence?
- Q9. Do you feel that you can save time by working remotely?
- Q10. Do you have more time for your family while working from home?
- Q11. Are you satisfied with the possibility to work remotely?
- Q12. Do you work from home in one place suitable for office work?
- Q13. Do you always work from home in a computer chair (5-arm base, armrests, adjustable seat height, tilt angle, backrest etc.)?
- Q14. Does remote working disrupt your daily schedule?
- Q15. Do family responsibilities interfere with your remote working?
- Q16. Does remote working interfere with your family life?
- Q17. Do you only work remotely during working hours (e.g. 9-17)?
- Q18. How would you rate the quality of internet connections used in remote working?

The results were analysed statistically, in the following ranges:

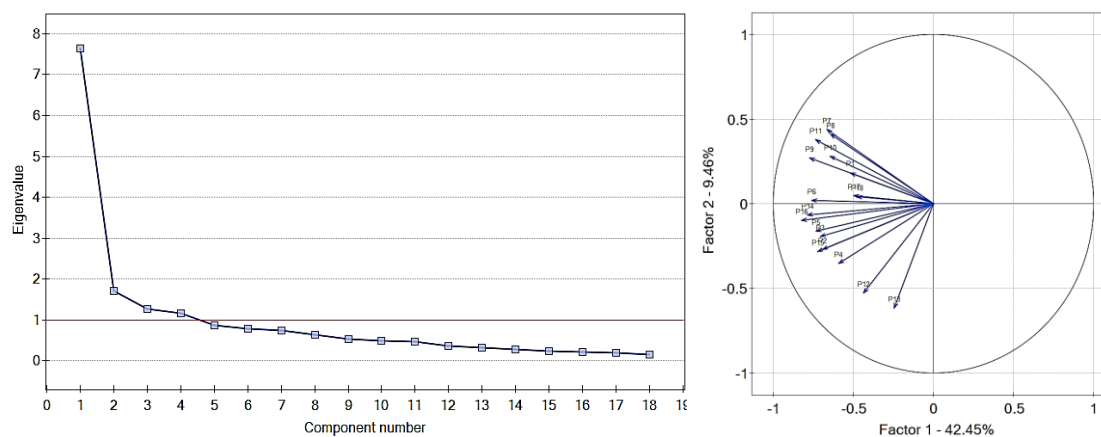
- data reliability analysis – a-Cronbach test (Cronbach, 1951) and Nunnally criterion (Nunnally, 1976),
- analysis of main factors – Bartlett test (Bartlett, 1937), Kaiser-Mayer-Olkin coefficient (Kaiser, 1974),
- decomposition analysis – Shapiro-Wilk test (Shapiro and Wilk, 1965),
- linear correlation analysis – Pearson test (Buda and Jarynowski, 2010),
- comparative analysis of ordered categories – ANOVA Kruskal-Wallis test (Kruskal, 1952) and POST-HOC test with Dunn Bonferroni correction (Dunn, 1964) or Mann-Whitney U test (Mann and Whitney, 1947),
- the Jonckheere-Terpstra trend test (Appelbaum et al., 2005).

For each of the tests carried out, the confidence level  $\alpha < 0.05$  was assumed.

## RESULTS

199 questionnaires were collected in total. The age of the respondents ranged from 22 to 71 years (arithmetic mean 38.2, coefficient of variation 0.24, median 38, trend). The age of the respondents for the purposes of the analysis was re-coded into generations: born to 1946-1964 (BB generation), 1965-1984 (X), 1985-1994 (Y), 1994 and later (Z).

In order to assess the reliability of the tests, the internal compatibility of the whole scale (18 questions) was analyzed using the  $\alpha$ -Cronbach compliance factor value. It was found that for the whole scale  $\alpha$ -Cronbach is 0.909, which, taking Nunnally's criterion, indicates very good reliability of the scale. The average correlation between pairs of items was 0.371, which was considered unsatisfactory. Therefore, further analysis of the main components was carried out in order to identify possible subscale. For the whole scale,  $p < 0.001$  was determined using Bartlett's test. The  $p$  value of Bartlett's statistics indicates the truthfulness of the hypothesis of a significant difference between the obtained correlation matrix and the unit matrix, i.e. a significant correlation of variables. The obtained KMO coefficient, on the other hand, is average and amounts to 0.895. Indications for the analysis of the main components were considered sufficient. The results of the analysis are presented in Fig. 1., where the settlement diagram shows the rate of decrease in own values, i.e. the percentage of explained variance. Graphic interpretation of the first two components is presented in Fig. 1b. It was found that the shortest vector has variables (questions) 17 and 18, which indicates that they carry the smallest amount of information.



**Fig. 1 Analysis of the main components of the whole scale; a) the settlement diagram, b) the nutrient charge diagram**

On the basis of the above, two subscale were selected, which included:

- Subscale 1 (SS1) – questions 7, 8, 9, 10, 11,
- Subscale 2 (SS2) – questions 3, 4, 5, 6, 14, 15, 16.

The remaining questions were omitted in the summary analysis, considering them as single issues. The analysis of main components showed that SS1 explains 65.75% of variance ( $p < 0.001$ , KMO = 0.828,  $\alpha$ -Cronbach 0.887, mean correlation between pairs of position 0.528), while SS2 explains 59.93% of variance ( $p < 0.001$ , KMO = 0.838,  $\alpha$ -Cronbach 0.613, mean correlation between pairs of position 0.209). Therefore, further analysis of the results was performed for two subscale related:

- mental well-being (feelings of employees) – SS1
- physical well-being (assessment of your remote working space) – SS2

Descriptive statistics for SS1 and SS2 are presented in Table 1.

**Table 1 Total results of SS1 and SS2**

	SS1					SS2				
	Evaluation					Evaluation				
	Arithmetic mean	Median	Variance	Coefficient of variation	p	Arithmetic mean	Median	Variance	Coefficient of variation	p
<b>Total</b>	17.9	18.0	28.2	0.297	---	25.4	26.0	47.4	0.271	-
<b>Gender</b>										
Women	18.3	18.0	27.9	0.288	0.067 <sup>1</sup>	24.9	28	48.6	0.280	0.208 <sup>1</sup>
Men	17.0	18.0	28.0	0.312		26.2	26	44.4	0.254	
<b>Generation</b>										
BB	17.9	19.0	40.0	0.321	0.882 <sup>2</sup>	28.2	31.0	51.5	0.255	0.392 <sup>2</sup>
X	17.7	18.0	26.4	0.291		25.4	26.5	44.7	0.263	
Y	18.1	19.0	30.3	0.304		24.5	24.5	51.2	0.292	
Z	18.5	20.0	37.0	0.329		26.1	26.0	52.6	0.278	
<b>Sector</b>										
Private	18.2	19.0	27.1	0.286	0.223 <sup>1</sup>	25.3	26.0	41.7	0.255	0.530 <sup>1</sup>
State	17.2	16.5	31.2	0.320		25.4	27.5	59.6	0.303	
<b>Size enterprise</b>										
Small	17.3	17.5	29.6	0.315	0.333 <sup>2</sup>	22.3	23.5	40.4	0.285	0.015 <sup>2</sup>
Medium	17.1	19.0	31.7	0.389		24.9	26.0	48.6	0.280	
Large	18.4	19.0	29.0	0.278		26.3	27.0	45.9	0.257	
<b>Place of residence</b>										
House	16.0	15.0	33.4	0.361	0.002 <sup>1</sup>	24.0	24.0	56.1	0.311	0.092 <sup>1</sup>

Apartm.	18.7	19.0	23.9	0.262		25.9	27.0	42.8	0.252	
<b>Marital status</b>										
Free	18.5	20.0	30.9	0.300	0.124 <sup>1</sup>	26.2	28.0	45.1	0.256	0.168 <sup>1</sup>
Married	17.5	18.0	26.4	0.294		24.9	26.0	48.4	0.280	
<b>Number of children under 3</b>										
0	18.0	19.0	27.7	0.292	0.341 <sup>1</sup>	25.6	26.0	46.5	0.266	0.240 <sup>1</sup>
1 and more	17.0	16.0	37.7	0.331		23.7	25.0	51.2	0.302	
<b>Number of children under 8</b>										
0 and 1	18.1	19.0	28.3	0.294	0.014 <sup>1</sup>	25.7	27.0	46.7	0.266	0.013 <sup>1</sup>
2 and more	15.0	15.0	18.9	0.290		21.5	24.0	40.9	0.297	
<b>Number of children under 18</b>										
0 and 1	18.3	19.0	26.8	0.283	0.033 <sup>1</sup>	26.0	27.0	46.6	0.262	0.005 <sup>1</sup>
2 and more	16.4	17.0	30.8	0.339		23.0	24.0	43.8	0.288	

Source: Own study

<sup>1</sup> Mann-Whitney's U test

<sup>2</sup> ANOVA Kruskala-Wallis

Taking into account the number of questions, the maximum marks for the subscale were 25 for SS1 and 35 for SS2 respectively. The obtained results confirmed the statistically significant difference in the middle values of the SS2 score for the criterion: size of the plant. Therefore, the POST-HOC test with Dunn Bonferroni correction and the Jonckheere-Terpstra trend test were used for this criterion. The results indicate that the place of residence and the gender of the employees are important criteria for the differentiation of the subscale assessments. Therefore, the ANOVA Kruskal-Wallis, POST-HOC and Junckheree-Terpstra test was carried out for the sets of obtained gender and residence combinations (4 sets).

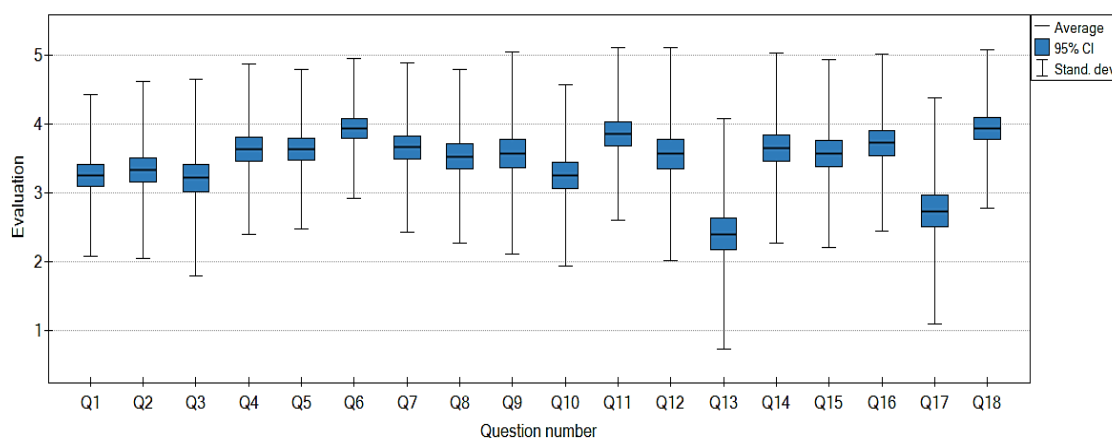


Fig. 2 Summary of average marks for all questions p < 0.001

The research included answers to 18 questions from the respondents. Graphically, a summary of the results for all questions is presented in Figure 2.

## DISCUSSION

The psychological well-being of employees is a set of subjective human feelings, which were represented by the SS1 subscale within the research. The maximum score for this subscale was 25, while the arithmetic mean for the subscale was 17.9, which is 71.6% of the maximum score. On the basis of the obtained results, it was found that the main criteria differentiating the feelings of employees are the place of residence and the number of children. The greatest sense of well-being was declared by employees living in an apartment (18.7), while the smallest by employees with two or more pre-school or early-school children up to 8 years old (15.0). The highest score, related to the place of residence, is surprising, as it should have been expected that people living in homes will have greater possibilities of self-organization of remote work, especially in terms of separating space for its performance. During the discussion, the authors of the article stated that the obtained results may result from the space available, but they prove the opposite of the initially accepted phenomenon. Employees living in apartments, usually two-roomed and one-level apartments (standard in Poland), performing remote work during a pandemic, usually stayed in apartments with children. Living on one level, in a limited space, it is easier to supervise children during work than in a few level, more spacious houses. It should be remembered that the above is only a hypothesis of the authors, requiring further research.

The assessment of the remote workspace, which is partly an assessment of the physical well-being of employees, was included in the SS2 scale. The arithmetic mean of the whole subscale was 25.4, which was 72.6% of the maximum score. The highest rating of 28.2 was obtained for the group of the oldest workers (generation BB), while the lowest for small workers (22.3). These results may indicate that the oldest employees are the most creative in organizing their space, which is in line with the characteristics of generation BB.

The size of the enterprise is an important criterion in assessing his/her physical well-being during the interventional referral to remote work. It was found that there is a correlation between the size of the establishment and the sense of physical well-being of the employee. This situation is due to the greater organizational, technical and personal resources of large companies, which are often subsidiaries of international concerns. The employer's greater resources allow him to better equip the employee while assigning him to unscheduled remote work and provide him with guidelines on how to organize this work in his place of residence. The results of the trend test confirmed these assumptions. The evaluation of the SS1 and SS2 subscale showed that the employees' sense of well-being is influenced by the size of the establishment where they are employed, their place of residence and the number of children. The results of the analysis for SS1 indicate that people living in apartments with no children or

with a maximum of 1 child are the best evaluators of their psychological well-being. Similarly, in the case of SS2, employees of large companies living without or with a maximum of 1 child are the best evaluators of their physical well-being. Employees sent to remote work, the lowest rating was given to equipping their workplace with basic computer equipment - an appropriate chair. This area was rated at 2.4 points, which means that only 48% of the respondents perform their work on a chair with a five-arm base, equipped with wheels, armrests, adjustable seat height and tilt angle backrest. In this respect, the worst rating was given to the flu of young workers, generation Y (40.4%) and generation Z (46.6%). Such a result may be related to the possibilities of premises, allowing older workers to separate the space for remote work in their place of residence and to their health problems intensifying as a function of remote work time. And this can be a stimulant to organize the workplace at home. The second worst result was related to working time. The respondents stated that only 54.6% of them (score 2.73) perform their duties during remote work during working hours. Significant differences in this respect are noticeable in the case of employees referred to work by small and large companies. This confirms the thesis of greater flexibility and ability to respond to unforeseen situations of large companies.

Respondents rated their effectiveness at work highly – 3.93 points. (78.6% of maximum score). The best results in remote work were reported by employees of large companies (4.06 points, 81.2%), which confirms the thesis of better guidelines for the organization of remote work by large companies, as well as better equipment, training and readability of the scope of tasks assigned to them and verification of their quality.

The analysis of the results showed that in the areas related to direct contact with other employees, assessment of the comfort of the workplace at home and performing remote work in one adjusted to this place there are no differences in the results obtained according to the adopted comparison criteria. The most often higher ratings for the questions asked were indicated by BB generation employees and people living in the apartment. On the other hand, parents with 2 or more children of preschool and school age had the lowest marks for their ability to work remotely in particular areas. In a situation of an epidemic, employers did not have time to undertake analyses and actions related to the selection of employees directed to remote work and to shape their workspace at home. However, in the case of long-term planning, employers, when directing employees to remote work, should, at the stage of mutual arrangements with the employee, take into account their well-being, setting individual guidelines and rules for their remote work. This is particularly evident in the case of differences in ratings in SS1 and SS2 between men and women living in homes and apartments.

## **SUMMARY**

The sudden and unexpected outbreak of COVID-19 forced employers to reorganize work immediately in order to maintain business continuity. There was



no time for analysis, preparation, it was necessary to act immediately under great time pressure. The study was able to indicate how this situation affected the physical and psychological well-being of employees to varying degrees. Factors affecting the well-being of employees forced to work remotely included: housing conditions, number and age of children, age of the employee, etc.

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**Keywords:** Well-being, COVID-19, epidemic, home office