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THE RELATIONSHIP BETWEEN THE EFFECTS OF THE COVID-19 PANDEMIC AND POLISH TEACHERS' MENTAL HEALTH AND WORK ABILITY

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Highlights

- Pandemic-related work stress was associated with poorer psychological functioning.
- Relational and communication difficulties were linked to low/moderate work ability.
- Organizational and training support is important during future crises.

Abstract

Objectives: The COVID-19 pandemic has had serious negative socioeconomic consequences and has led to changes in day-to-day functioning and work organization. The outbreak and subsequent school closures abruptly compelled teachers to switch from classroom instruction to distance education, requiring rapid adaptation to new digital technologies with insufficient support. These unexpected transformations may have affected teachers' stress levels and, consequently, their mental health and work ability. The purpose of the study was to examine the relationship between challenges at work during the pandemic, subjectively perceived work ability, and the general functioning of teachers of primary and secondary schools. **Material and Methods:** The study included 370 primary and secondary school teachers from the Łódź Voivodship, Poland. Data were collected online from October 2022 to May 2023, after in-person teaching had resumed. Participants completed an occupational stressor checklist, the single-item *Work Ability Score* (WAS) derived from the *Work Ability Index*, the *General Functioning Questionnaire*, 58 items (GFQ-58), and questions on pandemic-related concerns and threats. Factor structure and associations were examined using factor analyses, non-parametric tests, and binary logistic regression. **Results:** Work-related stress was associated with lower self-rated work ability and poorer general psychological functioning. Relational and communication difficulties were associated with higher odds of poor or moderate work ability (OR = 1.73, 95% CI: 1.17–2.55). Insufficient organizational and training support, technological barriers and rapid work changes, personal concerns, and an acute COVID-19 infection course were independently associated with higher odds of an elevated GFQ-58 score. **Conclusions:** The study allowed for the identification of key pandemic-related psychosocial stressors and their associations with teachers' work ability and general psychological functioning. These findings highlight the importance of organizational support and preparedness during periods of rapid change, while the effectiveness of specific interventions requires further evaluation. Int J Occup Med Environ Health. 2026;39(5):572–91

Key words:
teachers, work ability, psychosocial risks, work stressors, COVID-19 pandemic, mental health

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INTRODUCTION

In March 2020, the WHO announced COVID-19 a global pandemic. The constantly growing number of infections and subsequent deaths resulted in introducing a sanitary regime. The coronavirus pandemic not only affected the health of the entire population, but also led to changes in many areas of social life, closure of workplaces, financial concerns, significant reduction in social contacts. The virus has become the source of the most significant health, social and economic problems in recent years [1].

Due to the COVID-19 pandemic, on March 11, 2020, the Polish Minister of National Education issued a regulation [2], according to which, the operation of primary and secondary schools was temporarily suspended until the end of the 2019/2020 school year [3]. At that time, Polish teachers were responsible for transferring education to remote mode and introducing new methods of on-line teaching [4], although only 15% of them had any experience in distance learning [5]. Adapting to the online education mode meant a great deal of new, and demanding challenges, such as the need to use new technologies and introduce changes in teaching methods often accompanied by lack of technical resources, professional support and uncertainty.

Research carried out among teachers indicates that the COVID-19 pandemic had a substantial impact on their mental health and well-being. The outbreak significantly affected their daily lives. Many teachers were required to remain at home during periods of remote teaching, which contributed to reduced outdoor activities and increased social isolation. A study conducted in China among 1096 teachers aged 20–65 years showed that as many as 624 (56.9%) suffered from depression [6]. Depressive symptoms were significantly associated with age, participation in epidemic prevention and control, parent-child relationship, opinions on remote learning and prolonged school closure, increase in work intensity and duration, sleep duration, spending time with family, attitudes towards COVID-19, mental resilience, and stress [6]. Additionally, teachers reported higher levels of anxiety, anger, and boredom during distance learning [7,8]. In China, 25.3% of teachers experienced mild or greater somatic discomfort during the pandemic, 35.5% experienced sleep disturbances, 17.7% endured mild to severe anxiety, and only 4.0% reported clinically significant depression [9]. One of the reports from Great Britain presented the results of a survey of teachers' anxiety levels measured between October 2019 and September 2020. The findings highlighted that the highest levels of anxiety were experienced in the week before the initial school closures, and in the week when the reopening was announced [10]. In Greece, female teachers experienced more anxiety and depression at the beginning of the pandemic [11], while in China, female teachers reported higher levels of anxiety than male teachers [12]. In Wuhan, 24.55% of post-traumatic stress disorder (PTSD) cases were reported among higher education teachers during the pandemic [13]. The occurrence of PTSD-related symptoms is associated with the risk of virus exposure [14] and epidemic mortality rates [15]. Remote teaching, forced by the real epidemiological threat of the SARS-CoV-2 virus, was a solution that presented teachers and students with a completely new reality. The effects of social isolation are reflected in the results of a survey conducted in 2021 among 449 teachers from Poland. The survey was designed to answer the question of how their emotional well-being was affected, and what types of problems were generated by this significant change in the way of teaching [16]. The results show that 1 in 5 teachers described their emotional condition as bad, and 5.3% of them defined it as very bad. The study also revealed that the assessment of the impact of the pandemic on the emotional condition of teachers depended on the length of service, hence, teachers with short experience, more predominantly than those with longer experience, declared that their mental condition deteriorated as a result of the pandemic. The authors also dem-

onstrated that chronic fatigue, constant worrying, and putting a lot of effort into performing tasks were the prevailing problems teachers faced during this period [16]. Similarly, the study on teachers' occupational well-being during the COVID-19 pandemic conducted in Germany showed that although teachers were generally satisfied with their jobs, they (especially women) experienced elevated levels of stress and exhaustion which were related to job demands and lack of social support. In this study, personal readiness to innovate appeared to be the protective factor against exhaustion and diminished job satisfaction and self-efficacy [17]. In a recent systematic review of teacher mental health and possible risk factors during the pandemic, the following risks were identified: female gender, age <50 years, pre-existing chronic health condition or psychiatric illnesses, difficulty in adapting to the distance education model, family-work conflicts and negative symptoms caused by the pandemic [18].

As research results presented thus far show that the varying intensity and nature of the restrictions introduced during the pandemic, and the temporary total social isolation have resulted in numerous difficulties or crises, the consequences of which were endured by teachers as they faced the challenge of conducting remote teaching from the beginning of the pandemic. For a large number of teachers, this was associated with enormous pressure and fear caused by the lack of skills in using digital technology. A study conducted in Greece during the pandemic reveals that teachers reported inadequate support when implementing distance learning, whilst they had no previous experience in this area [19]. In addition, teachers from Spain and Ecuador indicated that the impact of COVID-19, the demand to use information and communication technology for distance learning, technical problems, and maintaining a balance between work and family life were significant factors impacting their stress levels [20]. The study did not show considerable differences in terms of the respondents' country of origin, professional experience or level of anxiety and depression. The stress levels were rather dependent on the teachers' perception of difficulties such as lack of appropriate resources and training, or lack of time. In addition to the previously indicated factors, the need to switch from stationary teaching to remote teaching constituted another significant stressor, regardless of teachers' previous technological skills. Another study conducted in Ecuador found that previously gained training and experience in remote learning before the pandemic was a protective factor in reducing stress levels and possibly lessening other psychological symptoms [21]. Reports from studies, in which the authors analyzed the relationship between technostress and COVID-19, suggested that age and gender play a role in experiencing anxiety related to technology [22,23]. One study found that 11% of teachers experienced techno-anxiety, 7.2% experienced techno-fatigue, and 6.8% experienced both manifestations, with higher levels of anxiety and fatigue among female teachers [22]. Insufficient training and limited organizational support may further contribute to difficulties related to the use of technology in educational settings [24,25]. Moreover, a South African study revealed that the higher the level of susceptibility to illness teachers perceived, the greater the fear of the SARS-COV-2, which in turn, was associated with lower professional satisfaction [26].

The research results presented above shed light on the fact that remote teaching forced by the epidemiological threat of the SARS-CoV-2 virus was a challenge that made teachers confront a completely new reality. Until now, many teachers have only practiced within a full-time on-site education frame. Therefore, the sudden change in the organization of the education process was not only an unfamiliarity but also a burden for many of them. The unpreparedness of the entire system for this transition, limited technical resources, and the lack of training in the use of technology and remote teaching resulted in teachers' exposure to a number of psychosocial stressors

at daily work. Exposure to these has led to problems and even affliction of teachers' mental health. The identification of psychosocial stressors experienced by teachers during the COVID-19 pandemic can be considered within the framework of the effort–reward imbalance (ERI) model proposed by Siegrist et al. [27]. According to this model, occupational stress occurs when work-related efforts are not matched by adequate rewards and resources, such as social support, recognition, or job security. The rapid transition to remote teaching, increased workload, technological challenges, and limited support experienced by many teachers during the pandemic may therefore be viewed as factors contributing to occupational stress. Although occupational stress played an important role in shaping teachers' well-being during the pandemic, previous studies have shown that the impact of COVID-19 extended beyond work-related factors. Parent-child relationships, spending time with family, and family-work conflicts were identified as factors associated with teachers' mental health during the pandemic [6,18]. Moreover, maintaining a balance between professional and family responsibilities during remote teaching was reported as an important source of stress [20]. Since the pandemic was also accompanied by economic uncertainty and substantial changes in everyday functioning, changes in financial situation and relationships with loved ones were also included among the variables analyzed in the present study.

The aim of the study was to explore the potential relationships between risks associated with direct exposure to the SARS-CoV-2 virus, occupational stressors arising from changes in work practices and organization during the pandemic, teachers' personal concerns regarding the spread of the virus, shifts in financial status, relationships with loved ones, and their associations with teachers' mental health and perceived work ability. The study distinguished between 3 different dimensions of pandemic-related experience. The first referred to direct exposure to COVID-19 and its consequences (e.g., infection, quarantine, or isolation). The second concerned personal concerns related to infection and the spread of the virus. The third referred to occupational stressors resulting from changes in work organization during the pandemic. These dimensions were analyzed separately due to their distinct conceptual nature. In addition, changes in financial situation and relationships with loved ones were analyzed as separate indicators of the broader social consequences of the pandemic.

The research questions (RQ) were as follows:

- RQ1. Are direct risks related to COVID-19 associated with subjective assessment of work ability and mental health status?
- RQ2. Are personal concerns related to being infected or spreading infection associated with subjective assessment of work ability and mental health status?
- RQ3. Are changes in the way work is performed and organized associated with subjective assessment of work ability and mental health status?
- RQ4. Is the change in the financial situation due to the pandemic associated with subjective assessment of work ability and mental health status?
- RQ5. Are changes in relationships with loved ones due to the pandemic and forced isolation associated with subjective assessment of work ability and mental health status?

MATERIAL AND METHODS

Procedure

The study was conducted online between October 2022 and May 2023 while maintaining the anonymity of the respondents. It was carried out in cooperation with the Chair of the Regional Board of the Independent Self-Governing Trade Union "Solidarity" (Niezależny Samorządny Związek Zawodowy „Solidarność" – NSZZ Solidarność) trade union, who distributed invitations to participate in the study among teachers employed in primary and upper

secondary schools (general and technical) in the Łódź Voivodship, Poland.

Methods

The survey included questions on basic sociodemographic and employment characteristics, as well as an adapted version of the first item of the *Work Ability Index* (WAI). The original item reads: "Assume that your work ability at its best has a value of 10 points. How many points would you give to your current work ability?" [28]. In the present study, participants were asked to compare their current work ability with their best work ability during the previous 2 years. Responses ranged from 0 (completely unable to work) to 10 (best work ability). The adapted item was used as a brief indicator of self-rated work ability and was referred to as the *Work Ability Score* (WAS). Previous research reported a statistically significant Spearman correlation between the categorized WAS and WAI levels ($r = 0.63$, $p < 0.001$) [29]. Based on the categories applied in that study, WAS scores were classified as poor (0–5), moderate (6–7), good (8–9), or excellent (10). For the binary logistic regression, poor and moderate work ability were combined into 1 category (WAS 0–7, coded 1), while good and excellent work ability formed the reference category (WAS 8–10, coded 0).

The *General Functioning Questionnaire*, 58 items (GFQ-58) developed by Styła and Kowalski [30] was used to assess mental health. The questionnaire is a screening instrument designed to measure the severity of psychopathological symptoms and overall functioning. It consists of 58 items grouped into 13 subscales: poor functioning at work and home (4 items), lack of entertainment (4 items), poor social relationships (4 items), cognitive impairment (3 items), addictions (4 items), positive psychotic symptoms (6 items), depressive symptoms (6 items), manic symptoms (6 items), anxiety symptoms (8 items), eating disorder symptoms (3 items), sleep problems (4 items), sexual problems (2 items), and somatic symptoms (4 items). An overall score can also be calculated. In the original validation studies, Cronbach's α coefficients for the subscales ranged 0.36–0.90, while the internal consistency of the total score ranged 0.89–0.92 [30]. In the present study, the internal consistency of the total GFQ-58 score was excellent (Cronbach's $\alpha = 0.954$). Cronbach's α coefficients for the subscales were as follows: poor functioning at work and home ($\alpha = 0.644$), lack of entertainment ($\alpha = 0.772$), poor social relationships ($\alpha = 0.644$), cognitive impairment ($\alpha = 0.786$), addictions ($\alpha = 0.777$), positive psychotic symptoms ($\alpha = 0.729$), depressive symptoms ($\alpha = 0.838$), manic symptoms ($\alpha = 0.548$), anxiety symptoms ($\alpha = 0.873$), eating disorder symptoms ($\alpha = 0.583$), sleep problems ($\alpha = 0.897$), sexual problems ($\alpha = 0.667$), and somatic symptoms ($\alpha = 0.816$). For binary logistic regression, the GFQ-58 overall mean score was dichotomized using the optimal cut-off value of 2.23 identified by Styła [31] using receiver operating characteristic (ROC) analysis. Scores of 2.23 or higher were classified as elevated (coded 1), whereas scores <2.23 were classified as non-elevated (coded 0). As this cut-off was developed for screening purposes, the resulting classification should not be interpreted as a clinical diagnosis.

Due to the lack of an instrument covering both pandemic and occupational stressors at the time of the study, the authors developed a psychosocial stressors checklist consisting of 26 items describing job stressors related to the pandemic and 2 items describing personal concerns about COVID-19 infection. The content and wording of the items were developed and discussed by a panel of 3 researchers experienced in occupational health and psychology. The internal consistency of the initial item pools was $\alpha = 0.925$ for the 26 occupational stressor items and $\alpha = 0.811$ for the 2 personal concern items. Participants responded to each of the 28 statements using a 4-point response scale, where 0 – did not occur, 1 – occurred but was not stressful, 2 – occurred and was moderately stressful, and 3 – occurred and was very stressful. In descriptive

and bivariate analyses, the responses to the initial 26 occupational stressor items and the 2 personal concern items were summed separately, with higher scores indicating greater stressor intensity. The 26-item total score was not used as a predictor in the multivariable regression models. Instead, the factor structure of the 26 occupational stressor items was examined using exploratory factor analysis. Following evaluation of the factor-loading pattern and interpretability of the solution, items 2, 5, 6, 13, 14, and 15 were excluded. Five factor scores derived from the final 20-item solution were used as separate predictors in the binary logistic regression models.

The research tools also included 8 questions about direct threats related to the pandemic. Respondents could answer "yes" or "no" to 5 of the 8 questions ("Were you infected with the COVID-19 virus?," "Were you in quarantine?," "Were you in an isolation facility?," "Has anyone around you had COVID-19?," "Has anyone around you died from COVID-19?"). Each "yes" answer was scored 2. By summing the answers to these questions, a COVID-19 threat index was created. The higher the score, the higher the level of exposure to threats. The internal consistency of the COVID-19 threat index was low (Cronbach's $\alpha = 0.471$), which likely reflects the conceptual heterogeneity of the distinct exposure events included in the index. Accordingly, the index was interpreted as a cumulative exposure indicator rather than as a unidimensional psychometric scale. The remaining 3 questions concerned the severity of COVID-19 infection, changes in financial situation, and changes in relationships with loved ones. As these variables represented consequences of the pandemic rather than direct exposure to COVID-19-related threats, they were analyzed separately.

Statistical analysis

Analyses were conducted using IBM SPSS Statistics 29 and jamovi 2.6.26. Spearman's rank correlations were used because the continuous variables were not normally distributed. The factor structure of the 26 occupational stressor items was explored using minimum residual extraction with oblimin rotation. Sampling adequacy was assessed with the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test. Inspection of the factor loadings and the interpretability of the solution led to the exclusion of items 2, 5, 6, 13, 14, and 15. The resulting 5-factor, 20-item solution was then evaluated using confirmatory factor analysis. Model fit was assessed using χ^2, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA) with a 90% confidence interval (CI), and standardized root mean square residual (SRMR). Factor scores from the final solution were used as predictors in the binary logistic regression models. Differences in continuous WAS and GFQ-58 scores according to financial situation, relationships with loved ones, and COVID-19 infection course were examined using Kruskal-Wallis tests. Significant omnibus tests were followed by Dwass-Steel-Critchlow-Fligner pairwise comparisons. Multiplicity-adjusted p-values were used to control the family-wise error rate, and effect sizes were reported as epsilon-squared (ε^2). Two binary logistic regression models were fitted, with all predictors entered simultaneously. The outcomes were poor or moderate work ability (WAS 0–7: 1, WAS 8–10: 0) [29] and elevated GFQ-58 scores (GFQ-58 ≥2.23: 1, GFQ-58 <2.23: 0) [31]. The predictors were the 5 occupational stressor factor scores, personal concerns, the COVID-19 threat index, infection course, financial situation, and relationships with loved ones. Infection course was categorized as no infection, asymptomatic or mild infection, and acute infection. No infection and no change in financial situation or relationships were used as the reference categories. Results were reported as odds ratios with 95% CIs. Model fit, predictive performance, and multicollinearity were assessed using likelihood-ratio tests, Nagelkerke's coefficient of determination (R^2), Akaike information criterion (AIC), area under the receiver operating character-

istic curve (AUC), classification indices, variance inflation factor (VIF) and tolerance. Sample size adequacy was checked using the conventional guideline of ≥10 observations in the less frequent outcome category per estimated parameter [32]. Each model included 10 predictors represented by 13 parameters, corresponding to a required minimum of 130 observations in the less frequent outcome category. The observed counts were 167 for the WAS model and 152 for the GFQ-58 model, so both models met this criterion. Statistical significance was set at $p < 0.05$.

RESULTS

Characteristics of the group under the study

A total of 370 primary, secondary and technical school teachers from the Łódź Voivodship participated in the study. Invitations to participate in the study were distributed with the assistance of the Interregional Section of Education and Upbringing of the Łódź Region (Międzyregionalna Sekcja Oświaty i Wychowania Ziemi Łódzkiej) of the Independent Self-Governing Trade Union "Solidarity" (NSZZ "Solidarność"), using a snowball sampling method. Due to the recruitment procedure, it was not possible to determine the exact response rate, as information regarding the number of teachers who received the invitation to participate was not available. Most of the participants were women (84%), married (72%), with an average age of 47.46 years (standard deviation [SD] = 8.57 years). The predominance of women in the study sample (84%) is consistent with the gender structure of the teaching profession in Poland, where women constituted 82.3% of all teachers during the study period [33]. The surveyed group consisted mainly of primary school teachers (approx. 70%) and certified teachers (65%); their professional experience ranged 1–43 years, with an average of 21.46 years (SD = 9.97 years). Primary school teachers were overrepresented in the sample compared with national statistics, according to which they constituted 51.7% of all teachers [33]. Regarding marital status, 72% of the respondents were married, 12% were unmarried, 9% were divorced, 5% were in an informal relationship, and 2% were widowed. More sociodemographic data on the study participants is presented in Table 1.

Table 1. Sociodemographic characteristics of primary and secondary school teachers participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Variable	Participants (N = 370)	
	n	%
School type		
primary school		
grades 1–3	70	19
grades 4-8	188	51
high school	44	12
vocational high school	68	18
Degree of professional advancement		
trainee teacher	9	2
contract teacher	36	10
appointed teacher	85	23
certified teacher	240	65

Professional promotion grades in accordance with the Regulation of the Minister of National Education of July 26, 2018, on obtaining professional promotion grades for teachers, applicable at the time of project implementation:
– trainee teacher – begins working at a school and undergoes a 9-month internship to prepare for the profession. The purpose of this internship is to introduce them to professional duties and prepare them for obtaining the next level of career advancement;
– contract teacher – after completing the internship and receiving a positive evaluation of their professional achievements, a trainee teacher may apply for the contract teacher status. A contract teacher already has some professional experience and can continue their career advancement, striving for higher levels of promotion;
– appointed teacher – to obtain this rank, a teacher must complete professional preparation, receive a positive performance evaluation, and pass an exam before an examination committee. The required competencies include the ability to conduct lessons, knowledge of educational law regulations, and the ability to individualize teaching;
– certified teacher –the highest level of professional advancement. A teacher must hold the appointed teacher rank, complete a required period of work experience, and receive a positive performance evaluation. During the qualification process, the teacher presents an analysis of their professional achievements to the committee, documenting aspects such as improving teaching methods, sharing knowledge with other teachers, and implementing initiatives for the education sector.

Table 2. Distribution of responses to questions about pandemic-related threats and consequences among primary and secondary school teachers participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Variable	Responses (N = 370)	
	n	%
COVID-19		
infection		
presence		
yes	190	51
no	180	49
course		
not applicable	167	45
asymptomatic	4	1
symptomatic		
mild	139	38
acute	60	16
quarantine		
yes	239	65
no	131	35
isolation		
yes	53	14
no	317	86
anyone around with COVID-19		
yes	310	84
no	60	16
anyone around died from COVID-19		
yes	134	36
no	236	64
Financial situation		
has not changed	208	56
worsened	150	41
improved	12	3
Relationships with loved ones		
not changed	281	76
worsened	69	19
improved	20	5

Percentages are calculated within the total sample (N = 370) for each response separately.

COVID-19 – direct and indirect threats

The present study analyzed the direct and indirect threats associated with the SARS-CoV-2 pandemic. Direct threats associated with the virus itself included the contraction of the infection, its course, being in isolation and/or quarantine, having someone in the respondent's surroundings contract COVID-19, and experiencing COVID-19-related deaths among people in the respondent's surroundings. Indirect threats include financial deterioration due to the pandemic and adverse changes in relationships with loved ones due to lifestyle changes during the pandemic period.

Table 2 presents the percentage distribution of respondents' answers regarding exposure to specific threats related to the pandemic. More than half of the respondents had been infected with COVID-19 (51%), and 65% had been quarantined. Just over 16% had experienced an acute course of COVID-19 infection, and approx. 36% reported that someone in their surroundings had died from COVID-19. Regarding indirect threats, approx. 41% of respondents reported a worsening of their financial situation, while 19% – a worsening of their relationships with loved ones.

Psychosocial working conditions at the time of the pandemic

The most common psychosocial work-related factors causing at least moderate stress were:

- increased workload (73.0%),
- the need to spend more time preparing for work (72%),
- the need to comply with Ministry of Education recommendations that were inadequate to existing conditions (67%),
- lack of control over students (66%),
- diminished students' activity during lessons (65.1%),
- rapid and frequent changes in working conditions (65%),
- difficulties in providing support to students (61%),
- fear of contracting COVID-19 (58.1%).

Detailed information about teachers' perceptions of psychosocial working conditions is presented in Table 3.

Table 3. Distribution of responses to statements about specific stressors at work as a teacher during the COVID-19 pandemic among primary and secondary school teachers (N = 370) participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Item	Responses							
	did not occur		occurred, but was not stressful		occurred and was moderately stressful		occurred and was very stressful	
	n	%	n	%	n	%	n	%
Work demands and stressors								
1. Lack of the appropriate equipment to conduct lessons	138	37	39	11	133	36	60	16
2. Lack of separate room while working online	137	37	59	16	110	30	64	17
3. Lack of IT literacy at the beginning of distance learning	117	32	53	14	105	28	95	26
4. Quick and unexpected changes of working conditions	45	12	83	22	142	38	100	27
5. Lack of eye contact with the students during on-line lessons	55	15	113	31	117	32	85	23
6. Diminished students' activity during lessons	45	12	84	23	131	35	110	30
7. Difficulties in contacting coworkers	110	30	106	29	118	32	36	10
8. Difficulties in contacting supervisors	192	52	97	26	61	17	20	5
9. Deterioration of relationships with students	172	47	48	13	104	28	46	12
10. Deterioration of contact with parents/ guardians of students	207	56	52	14	83	22	28	8
11. Lack of supervisor's support	251	68	46	12	43	12	30	8
12. Lack of co-workers' support	271	73	54	15	34	9	11	3
13. Difficulties in giving support to students	75	20	69	19	147	40	79	21
14. Excessive parental expectations	202	55	31	8	79	21	58	16
15. Necessity to obey Ministry of Education's recommendations which were inadequate to existing conditions	67	18	56	15	125	34	122	33
16. More work to do	43	12	57	15	95	26	175	47
17. Life-work interference	154	42	35	10	91	24	90	24
18. Need to spend more time for preparation to work	47	13	56	15	125	34	142	38
19. No training on distance learning methods offered by the employer	239	65	47	13	48	13	36	10
20. Suspended lessons	340	92	13	4	14	4	3	1
21. Classes in my subject were mostly carried out in the form of independent work by the student or parent and student	247	67	57	15	47	13	19	5
22. There were students in my classes who could not participate in online lessons due to poor conditions or lack of equipment	150	41	67	18	86	23	67	18
23. I had problems assessing students' work	104	28	67	18	115	31	84	23
24. Due to the pandemic situation, I had to lower my expectations towards students	65	18	107	29	130	35	68	18

Table 3. Distribution of responses to statements about specific stressors at work as a teacher during the COVID-19 pandemic among primary and secondary school teachers (N = 370) participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023 – cont.

Item	Responses							
	did not occur		occurred, but was not stressful		occurred and was moderately stressful		occurred and was very stressful	
	n	%	n	%	n	%	n	%
Work demands and stressors – cont.								
25. Completing the core curriculum was very difficult or impossible	134	36	58	16	106	29	72	20
26. I didn't have enough control over the students	40	11	85	23	126	34	119	32
Personal concerns								
1. I was afraid of getting infected with the COVID-19	81	22	74	20	114	31	101	27
2. I was afraid of spreading the infection to students	132	36	55	15	99	27	84	23

Percentages are calculated within the total sample (N = 370) for each response separately.

Factor structure of occupational stressors

The data were suitable for factor analysis, as indicated by the KMO measure (0.898) and Bartlett's test of sphericity ($\chi^2(325) = 2204$, $p < 0.001$). The initial 5-factor exploratory factor analysis (EFA) of the 26 occupational stressor items explained 48.7% of the total variance. Based on the factor-loading pattern and interpretability, items 2, 5, 6, 13, 14, and 15 were excluded. The final 5-factor solution included 20 items, explained 50.4% of the variance, and retained satisfactory sampling adequacy (KMO = 0.859, Bartlett's $\chi^2(190) = 1509$, $p < 0.001$). The factors were labelled: work intensification and instructional difficulties, relational and communication difficulties, insufficient organizational and training support, technological barriers and rapid work changes, and limitations in teaching delivery. Confirmatory factor analysis (CFA) provided partial support for this structure ($\chi^2(160) = 393$, $p < 0.001$, CFI = 0.847, TLI = 0.819, RMSEA = 0.089, 90% CI: 0.078–0.100, and SRMR = 0.064). Standardized factor loadings ranged 0.356–0.834 and were statistically significant. The composition of the 5 factors, the ranges of the EFA and standardized CFA loadings, and the proportion of variance explained by each factor are presented in Table 4. Given the suboptimal CFI, TLI, and RMSEA values, the factor structure should be interpreted cautiously.

Relationships between psychosocial working conditions, personal concerns, COVID threats, work ability and wellbeing of teachers

Spearman's correlation analysis revealed statistically significant associations between work stress and the subjective assessment of work ability ($r_s = -0.406$, $p < 0.001$) as well as the GFQ-58 overall score ($r_s = 0.406$, $p < 0.001$). This indicates that the greater the work stress experienced by the respondents, the lower they rated their current ability to work and overall well-being.

In the case of personal concerns, the correlation followed the same direction; however, the strength of the association was weaker. Personal concerns were significantly correlated with both the subjective assessment of work ability ($r_s = -0.218$, $p < 0.001$) and the GFQ-58 overall score ($r_s = 0.306$, $p < 0.001$).

The higher the COVID-19 threat index, the worse the respondents assessed their well-being ($r_s = 0.184$, $p < 0.001$), although the strength of this correlation was weak. No statistically significant correlation was found

Table 4. Factor structure of the occupational stressor checklist among primary and secondary school teachers (N = 370) participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Factor	Item	Loading range		Variance explained [%]
		EFA	CFA standardized	
Work intensification and instructional difficulties	16, 17, 18, 22, 23, 24, 25, 26	0.419–0.781	0.551–0.800	19.37
Relational and communication difficulties	7, 8, 9, 10	0.573–0.713	0.662–0.833	10.97
Insufficient organizational and training support	11, 12, 19	0.449–0.855	0.510–0.834	7.63
Technological barriers and rapid work changes	1, 3, 4	0.412–0.769	0.619–0.699	7.03
Limitations in teaching delivery	20, 21	0.625–0.626	0.356–0.600	5.36
Total variance explained				50.36

CFA – confirmatory factor analysis; EFA – exploratory factor analysis.
The table presents the ranges of factor loadings for the items assigned to each factor. Item numbers correspond to the occupational stressor items presented in Table 3.

between the COVID-19 threat index and the subjective assessment of work ability ($r_s = –0.067$, $p > 0.05$).

Kruskal-Wallis tests revealed statistically significant differences in the subjective assessment of work ability only in relation to changes in relationships with loved ones. Respondents whose relationships had improved rated their work ability higher than did respondents whose relationships had deteriorated. No statistically significant differences were found according to changes in financial situation or the course of COVID-19 infection (Table 5).

Statistically significant differences in the GFQ-58 overall score were found according to changes in financial situation, relationships with loved ones, and the course of COVID-19 infection. Respondents whose financial situation had deteriorated obtained higher GFQ-58 scores, indicating poorer general functioning, than those reporting no change. Similarly, respondents whose relationships had deteriorated obtained higher scores than those reporting no change or improvement. Respondents with a mild or acute course of COVID-19 obtained higher GFQ-58 scores than those who had not been infected, while those with an acute course also scored higher than those with a mild course. No other pairwise differences were statistically significant (Table 5).

Binary logistic regression analyses

Binary logistic regression analyses were conducted to examine whether occupational stressors, personal concerns, the COVID-19 threat index, infection course, financial situation, and relationships with loved ones were associated with poor or moderate work ability and elevated GFQ-58 scores. Both regression models were statistically significant (Table 6). The model for poor or moderate work ability yielded a Nagelkerke's R^2 of 0.20. Relational and communication difficulties were significantly associated with a greater likelihood of poor or moderate work ability. Work intensification and instructional difficulties showed a borderline association, whereas the remaining variables did not demonstrate statistically significant independent associations with work ability. The model for elevated GFQ-58 scores yielded a Nagelkerke's R^2 of 0.27. Insufficient organizational and training support, technological barriers and rapid work changes, personal concerns, and an acute COVID-19 infection course were independently associated with a greater likelihood of an elevated GFQ-58 score. The overall effects of financial situation and relationships with loved ones were not statistically significant. For the WAS model, AIC was 478, classification accuracy was 67.8%, sensitivity – 74.4%, and specificity – 59.9%. For the GFQ-58 model, AIC was 446, classification accu-

Table 5. Kruskal-Wallis test results for differences in work ability and mental health status (*General Functioning Questionnaire*, 58 items [GFQ-58] overall score) according to changes in financial situation, relationships with loved ones, and COVID-19 infection course among primary and secondary school teachers (N = 370) participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Variable	Score [pts]		H	p	ε^2	Significant DSCF comparisons
	M	SD				
Work ability						
financial situation			4.72	0.094	0.013	–
not changed	7.13	1.84				
worsened	6.68	2.31				
improved	7.75	1.71				
relationships with loved ones			8.73	0.013*	0.024	worsened-improved (p = 0.024)
not changed	7.05	1.92				
worsened	6.32	2.46				
improved	7.95	1.76				
course of infection			7.54	0.057	0.020	–
not applicable	7.23	1.89				
asymptomatic	7.00	2.16				
symptomatic						
mild	6.85	2.14				
acute	6.50	2.20				
Mental health status (GFQ-58 overall score)						
financial situation			13.22	0.001*	0.036	not changed-worsened (p < 0.001)
not changed	2.07	0.53				
worsened	2.29	0.57				
improved	2.08	0.50				
relationships with loved ones			24.00	<0.001*	0.065	not changed-worsened (p < 0.001); worsened-improved (p = 0.003)
not changed	2.10	0.53				
worsened	2.43	0.57				
improved	2.04	0.55				
course of infection			27.38	<0.001*	0.074	not applicable-mild (p = 0.016); not applicable-acute (p < 0.001); mild-acute (p = 0.049)
not applicable	2.02	0.50				
asymptomatic	1.72	0.35				
symptomatic						
mild	2.21	0.55				
acute	2.44	0.58				

DSCF – Dwass-Steel-Critchlow-Fligner; H – Kruskal-Wallis test statistic; ε^2 – epsilon-squared effect size.
Pairwise comparisons were conducted using the DSCF procedure with multiplicity-adjusted p-values controlling the family-wise error rate.
* $p < 0.05$.

Table 6. Results of binary logistic regression models for work ability and general psychological functioning among primary and secondary school teachers (N = 370) participating in a cross-sectional survey conducted in the Łódź Voivodship, Poland, October 2022 – May 2023

Predictor	Low/moderate work ability	p	Elevated GFQ-58
Work intensification and instructional difficulties (OR (95% CI))	1.50 (1.00–2.26)	0.050	
Relational and communication difficulties (OR (95% CI))	1.73 (1.17–2.55)**		
Insufficient organizational and training support (OR (95% CI))			1.45 (1.02–2.07)*
Technological barriers and rapid work changes (OR (95% CI))			1.42 (1.02–1.97)*
Limitations in teaching delivery			
Personal concerns (OR (95% CI))			1.14 (1.01–1.29)*
COVID-19 threat index			
Infection course (OR (95% CI))			3.34 (1.46–7.64)**[a]
Financial situation			
Relationships with loved ones			
Nagelkerke's R^2	0.200		0.270
Model χ^2 (df)	59.9 (13)***		82.8 (13)***
AUC	0.729		0.761

AUC – area under the receiver operating characteristic curve; GFQ-58 – *General Functioning Questionnaire*, 58 items.
All predictors were entered simultaneously. Only statistically significant or borderline coefficients are shown; empty cells indicate no statistically significant independent association. Reference categories were no infection, unchanged financial situation, and unchanged relationships with loved ones.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
[a] Acute infection compared with no infection; the overall effect of infection course was statistically significant ($p = 0.015$).

racy – 70.5%, sensitivity – 54.6%, and specificity – 81.7%. The VIF values ranged 1.03–1.36 and tolerance values 0.738–0.972, indicating no problematic multicollinearity. The principal model coefficients, odds ratios, CIs, and fit indices are presented in Table 6.

DISCUSSION

Factor analysis distinguished 5 dimensions of occupational stressors: work intensification and instructional difficulties, relational and communication difficulties, insufficient organizational and training support, technological barriers and rapid work changes, and limitations in teaching delivery. As the CFA provided only partial support for this structure, the factors should be interpreted cautiously. In the adjusted models, relational and communication difficulties were associated with poor or moderate work ability, while the association with work intensification and instructional difficulties was borderline. Elevated GFQ-58 scores were associated with insufficient organizational and training support, technological barriers and rapid work changes, personal concerns, and an acute course of infection. Although financial situation and relationships with loved ones were related to GFQ-58 scores in the unadjusted analyses, their overall effects were not significant after adjustment. From the perspective of the ERI model [27], increased demands, rapid changes, and limited organizational support may reflect an imbalance between teachers' efforts and available resources.

All participants completed the survey between October 2022 and May 2023, after full-time in-person teaching had resumed in Poland. Thus, none of the data were collected during pandemic-related school restrictions, and all assessments of pandemic-related occupational stressors

were retrospective. Recall may have been influenced by participants' current psychological functioning and subsequent professional experiences, potentially affecting the magnitude of the observed associations. The findings should therefore be interpreted as associations with retrospectively recalled pandemic experiences rather than concurrent exposure.

The results seem to concur with the reports from a study conducted in Switzerland among primary school teachers. The transition from face-to-face teaching to online learning proved to be a key event in their professional lives, causing medium to high levels of stress [34]. Issues such as the double burden of family and school demands, heavy workloads, inconsistent policies, and students who needed special support for online learning negatively impacted their mental well-being [34]. The research results presented in the article also coincide with the results of research conducted in Spain, Chile, and Japan, which showed that a high percentage of teachers experienced symptoms of stress, anxiety, and depression during the pandemic [23,35,36]. Symptoms faced by this group included: emotional fatigue, weariness, headaches, sleep problems, changes or disturbances in eating and appetite, irritability, anger, depressive feelings, and inability to concentrate.

A systematic review and meta-analysis of data from 256 896 teachers in 54 studies across 22 countries confirmed the high prevalence of stress (62.6%), depression (59.9%), and anxiety (36.3%) in this professional group [37]. It is noteworthy that there were certain parallels with the authors' study with regard to the factors associated with elevated stress levels and suboptimal mental well-being. The authors of the aforementioned study concluded, inter alia, that inadequate IT proficiency, a paucity of experience with online teaching, and concerns regarding the pandemic were associated with heightened levels of stress, depression and anxiety. Numerous protective factors were also noted, such as individual psychological resilience, self-efficacy or support received from superiors, and motivation to work in the profession. The impact of remote working on work-family conflict has also been a subject of research during the pandemic [38,39]. The findings of these studies, which have included teachers, have demonstrated that working from home has led to an escalation in this conflict and has contributed to an increase in teachers' stress levels, a decrease in teaching self-efficacy [40] and deterioration in their mental well-being [41].

An interesting addition to the authors' research is the recently published results of a U.S. study of K–12 teachers (from kindergarten through 12th grade) [42]. This study confirmed the negative effects of teachers' stress during the pandemic. Still, an important complement was the analysis of the relationship between working mode (dual mode-work both onsite and online vs. online only or only in person) and health effects. The results of this study found that teaching both in person and online is associated with a higher level of stress, poorer general well-being, greater levels of depression, and anxiety symptomatology in comparison to teaching only online or only in person. It seems, therefore, that the need to switch from 1 mode of work to another is an additional, particularly burdensome factor in a teacher's job.

Concerning the findings of the perceived work ability, there is a paucity of available points of reference. To the best of the authors' knowledge, only 1 study on this issue was conducted during the pandemic period. Research undertaken among teachers in Campo Grande, Brazil, found that reduced work ability, as measured by the WAI, was associated with higher emotional exhaustion and depersonalisation. Conversely, a sense of personal achievement was concomitant with enhanced work ability [43]. These results offer indirect validation of the authors' findings concerning the adverse correlation between occupational stressors and work ability. The present study has demonstrated that selected stressors resulting from orga-

nizational change during the pandemic were associated with self-perceptions of work ability and mental health status. These associations were observed after accounting for the other occupational and pandemic-related variables included in the models.

It is vital to emphasize that the findings of this study are pertinent not only to the pandemic but also to the phenomenon of organizational and technological change. This change was implemented abruptly, without sufficient preparation, and was particularly challenging for many teachers and students. All of them posed a huge challenge both to the education system and the people within it. It is worth noting that, according to research carried out in Organisation for Economic Co-operation and Development (OECD) countries in 2018, on average, only 43 % of teachers felt well-prepared for the use of information and communication technology (ICT) for teaching – in the authors' study, >50% of respondents considered lack of ICT literacy as stressful [44]. Research to date suggests that although organizational change is common in the modern world of work, it is always associated with a stressful adjustment effort, which can be accompanied by negative outcomes such as fatigue, burnout, reduced job satisfaction and deterioration in mental health [45], and especially multiple and repeated changes may lead to mental health distress [46]. The case of a pandemic, and the various risks associated with it, should be regarded as an instructive example for managers, highlighting the necessity to equip organizations and employees with the capacity to respond swiftly to sudden changes resulting from external circumstances that are challenging to anticipate. From the perspective of the ERI model, adequate organizational, technical, and training resources may help to balance the increased work-related demands associated with such rapid changes. Crisis action plans and inventories of resources that can be used in the event of a crisis should be prepared in every organization, especially in organizations of great social importance, such as schools and other public institutions. Concomitant with this imperative is the need to prepare employees both substantively and psychologically for such changes, thereby strengthening the organizational resources available to them.

Limitations and directions for further research

Although the study brought interesting results, it is worth noting that it was not performed on a representative national sample of teachers working at all levels of Polish education systems. Additionally, the sampling method used could have promoted self-selection biases leading to overrepresentation of teachers reached through the Interregional Section of Education and Upbringing of the Łódź Region of the Independent Self-Governing Trade Union "Solidarity" (NSZZ "Solidarność") , and ones whose concerns about working and pandemic related factors were more profound [47]. All the above-mentioned limitations limit generalization of results. Moreover, the survey was cross-sectional and all variables analyzed were tested using self-reporting methods, which generates the appearance of a common method error. A further limitation concerns the use of an adapted single-item WAS rather than the full WAI. The association between the WAS and the full WAI reported by El Fassi et al. [29] was moderate ($r_s = 0.63$), corresponding to approx. 39.7% shared variance and indicating that >60% of the variance in the full WAI was not captured by the single-item measure. Unlike the full WAI, the WAS does not account for such dimensions as diagnosed diseases, sickness absence, work ability prognosis, and psychological resources. Moreover, the item used in the present study was adapted by asking participants to compare their current work ability with their best work ability during the previous 2 years. Consequently, the use of this adapted single-item measure may have attenuated the observed associations between occupational stressors and work ability. All participants completed the survey between October 2022 and May 2023, after full-time in-person teaching had resumed. Pan-

demic-related occupational stressors were therefore assessed retrospectively rather than during the periods of pandemic restrictions.

Notwithstanding the aforementioned limitations, it is noteworthy that the presented study provides information on the associations between retrospectively reported pandemic experiences, changes in work organization, and teachers' well-being. The relationships between occupational stress resulting from changes in work organization and the ability to work and mental health appear to be of particular significance. The pandemic and its consequences provided valuable lessons for improving work organization and practices. An important direction for future research would be to check to what extent the specific requirements of conducting online education can be compensated by individual competencies, personal characteristics such as a sense of effectiveness, innovation, entrepreneurship and what systems of work organization and school management promote the well-being of teachers working online.

CONCLUSIONS

The findings indicate that different aspects of teachers' pandemic experiences were associated with work ability and general psychological functioning. Relational and communication difficulties were associated with higher odds of poor or moderate work ability, whereas insufficient organizational and training support, technological barriers and rapid work changes, personal concerns about COVID-19, and an acute course of infection were associated with higher odds of elevated GFQ-58 scores. Given the cross-sectional and retrospective design of the study, these associations should not be interpreted as causal. From the perspective of the ERI model [27], these findings highlight the importance of reducing excessive work demands and strengthening organizational resources and support when preparing teachers for remote work. This preparation should include introducing content related to the development of online teaching skills into teacher training curricula; providing in-service training courses on the use of modern technologies, including AI, in teaching; providing equipment and software for remote work; enabling teachers to use classroom facilities during online work; ensuring easily accessible technical support; adapting the organization and management of schools operating online to provide teachers with professional support; and expanding knowledge and strengthening competencies in occupational health and hygiene in online work. At the same time, new technologies, including AI, may also generate additional demands related to training, verification, and adaptation; therefore, their potential benefits depend on whether their implementation ultimately reduces rather than increases teachers' workload.

Practical implications

The findings support the importance of providing teachers with appropriate organizational support to help them cope with demanding work situations, particularly during periods of rapid change in working conditions. Such support may include expanding relevant skills, providing appropriate training and technical assistance, ensuring access to suitable tools and equipment, and introducing clear organizational procedures. These measures may contribute to better preparedness for remote teaching and other sudden changes in work organization; however, their effectiveness was not directly evaluated in the present study.

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AI USE

The AI-powered grammar check.

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REFERENCES

1. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al. The socio-economic implications of the coronavirus pandemic (COVID-19): a review. Int J Surg. 2020;78:185-93. https://doi.org/10.1016/j.ijsu.2020.04.018.
2. Rozporządzenie Ministra Edukacji Narodowej z dnia 11 marca 2020 r. w sprawie czasowego ograniczenia funkcjonowania jednostek systemu oświaty w związku z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19. DzU. 2020; poz. 410. Available from: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20200000410.
3. Ministerstwo Edukacji Narodowej. Podsumowanie roku szkolnego 2019/2020 [Internet]. Available from: https://www.gov.pl/web/edukacja/podsumowanie-roku-szkolnego-20192020.
4. Dhawan S. Online learning: a panacea in the time of COVID-19 crisis. J Educ Technol Syst. 2020;49(1):5-22. https://doi.org/10.1177/0047239520934018.
5. Buchner A, Majchrzak M, Wierzbicka M. Edukacja zdalna w czasie pandemii. Raport z badań. Warszawa: Fundacja Centrum Cyfrowe; 2020. Available from: https://centrumcyfrowe.pl/edukacja-zdalna-w-czasie-pandemii-1-edycja/.
6. Zhou J, Yuan X, Huang H, Li Y, Yu H, Chen X et al. The prevalence and correlative factors of depression among Chinese teachers during the COVID-19 outbreak. Front Psychiatry. 2021;12:644276. https://doi.org/10.3389/fpsyt.2021.644276.
7. Letzel V, Pozas M, Schneider C. Energetic students, stressed parents, and nervous teachers: inclusive homeschooling during the COVID-19 crisis. Open Educ Stud. 2020;2:159-70. https://doi.org/10.1515/edu-2020-0122.
8. Ozamiz-Etxebarria N, Berasategi Santxo N, Idoiaga Mondragon N, Dosil Santamaria M. Psychological state of teachers during the COVID-19 crisis: the challenge of returning to face-to-face teaching. Front Psychol. 2020;11:620718. https://doi.org/10.3389/fpsyg.2020.620718.
9. Xu L, Cheng P, Zheng W, Xu S, Li L, Zhang L, et al. Factors associated with preference of psychological intervention and mental status among Chinese teachers during coronavirus disease 2019: a large cross-sectional survey. Front Psychiatry. 2021;12:704010. https://doi.org/10.3389/fpsyt.2021.704010.
10. Allen R, Jerrim J, Sims S. How did the early stages of the COVID-19 pandemic affect teacher wellbeing? CEPEO Working Paper No. 20-15. Centre for Education Policy and Equalising Opportunities, UCL; 2020.
11. Stachteas P, Stachteas C. The psychological impact of the COVID-19 pandemic on secondary school teachers. Psychiatriki. 2020;31:293-301. https://doi.org/10.22365/jpsych.2020.314.293.
12. Li Q, Miao Y, Zeng X, Tarimo CS, Wu C, Wu J. Prevalence and factors for anxiety during the coronavirus disease 2019 (COVID-19) epidemic among the teachers in China. J Affect Disord. 2020;277:153-8. https://doi.org/10.1016/j.jad.2020.08.017.
13. Fan C, Fu P, Li X, Li M, Zhu M. Trauma exposure and the PTSD symptoms of college teachers during the peak of the COVID-19 outbreak. Stress Health. 2021;37(5):914-27 https://doi.org/10.1002/smi.3049.
14. McAlonan GM, Lee AM, Cheung V, Cheung C, Tsang KWT, Sham PC et al. Immediate and sustained psychological im-

pact of an emerging infectious disease outbreak on healthcare workers. Can J Psychiatry. 2007;52:241-7. https://doi.org/10.1177/070674370705200406.

15. Singhal T. A review of coronavirus disease-2019 (COVID-19). Indian J Pediatr. 2020;87:281-6. https://doi.org/10.1007/s12098-020-03263-6.
16. Lisowski K, Szaban D. Kondycja emocjonalna nauczycieli wychowawców po pierwszym roku pandemii COVID-19. Youth Cent East Eur. 2022;9(13):48-56. https://doi.org/10.24917/ycee.9156.
17. Stang-Rabrig J, Brüggemann T, Lorenz R, McElvany N. Teachers' occupational well-being during the COVID-19 pandemic: The role of resources and demands. Teach Teach Educ. 2022;117:103803. https://doi.org/10.1016/j.tate.2022.103803.
18. Santiago ISD, Dos Santos EP, da Silva JA, de Sousa Cavalcante Y, Gonçalves Júnior J, de Souza Costa AR et al. The impact of the COVID-19 pandemic on the mental health of teachers and its possible risk factors: A systematic review. Int J Environ Res Public Health. 2023;20(3):1747. https://doi.org/10.3390/ijerph20031747.
19. Nikiforos S, Tzanavaris S, Kermanidis KL. Post-pandemic pedagogy: Distance education in Greece during COVID-19 pandemic through the eyes of the teachers. Eur J Eng Res Sci. 2020:1-5. https://doi.org/10.24018/ejers.2020.0.CIE.2305.
20. Navarro-Espinosa JA, Vaquero-Abellán M, Perea-Moreno AJ, Pedrós-Pérez G, Aparicio-Martínez P, Martínez-Jiménez MP. The Influence of Technology on Mental Well-Being of STEM Teachers at University Level: COVID-19 as a Stressor. Int J Environ Res Public Health. 2021;18:9605. https://doi.org/10.3390/ijerph18189605.
21. Hidalgo-Andrade P, Hermosa-Bosano C, Paz C. Teachers' mental health and self-reported coping strategies during the COVID-19 pandemic in Ecuador: A mixed-methods study. Psychol Res Behav Manag. 2021;14:933-44. https://doi.org/10.2147/PRBM.S314844.
22. Estrada-Muñoz C, Vega-Muñoz A, Castillo D, Müller-Pérez S, Boada-Grau J. Technostress of Chilean teachers in the context of the COVID-19 pandemic and teleworking. Int J Environ Res Public Health. 2021;18:5458. https://doi.org/10.3390/ijerph18105458.
23. Lizana PA, Vega-Fernandez G, Gomez-Bruton A, Leyton B, Lera L. Impact of the COVID-19 pandemic on the teacher quality of life: A longitudinal study from before and during the health crisis. Int J Environ Res Public Health. 2021;18:3764. https://doi.org/10.3390/ijerph18073764.
24. Burke MS. The incidence of technological stress among baccalaureate nurse educators using technology during course preparation and delivery. Nurse Educ Today. 2009;29:57-64. https://doi.org/10.1016/j.nedt.2008.06.008.
25. Hall AK, Nousiainen MT, Campisi P, Dagone JD, Frank JR, Kroeker KI et al. Training disrupted: Practical tips for supporting competency-based medical education during the COVID-19 pandemic. Med Teach. 2020;42:756-61. https://doi.org/10.1080/0142159X.2020.1766669.
26. Padmanabhanunni A, Pretorius T. „I Teach, Therefore I Am": The Serial Relationship between Perceived Vulnerability to Disease, Fear of COVID-19, Teacher Identification and Teacher Satisfaction. Int J Environ Res Public Health. 2021;18:13243. https://doi.org/10.3390/ijerph182413243.
27. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, et al. The measurement of effort-reward imbalance at work: European comparisons. Soc Sci Med. 2004;58(8):1483-99. https://doi.org/10.1016/S0277-9536(03)00351-4.
28. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work Ability Index. 2nd revised ed. Helsinki: Finnish Institute of Occupational Health; 1998.
29. El Fassi M, Bocquet V, Majery N, Lair ML, Couffignal S, Mairiaux P. Work ability assessment in a worker population: comparison and determinants of Work Ability Index and Work Ability score. BMC Public Health. 2013;13:305. https://doi.org/10.1186/1471-2458-13-305.
30. Styla R, Kowalski J. Psychometric properties of the General Functioning Questionnaire (GFQ-58) used for screening for symptoms of psychopathology and overall level of

functioning. Psychiatr Pol. 2020;54(1):83-100. https://doi.org/10.12740/PP/99564.

31. Styła R. General Functioning Questionnaire (GFQ-58) and its short versions (GFQ-13) – normalisation, validity, reliability, and cut-off scores based on a nationwide representative sample and two clinical groups. Psychiatr Psychol Klin. 2025;25(4):317-27. https://doi.org/10.15557/PiPK.2025.0037.
32. Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. J Clin Epidemiol. 1996;49(12):1373-9. https://doi.org/10.1016/S0895-4356(96)00236-3.
33. Główny Urząd Statystyczny. Edukacja w roku szkolnym 2022/2023 (wyniki wstępne) [Internet]. Warsaw: Statistics Poland; 2023 [cited 2026 Jun 15]. Available from: https://stat.gov.pl/obszary-tematyczne/edukacja/edukacja/edukacja-w-roku-szkolnym-20222023-wyniki-wstepne,21,1.html.
34. Hascher T, Beltman S, Mansfield C. Swiss Primary Teachers' Professional Well-Being During School Closure Due to the COVID-19 Pandemic. Front Psychol. 2021;12:687512. https://doi.org/10.3389/fpsyg.2021.687512.
35. Dosil Santamaría M, Idoiaga Mondragon N, Berasategi Santxo N, Ozamiz-Etxebarria N. Teacher stress, anxiety and depression at the beginning of the academic year during the COVID-19 pandemic. Glob Ment Health (Camb). 2021;8:e14. https://doi.org/10.1017/gmh.2021.14.
36. Kuwato M, Hirano Y. Sense of coherence, occupational stressors, and mental health among Japanese high school teachers in Nagasaki prefecture: A multiple regression analysis. BMC Public Health. 2020;20:1355. https://doi.org/10.1186/s12889-020-09475-x.
37. Ma K, Liang L, Chutiyami M, Nicoll S, Khaerudin T, Ha XV. COVID-19 pandemic-related anxiety, stress, and depression among teachers: A systematic review and meta-analysis. Work. 2022;73(1):3-27. https://doi.org/10.3233/WOR-220062.
38. Khawand S, Zargar P. Job autonomy and work-life conflict: A conceptual analysis of teachers' wellbeing during COVID-19 pandemic. Front Psychol. 2022;13:882848. https://doi.org/10.3389/fpsyg.2022.882848.
39. Burić I, Šimunović M, Balaž B. Work–family conflicts and teacher commitment during the COVID-19 pandemic: a moderated mediation analysis of emotional exhaustion and psychological capital. Educ Psychol. 2023;43(5):472-90. https://doi.org/10.1080/01443410.2022.2091750.
40. Rabin E, Goldberg S, Blau I. Mediation of work-and-family conflict in the relationship between social-and-organizational support and teaching self-efficacy: The case of parent-teachers working remotely. Educ Inf Technol. 2024;29(17):22545-66. https://doi.org/10.1007/s10639-024-12732-w.
41. Zhao W, Liao X, Li Q, Jiang W, Ding W. The relationship between teacher job stress and burnout: A moderated mediation model. Front Psychol. 2022;12:784243. https://doi.org/10.3389/fpsyg.2021.784243.
42. Leger KA, Haynes EN, Hilbert TJ, Maras J, Brancato C, Bush HM. Teacher Stress and Mental Health During the COVID-19 Pandemic: Differences by Teaching Modality. School Psychol Rev. 2025;54(4):531-40. https://doi.org/10.1080/2372966X.2024.2317700.
43. Neto LB, Christofoletti G, de Alencar GP, Burke TN. Burnout syndrome, work ability, quality of life and physical activity in teachers during the COVID-19 pandemic in Campo Grande, Brazil. Work. 2024;78(1):45-53. https://doi.org/10.3233/WOR-220187.
44. Reimers FM. Learning from a pandemic. The impact of COVID-19 on education around the world. In: Reimers FM, editor. Primary and secondary education during Covid-19: disruptions to educational opportunity during a pandemic. Cham: Springer; 2022. p. 1-37. https://doi.org/10.1007/978-3-030-81500-4_1.
45. Backhaus I, Lohmann-Haislah A, Burr H, Nielsen K, di Tecco C, Dragano N. Organizational change: challenges for workplace psychosocial risks and employee mental health. BMC Public Health. 2024;24:2477. https://doi.org/10.1186/s12889-024-19815-w.

46. Fløvik L, Knardahl S, Christensen JO. Organizational change and employee mental health: A prospective multilevel study of the associations between organizational changes and clinically relevant mental distress. Scand J Work Environ Health. 2019;45(2):134-45. https://doi.org/10.5271/sjweh.3777.

47. Kaźmierczak I, Zajenkowska A, Rogoza R, Jonason PK, Ścigała D. Self-selection biases in psychological studies: Personality and affective disorders are prevalent among participants. PLoS One. 2023;18(3):e0281046. https://doi.org/10.1371/journal.pone.0281046.

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