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Working and absence from work during the pandemic

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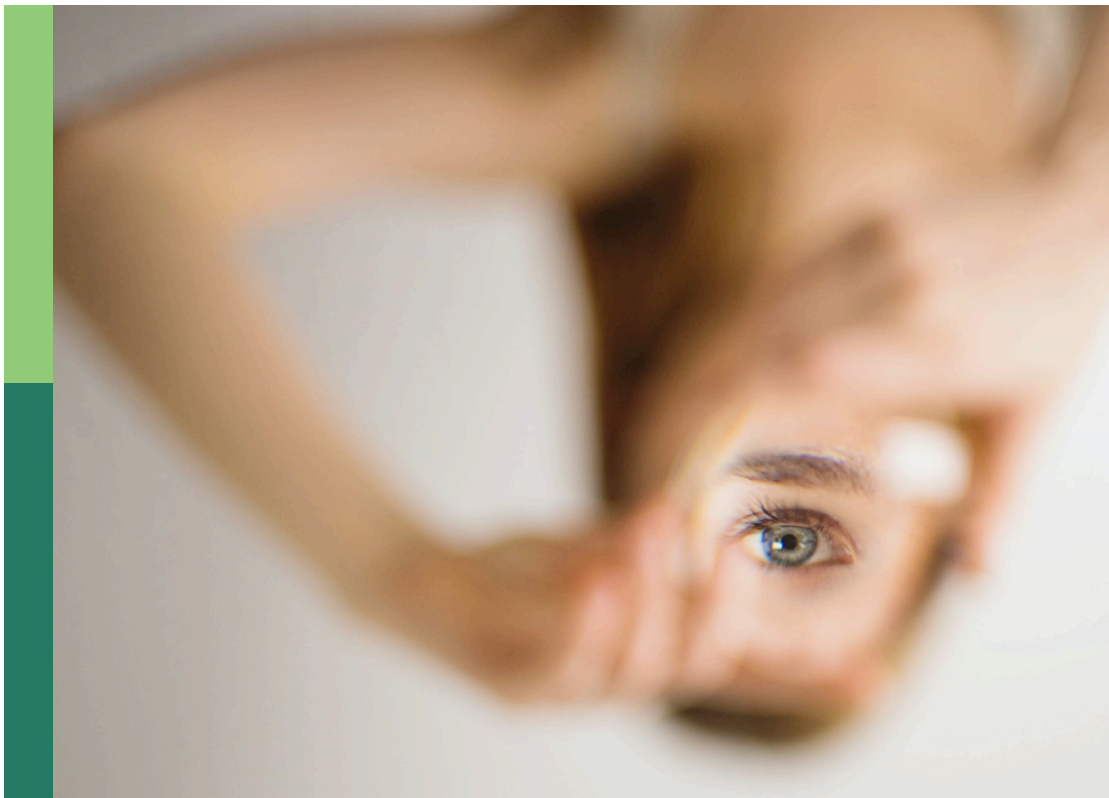

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Working and absence from work during the pandemic

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Editorial: Working and absence from work during the pandemic

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KEYWORDS

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Editorial on the Research Topic
Working and absence from work during the pandemic

The Pandemic has taught us new lessons that needed to be learned many years ago: absence from work is not always an absence. Some people are highly engaged in work tasks when they work from home, while others reach their maximum potential working from the office. Some, like front-line workers, including health workers, have no other option but to work at their workplace. During the pandemic we have learned that coming to work while sick (sickness presenteeism) is not a noble thing to do, but represented a threat to themselves and others. Staying at home while sick (sickness absenteeism), has become a noble and mandatory act.

In this Research Topic, we have asked the researchers for a deeper insight and understanding from both workers' and/or employers' perspective about the absence from work and working life in general, during the pandemic. We have laid down numerous questions. What level of engagement did employees have during the pandemic? How did this new context influence the health and wellbeing of workers, as well as economic processes? Furthermore, we were very interested in the "user experience." Did the "new normal" come with a price? Was the new normal at least normal? Should we remain in the new normal once the pandemic is over or should we go back to the old?

After one and a half years of collection and review, out of 34 submitted papers, 19 have reached the publication decision. Two out of the 19 accepted papers are mini-reviews, while 17 are original research papers, including 141 co-authors altogether. Each of these 19 seminal papers dissects unique dimensions of the global health crisis during COVID-19, ranging from psychological impacts on workers and shifts in healthcare systems to remote work, stress, adaptation and coping, organizational communication, and eventually presenteeism. These studies offer critical insights into the multifaceted consequences and adaptive strategies used during this period.

Several studies, including those by Kröner and Müller, Milaković et al., and Orešković et al., touch upon the shift to remote work during the pandemic. These studies underline the impact of telework on musculoskeletal disorders, job satisfaction, work-life balance, and mental wellbeing, highlighting both the benefits and challenges associated with remote work arrangements. The study by Milaković et al. critically examines the emerging trend

of telework and its association with musculoskeletal disorders (MSDs). Highlighting the importance of ergonomic setups and balanced work-life boundaries, this research provides essential guidance on how to navigate the challenges of remote work environments. Orešković et al. scrutinize the association between remote work and job satisfaction. Their large-scale survey counters prior assumptions about remote work's disadvantages, advocating for employee-centric work arrangement policies. Kröner and Müller investigate the longitudinal impact of telework on mental wellbeing. Their identification of three distinct wellbeing trajectories among German workers reveals telework as a potential buffer against work-related stressors, offering valuable insights for future remote work policies.

The pandemic-induced stress and mental health issues are a recurring theme. Studies such as those by Jia et al., Koren et al., and Tsubono and Mitoku emphasize the increased levels of stress among various professional groups, including teachers, healthcare workers, and general employees. These studies highlight the importance of addressing mental health and stress management in these challenging times. Research by Tsubono and Mitoku delves into the occupational stress of public school teachers in Japan during the pandemic. The nationwide survey pointed out the overarching issues of quantitative workload and long working hours, along with school-type-specific stressors such as managing extracurricular activities in junior high schools. This study is significant for its comprehensive approach to understanding the various stress factors in education and the importance of addressing them through tailored strategies. The 2023 study by Jia et al. focuses on the physical discomforts experienced by 515 front-line medical personnel in China. In particular, the study brings to light severe physical discomforts, including dyspnea and pain, primarily attributed to the prolonged use of personal protective equipment (PPE). This underscores the pressing need to address the physical and ergonomic aspects of medical work during health crises. Koren et al. review the psychosocial risks emerging from the pandemic and their impacts on mental health. They highlight crucial factors such as isolation, job insecurity, and digitalization-induced stress, emphasizing the need for workplace mental health interventions. This study is critical for understanding the broad spectrum of pandemic-related stressors and their implications for mental health.

Papers by Mijakoski et al., Schmidt-Stiedenroth et al., and Veje et al. discuss the resilience and challenges faced by healthcare systems and professionals. These studies explore how the pandemic has strained healthcare workers, highlighting the need for supportive measures and organizational support to maintain their wellbeing and effectiveness. Mijakoski et al. conducted a comprehensive analysis of the relationship between burnout and job demands and resources among healthcare workers in Southeast European countries. With 4,621 HWs, the research used the Maslach burnout inventory and other tools to assess burnout dimensions, job demands, and resources such as remuneration and supervisory relationships. Significant differences in emotional exhaustion were found between countries and in job demands/resources. The findings indicate that job demands and resources predict emotional exhaustion. The study concludes that preventive measures for the mental health of HWs should consider country-specific contexts and prepare for future crises. Schmidt-Stiedenroth et al.'s investigation into the psychosocial stressors and resources among hospital staff in Germany provides crucial insights into crisis management within healthcare institutions. Their research, based on 303 responses, underscores the importance of psychosocial support, clear communication, and efficient workload management to maintain the wellbeing of healthcare professionals during crises. In the study by Veje et al., the experiences of healthcare workers in a Swedish university hospital's infectious disease department during the pandemic are meticulously analyzed. The research emphasizes the increased workload and emotional stress, advocating for well-structured support systems for healthcare workers, especially younger employees and those with greater concerns about infection.

Adaptation to the challenges of the pandemic is a key focus of studies like those of Härgestam et al., Straßburger et al. and Tien et al.. These studies illustrate how professionals, including physicians and female STEM workers, adapted and coped with the new realities of the pandemic, highlighting resilience and flexibility in face of adversity.

Härgestam et al. provide a compelling narrative on the challenges Swedish physicians faced in preserving their professional identity amid the pandemic. Their research reveals the tensions between traditional medical practice and the exigencies of a public health crisis, shedding light on the adaptability and ethical quandaries encountered by medical professionals. Tien et al. provide an insightful look at the coping strategies of female STEM professionals in Silicon Valley during the pandemic. Their in-depth interviews reveal how these women effectively navigated new work-life challenges, emphasizing the value of flexibility and support systems. Straßburger et al. explore the return-to-work process for employees affected by Post-COVID syndrome. Their focus on personal coping resources and organizational offerings highlights the necessity for a multidisciplinary approach in facilitating reintegration.

The importance of organizational communication and support is evident in studies by Björk et al., Côté et al., and Ibañez et al.. These papers shed light on the role of effective communication and organizational strategies in managing pandemic-related challenges in workplaces, emphasizing the need for clear, consistent, and culturally sensitive messaging. The 2024 study by Côté et al. critically examines communication barriers and strategies in Quebec and Ontario workplaces during the pandemic. The study reveals the challenges faced by essential workers in precarious employment and underscores the importance of effective and adaptable communication in crisis management. In the study by Ibañez et al., the resilience of family businesses in Chile during the pandemic is highlighted. Surveying 516 employees, the study found that these businesses effectively counteracted burnout and bolstered affective commitment, thereby elevating job satisfaction during challenging times. This research is crucial as it shines a light on adaptive capabilities and the unique work culture of family firms, underlining the importance of nurturing employee commitment as a buffer during crises. Björk et al. examine the challenges faced by healthcare managers in Sweden during the first wave of COVID-19. Their mixed-method approach highlights the critical need for

clear communication and adequate support for managers to adapt to rapid changes and maintain workforce wellbeing.

Finally, the theme of presenteeism is explored in the study by Biron et al.. It examines how presenteeism, as an adaptive behavior, is influenced by the work environment and health limitations, thus impacting performance. This highlights the complexity of presenteeism and the need for nuanced workplace health management. Biron et al. offer an innovative perspective on presenteeism, categorizing it into functional, dysfunctional, overachieving, and average types. This study is instrumental in understanding the complex interaction between health and performance on the job, which calls for tailored interventions.

These studies collectively offer a multifaceted view of the challenges and adaptations during the COVID-19 pandemic in different sectors. They reveal the crucial role of organizational support, communication strategies, and individual resilience in navigating the complexities of the pandemic. This Research Topic not only documents immediate responses to the crisis, but also provides valuable insight for future preparedness in similar global challenges. In conclusion, the COVID-19 pandemic has led to a shift in work patterns. These changes have been influenced by various factors including health behaviors, work-related factors, and the blurring of boundaries between work and home.

We express our profound gratitude to all the authors who recognized the significance of our theme and contributed their valuable work to this Research Topic. Your insightful papers have not only enriched this Research Topic, but have also significantly advanced our understanding of the multifaceted impacts of the COVID-19 pandemic. Our heartfelt thanks go to all the reviewers who dedicated their time and expertise to meticulously assess each submission with their constructive feedback and rigorous evaluations have been indispensable in upholding the quality and integrity of this publication. The authors are also deeply grateful to Frontiers in Psychology for their collaboration and trust in this endeavor. The support and guidance provided by the journal team have been crucial in bringing this Research Topic to fruition. This collaborative effort has resulted in a Research Topic that we believe will be a valuable resource for readers and researchers alike. We thank you all for your contributions, dedication, and commitment to advancing scientific knowledge in these challenging times.

Author contributions

HB: Conceptualization, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. DM: Conceptualization, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. MM: Conceptualization, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. OB: Conceptualization, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The pros and cons of remote work in relation to bullying, loneliness and work engagement: A representative study among Norwegian workers during COVID-19

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Remote work became the new normal during COVID-19 as a response to restrictions imposed by governments across the globe. Therefore, remote work's impact on employee outcomes, well-being, and psychological health has become a serious concern. However, the knowledge about the mechanisms and outcomes of remote work is still limited. In this study, we expect remote work to be negatively related to bullying and assume that bullying will mediate remote work's impact on work engagement and loneliness. To test our hypothetical model, we applied a cross-sectional design using data from a large representative sample of 1,511 Norwegian workers. The data were collected in September 2021 during a period of COVID-19 restrictions in Norway. The results confirmed our hypotheses: remote work was positively related to loneliness and work engagement but negatively related to bullying. Further, bullying was positively related to loneliness and negatively related to work engagement. Moreover, bullying was also found to play a partial mediating role, supporting our hypothesis. This study suggests that remote work is related to both positive and negative mechanisms in the workplace. Remote work can potentially reduce bullying and have a protective function in preventing bullying. However, since remote work has positive relations with both loneliness and work engagement, this study illustrates that organizations should be cautious and perhaps consider a moderate level of remote work. Hence, the results have several implications for HR policies and management.

KEYWORDS

remote work, loneliness, work engagement, bullying, COVID-19, psychological health, well being

Introduction

The COVID-19 outbreak caused a rapid shift into full-time remote work for millions of employees all over the globe (Contreras et al., 2020; Yang et al., 2022). Without any preparations, remote work became the new normal (Schur et al., 2020), even in positions we previously assumed had to be done on-site (Savić, 2020; Sytch and Greer, 2020). Remote work represents a fundamental shift in organizational work design (Wang et al., 2021) and completely changes physical and psychological interactions, possibilities, and relationships (Konradt et al., 2003; Gajendran, 2007; Contreras et al., 2020; Schur et al., 2020; Yang et al., 2022). This shift in work design makes it important to investigate remote work's effect on important mechanisms at the workplace.

The extent to which employees were able to adjust to remote work is crucial for the individual- and organizational outcomes, such as mental health, well-being, and work engagement (van Zoonen et al., 2021). As a result, research on remote work in the aftermath of COVID-19 is increasing, and remote work has become a topic of great scholarly interest (e.g., Brynjolfsson et al., 2020; Ozimek, 2020; Popovici, 2020; Ferreira et al., 2021; Wang et al., 2021; Pokojski et al., 2022; Yang et al., 2022). However, there is still a lack of research on remote work's potential effect on workplace bullying. Bullying is claimed to be the most severe social stressor in the workplace, and in-person interactions are an important driver of bullying (Bacher-Hicks et al., 2022). Therefore, it is important to investigate bullying in the context of remote work, where targets and bullies are physically separated. This study aims to fill this gap by developing a theoretical model that explores the mediating role of bullying in relation to remote work and its effect on loneliness and work engagement. It investigates the effects of remote work on Norwegian employees almost 2 years into the pandemic. Furthermore, it seeks to address the gap in the existing literature.

This study assumes that remote work will substantially influence social interactions at work, thereby reducing perceptions of bullying and influencing workers' perceptions of loneliness and work engagement. We seek to understand the relationships between remote work, bullying, loneliness, and work engagement, and seek to gain information about these unexplored, yet important issues affected by remote work. Based on theory, we will develop and test a theoretical model in a representative sample of workers in Norway. This study will provide new insights and knowledge about the versatile influence of remote work in the workplace.

Theoretical background and research hypotheses

Remote work and loneliness

Loneliness is an important factor in organizational contexts. For example, employee loneliness is negatively related to well-being, creative performance, organizational citizenship behavior, job satisfaction, and job performance (Wright, 2005; Erdil and Ertosun, 2011; Ozcelik and Barsade, 2018; Firoz and Chaudhary, 2021). Loneliness is a psychological state that occurs when there is a discrepancy between the interpersonal relationships one wishes to have and the relationships one has (Peplau and Perlman, 1982). Those who experience difficulties establishing and maintaining interpersonal relationships struggle to address their need for belonging and are more likely to experience loneliness (Baumeister and Leary, 1995; Cacioppo et al., 2000). Loneliness is experienced by adults of all ages (Ozcelik and Barsade, 2018), and influences how people feel and behave towards others and how others feel and behave towards them (Heinrich and Gullone, 2006; Cacioppo and Hawkley, 2009). Even though loneliness may be experienced differently based on personality traits (Buecker et al., 2020), it is particularly important for organizations to address loneliness, as positive employee interactions play a significant role in employees' motivation and satisfaction at work (Dutton and Heaphy, 2003; Wang and Brower, 2019).

It was only recently that studies began investigating the relationship between remote work and loneliness. Remote work completely changes social interactions, social possibilities, and social relationships (Konradt et al., 2003; Contreras et al., 2020; Schur et al., 2020; Yang et al., 2022). Employees working remotely may feel more lonely as they have fewer in-person interactions, are more exposed to social isolation, and lose the opportunity to meet friends and colleagues (Hwang et al., 2020; Wang et al., 2021; Buecker and Horstmann, 2022). Further, a study by Carillo et al. (2021) points out that lack of contact and informal relationships with colleagues and lack of feedback from managers and organizations are major problems for remote work. The lack of contact and informal relationships makes it difficult to maintain interpersonal relationships digitally. Therefore, we propose the following hypothesis (H):

> *H1*: Remote work is positively associated with loneliness.

Remote work and work engagement

Organizations must facilitate and inspire full engagement for their employees. Work engagement can truly make a difference for employees and may result in competitive advantages, such as increased job performance (Bakker and Demerouti, 2008). Work engagement is defined as "a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption" (Bakker et al., 2011, p. 5). Engagement is predicted by typical job resources (Bakker and Demerouti, 2007). For example, social support from colleagues, performance feedback, skill variety, and autonomy (Bakker and Demerouti, 2008). Engagement is a motivational concept, increasing personal growth, development, and performance. Overall, producing positive outcomes at an individual and organizational level (Bakker and Leiter, 2010).

Despite the increased prevalence of remote work, its direct impact on work engagement remains relatively unexplored. For example, new research on work engagement during COVID-19 explored predictors, gender differences, and possible relationships with work engagement (Gopalan et al., 2021; Koekemoer et al., 2021; Ojo et al., 2021; Rožman et al., 2021), but have left the direct effects of remote work on work engagement unspecified. Palumbo (2020) argues that remote work positively affects work engagement, since remote work empowers employees to harmonize work and family-related commitments and increases work-life balance. Some studies have also found that remote work increases productivity, which is highly correlated with work engagement (Ozimek, 2020; Toscano and Zappalà, 2021). Furthermore, remote work reduces commuting time, unnecessary meetings, and distractions in the office (Ozimek, 2020), ultimately giving employees more time to engage in their work. It can be argued that remote work reduces work engagement through work/life balance as it may cause more distractions (e.g., shopping, hanging with friends, housework) than being physically at the workplace. However, based on the literature it seems reasonable to assume that remote work increases work engagement. We thus propose the following hypothesis (H).

> *H2*: Remote work is positively associated with work engagement.

Remote work and bullying

Workplace bullying is defined as "repeating and enduring aggressive behaviors that are intended to be hostile and/or perceived as hostile by the recipient" (Einarsen, 1999, p. 18). Long-term exposure to bullying is more damaging for the recipients than all other kinds of work-related stress put together, as long-lasting bullying may cause severe psychosomatic and psychological problems for the target (Hauge et al., 2010; Mikkelsen et al., 2020). Moreover, employees exposed to bullying show lower levels of satisfaction and commitment at work, and their desire to remain with an employer and their willingness to be present at work decreases (McMahon, 2000). Bullying is found to be strongly associated with in-person interactions (Bacher-Hicks et al., 2022). Knowing this, workplace bullying represents a critical area of research. Especially in times of extensive use of remote work, where in-person interactions between employees are removed.

As a response to being bullied, victims could see it as a psychological necessity to either quit the job or take sick leave (O'Donnell et al., 2010). This way of separating themselves from perpetrators and leaving the situation is found to be the most effective coping strategy for bullied victims (Aquino and Thau, 2009). However, in terms of salary and commitments to other obligations, attendance at work is necessary and unavoidable (Hauge et al., 2010). Previous studies on remote work emphasize the positive aspects of employees choosing to work from home to avoid certain aspects of organizational life, such as bullying and other negative social acts (Mirchandani, 1998; Collins et al., 2016). Furthermore, a study by Karatuna (2015) found the physical separation of perpetrators and targets helped to de-escalate conflicts and end the bullying. In the case of remote work, the separation of perpetrators and targets happens naturally, since it allows employees to conduct work outside the traditional office. Furthermore, remote work could mitigate feelings of social exclusion (e.g., not being included in small talk, meetings, or lunches), as these social interactions are less visible or even eliminated when working remotely.

Based on this, our study assumes that remote work will have a positive impact on workplace bullying. Remote work removes in-person contact between employees and physically separates perpetrators and victims. Thus, the following hypothesis is proposed (H):

> *H3*: Remote work is negatively related to bullying.

Bullying, loneliness, and work engagement

Being a target of bullying has negative consequences on health-related and job-related outcomes (Trépanier, 2014; Khalid and Ishaq, 2015; Gupta et al., 2017). Furthermore, workplace bullying can severely affect organizational productivity and represents a significant source of social stress at work (McMahon, 2000; Vartia-Väänänen, 2003; Bano and Malik, 2013).

First, workplace bullying negatively affects the basic human need for belonging (Baumeister et al., 2007). Moreover, the experience of being bullied affects one's ability to feel socially included in the organization (Fattori et al., 2015), loneliness and social isolation are consequences of bullying (Hogh et al., 2012; Campbell, 2013). According to Wright et al. (2006), loneliness is strongly related to the desired quality of interpersonal relationships. Therefore, the lack of high-quality relationships in work environments due to bullying could cause loneliness. Furthermore, loneliness caused by bullying is damaging to the affected person, causing stress, anxiety, and other health problems (Lewis and Orford, 2005; Green, 2021).

Second, workplace bullying has a negative impact on work engagement (Trépanier, 2014; Park and Ono, 2017; Goodboy et al., 2020). Victims of bullying report problems concentrating, self-doubt, decreased job satisfaction, and decreased productivity (Hallberg and Strandmark, 2006; Yıldırım, 2009; O'Donnell et al., 2010; Trépanier, 2014; Mikkelsen et al., 2020). Furthermore, several studies report that bullied victims have higher absenteeism, lower dedication, and lower commitment to work, all of which are negatively related to work engagement (McMahon, 2000; Yıldırım, 2009; Trépanier, 2014). Hence, being a victim of bullying is damaging to the affected person and has a direct effect on performance and psychological health. Thus, we hypothesize as follows (H):

H4: Bullying is positively related to loneliness.

H5: Bullying is negatively related to work engagement.

Bullying as a mediator

From the theoretical framework presented above, we predict that remote work is negatively associated with bullying. Furthermore, we propose that remote work is negatively related to loneliness and positively related to work engagement and that bullying is negatively associated with work engagement and positively related to loneliness. This study will explore how bullying might mediate remote work's influence on work engagement and loneliness. We seek to investigate whether remote work provides a protective mechanism against bullying.

A study by Olsen et al. (2017) revealed that bullying mediates the influence of job resources and demands on job performance, job satisfaction, and work ability. Hence, bullying has been shown to mediate the association between social interactions and outcomes at work. Our study hypothesizes that the perception of being bullied is reduced by working from home and therefore assumes that bullying will mediate the impact of remote work on loneliness and work engagement. First, we expect that the experience of workplace bullying will have significant consequences for work engagement since perceptions of being bullied are stressful experiences with negative effects on vigor (high mental energy), dedication (high involvement in work), and absorption (high concentration and engrossment in work; Goodboy et al., 2020). Second, bullying has severe negative consequences on the social environment (Einarsen et al., 1994). Since being bullied does not reflect the desired quality of interpersonal relationships, it has positive associations with feelings of loneliness (Wright et al., 2006).

Moreover, bullying is an interpersonal behavior intentionally aimed at causing harm to another employee (Bowling and Beehr, 2006). Since remote work reduces interpersonal contact, it is reasonable to believe that remote work will be negatively associated with bullying. This is reflected in a study by Golden and Gajendran (2019), which found that employees who experienced low levels of social support at work were positively associated with remote work. Furthermore, as low social support is positively associated with being bullied (Evans et al., 2014), we assume remote work will influence social interactions in the workplace, and that bullying will mediate the influence of remote work on loneliness and work engagement. As the above theoretical framework proposes, the physical and psychological separation induced by remote work could have positive outcomes. Thus, we propose the following hypothesis (H):

H6: Bullying will mediate remote work's associations with (a) loneliness and (b) work engagement.

Research model

Based on the theoretical framework and the above hypotheses, the following research model (Figure 1) is developed in this study.

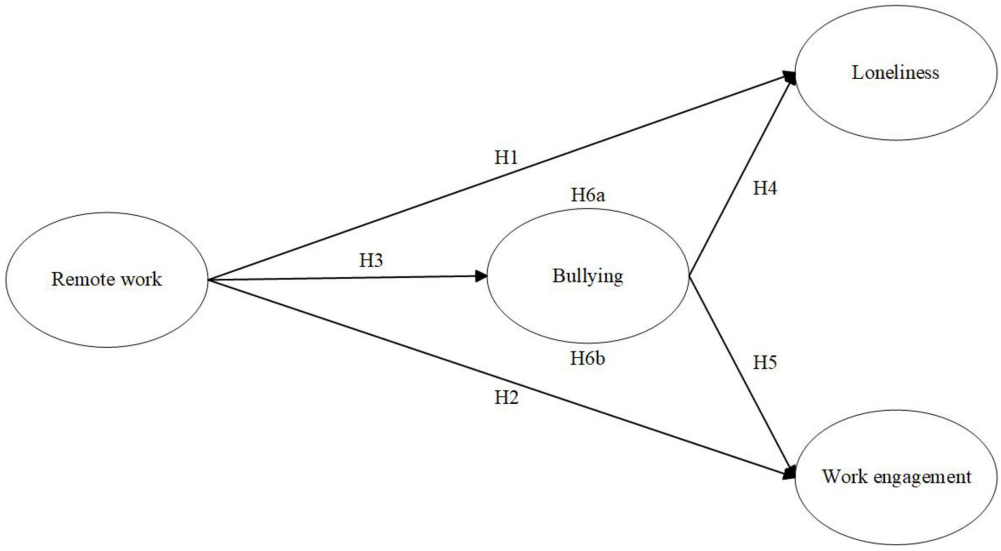

FIGURE 1
The research model, with letters referring to the presented hypotheses.

Materials and methods

Sample and data collection

In September 2021, data were collected by Norstat Norway through an electronic questionnaire assembled specifically for this research. From Norstat's panel of 85,000 active participants, there was a total of 1,511 respondents. According to the sociodemographic structure described by Statistics Norway (Statistics Norway, 2022), the sample is considered representative of the Norwegian working population.

The respondents were granted anonymity through a two-step procedure. Norstat had access to their identities for future follow-up studies, but no identity information was shared with the researchers. Further, the respondents were informed about the purpose of the study, about their right to withdraw at any time, and that the data would be used for research only. Any questions that might arise were to be directed to the project leader.

Norstat operates within the Directive 95/46/EC General Data Protection Regulation and complies with Norwegian data protection laws and the main research standards and guidelines described in ICC/ESOMAR and the Quality Management System ISO9001:2015. The Norwegian Centre for Research Data (NSD) approved the research plan and had no comments to the ethical aspects of the research project. At the end of the process, an anonymized complete data file was made available to the research group.

Measures

Remote work

Two items, each with a five-point scale (1 = less than before, 5 = much more than before), were used to measure remote work (Grødem, 2020). One item measured how the COVID-19 restrictions resulted in more remote work, while the other measured whether COVID-19 restrictions resulted in using more digital tools than before the pandemic. Cronbach's alpha was 0.75.

Bullying

Exposure to bullying was measured with 11 items using a trimmed version of the Negative Acts Questionnaire-Revised (NAQ-R) instrument (Einarsen et al., 2009). All items are formulated consistently, avoiding references to the term "bullying" and covering both direct and indirect behaviors. This method may be perceived as more accurate since it does not rely on the respondent's understanding of bullying (Nielsen et al., 2010). The items assess exposure to negative acts on a five-point scale (1 = Never, 5 = Daily). Cronbach's alpha was 0.92.

Loneliness

Two items developed by Hughes et al. (2004) were used to measure loneliness. The items use a five-point scale (1 = Never, 5 = Daily). One item measured the lack of contact with other people and the other measured the feeling of isolation. Cronbach's alpha was 0.86.

Work engagement

The ultra-short UWES–3 instrument (Schaufeli et al., 2019) was used to measure work engagement. The three items use a five-point scale (1 = Strongly disagree, 5 = Strongly agree) to assess the respondent's energy, enthusiasm, and immersion at work. Each item represents one aspect of work engagement (vigor, dedication, or absorption). Cronbach's alpha was 0.81.

Control variables

Age and gender were included as control variables in the structural equation model and the correlation matrix.

Data analysis

Descriptive statistics, correlations, and Cronbach's alphas were analyzed using SPSS 26.0, while confirmatory factor analysis (CFA) and structural equation modeling (SEM) were conducted in AMOS 26.0. CFA using maximum likelihood estimation (MLE) was performed to test the validity of the constructs. The measurement model was validated before estimating the structural model (McDonald and Ho, 2002). To analyze the relationships between the latent variables in the developed theoretical model, SEM with MLE was performed. The direction and significance of the beta coefficients potentially support or reject the theoretical model and the associated hypotheses.

Guidelines from (Hu and Bentler, 1999) were used to establish cut-off criteria for the validity and reliability of concepts. The reliability of the concepts is investigated with composite reliability (CR > 0.7) and Cronbach's alpha (> 0.7). Convergent validity is investigated with average variance explained (AVE > 0.5).

The following indicators and thresholds were used to evaluate the model fit: the comparative fit index (CFI), incremental fit index (IFI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR). An RMSEA of less than 0.05 indicates a "good" fit, while an RMSEA of less than 0.08 indicates an "acceptable" fit (McDonald and Ho, 2002). For SRMR, a range of 0 to 0.08 is considered "acceptable" (Hu and Bentler, 1999), while for other indicators, values of 0.90 or greater indicate a "good" fit (Hoyle, 1995; McDonald and Ho, 2002). Chi-square was not used to evaluate the model fit due to the large sample size (Bentler and Bonett, 1980; Schumacker and Lomax, 2004).

Bootstrapping was used to test for indirect effects and the mediating role of bullying. Bootstrapping is a method that involves repeatedly sampling from the dataset and estimating the indirect effect in each resampled dataset (Preacher and Hayes, 2008). This method is used before the Sobel test to address indirect effects, as it has high statistical power while also maintaining reasonable control over the Type I error rate (Preacher and Hayes, 2008). Following Hayes' (2013) recommendations, the data were resampled 5,000 times, and 95 percent bias-corrected confidence intervals (CIs) were estimated.

Results

Sample

A total of 1,511 Norwegian workers participated in the study. Among them, 688 were female (45.5%), 771 were between 40 and 66 years old (50.9%), and 602 were less than 40 years old (39.8%). Further, 660 had been in their jobs for 5–20 years (43.7%), while 620 had been in their current jobs for four or fewer years (41%). Of the respondents, 1,053 worked from 21 to 40 h per week (69.7%), and 1,262 were full-time employees (83.5%). The demographic data are presented in Table 1.

TABLE 1 Characteristics of the study participants.

Demographic variables		Total Sample (N = 1,511)	
		n	%
Gender	Female	688	45.5
	Male	823	54.5
Age	20–24	114	7.5
	25–39	488	32.3
	40–54	486	32.2
	55–66	285	18.9
	67–74	138	9.1
Years in current job			
	≤ 4	620	41
	5–10	379	25.1
	11–20	281	18.6
	≥ 21	231	15.3
Working hours per week			
	≤ 20	119	7.9
	21–40	1,053	69.7
	41–60	308	20.4
	≥ 61	31	2.1
Work situation			
	Full-time	1,262	83.5
	Part-time	243	16.1
	Laid-off	6	0.4

Descriptive statistics

Descriptive statistics and correlations are presented in Table 2. Participants' ages varied from 20 to 75 (mean = 45.75, SD = 13.88). Gender was measured on a scale from 0 to 1, where 0 = male and 1 = female (mean = 0.46, SD = 0.50). Excluding control variables, remote work had the highest score (mean = 3.98, SD = 0.87), followed by work engagement with the second highest (mean = 3.38, SD = 0.87). Bullying had the lowest score (mean = 1.27, SD = 0.47), followed by loneliness with the second lowest (mean = 1.57, SD = 0.87). The statistical variation of the different indicators was considered satisfactory.

Relations among measurement concepts were measured by Pearson's r. The correlations ranged from −0.22 to 0.57. Overall, nine correlations were negative and six were positive. Remote work was negatively correlated to gender and bullying. Bullying was negatively correlated to age, gender, remote work, and work engagement. Further, loneliness was negatively correlated with age, and work engagement, while work engagement was negatively correlated to bullying and loneliness. In general, all correlations were significant ($p < 0.01$), with the exception of correlations with gender.

Confirmatory factor analysis, reliability, and validity

Confirmatory factor analysis (CFA) was performed using maximum likelihood estimation (MLE) to assess the validity of all the concepts. All dimensions of associated items were included in the assessments (Table 3). CFA supported the measurement model with a "good" fit (CFI = 0.91, IFI = 0.91, RMSEA = 0.07, SRMR = 0.05). The standardized factor loadings ranged from 0.63 to 0.98. Bullying had the lowest loading (0.63) with "being ignored or excluded," while loneliness had the highest loading (0.98) with "How often do you feel isolated from others?" Moreover, CR was above 0.7, AVE was above 0.5, and Cronbach's alphas ranged from 0.75 to 0.92, with remote work being the lowest (0.75) and bullying being the highest (0.92). Based on the overall results and the model fit, the factor-to-item relations were considered satisfactory.

TABLE 2 Descriptive statistics and correlations.

	Range	Mean	SD	1	2	3	4	5	6
1. Age	20–75	45.75	13.88	–					
2. Gender	0–1	0.46	0.50	−0.10**	–				
3. Remote work	1–5	3.93	0.87	0.07**	−0.04	–			
4. Bullying	1–5	1.27	0.47	−0.15**	−0.02	−0.22**	–		
5. Loneliness	1–5	1.57	0.87	−0.11**	0.05	0.30**	0.57**	–	
6. Work engagement	1–5	3.38	0.87	0.14**	−0.01	0.12**	−0.22**	−0.21**	–

Gender: 0 = Male, 1 = Female.
**$p < 0.01$.

TABLE 3 Confirmatory factor loadings with standardized factor loadings, reliability, and convergent validity.

Dimension/Item	Factor loadings	CR	AVE	Alpha
Remote work		0.76	0.61	0.75
Have the measures led to you working from home?	0.80			
Have the Covid-19 restrictions led to you using digital tools more often than before (Skype, Teams, Zoom, and similar services)?	0.76			
Bullying		0.92	0.52	0.92
Being ignored or excluded.	0.63			
Having insulting or offensive remarks made about your person, attitudes, or your private life.	0.74			
Being shouted at or being the target of spontaneous anger.	0.65			
Repeated reminders of your errors and mistakes.	0.74			
Being ignored or facing a hostile reaction when you approach.	0.76			
Persistent criticism of your errors or mistakes.	0.79			
Having your opinion ignored.	0.76			
Practical jokes carried out by people you do not get along with.	0.75			
Being the subject of excessive teasing and sarcasm.	0.67			
Someone withholding information which affects your performance.	0.68			
Spreading of gossip and rumors about you.	0.72			
Loneliness		0.87	0.78	0.86
First, how often do you feel that you lack companionship?	0.77			
How often do you feel isolated from others?	0.98			
Work engagement		0.82	0.60	0.81
At my work, I feel bursting with energy.	0.75			
I am enthusiastic about my work.	0.90			
I am immersed in my work.	0.66			

CR = composite reliability; AVE = average variance explained; Alpha = Cronbach's alpha.

Therefore, the structural model could be tested with a validated measurement model.

Result of structural equation modeling

The theorized model (Figure 2) with the control variables applied was tested using SEM and maximum-likelihood extraction. All model fit indicators were above the recommended thresholds (CFI = 0.91, IFI = 0.91, RMSEA = 0.07, SRMR = 0.05); thus, the model fit of the structural model was considered "acceptable.." All the beta coefficients were significant and consistent with the hypothesized directions, they are presented in Table 4. Remote work was positively related to loneliness ($\beta = 0.18$, $p < 0.01$), supporting hypothesis 1. Remote work was positively related to work engagement ($\beta = 0.06$, $p < 0.05$), supporting hypothesis 2. Additionally, remote work was negatively related to bullying ($\beta = -0.14$, $p < 0.01$), supporting hypothesis 3. Moreover, bullying was positively related to loneliness ($\beta = 0.48$, $p < 0.01$) and negatively related to work engagement ($\beta = -0.25$, $p < 0.01$), supporting hypotheses 4 and 5. In total, the model explained 5% of the variance related to bullying, 25% of the variance related to loneliness, and 9% of the variance related to work engagement.

Regarding the control variables, age had three significant relations while gender had one. Age was positively related to remote work ($\beta = 0.08$, $p < 0.05$), negatively related to bullying ($\beta = -0.15$, $p < 0.01$), and positively related to work engagement ($\beta = 0.11$, $p < 0.01$). Gender was positively related to loneliness ($\beta = 0.06$, $p < 0.05$), indicating that men were lonelier than women.

Mediation by bullying

Bootstrapping was used to test for indirect effects. With the data resampled 5,000 times, two significant indirect effects were discovered, these are presented in Table 5. (H6a) remote work → bullying → loneliness (standardized indirect effect = −0.07, $p < 0.001$; 95% CI = −0.11, −0.04), and (H6b) remote work → bullying → work engagement (standardized indirect effect = 0.04, $p < 0.001$; 95% CI = 0.02, 0.06). Hence, the results support hypotheses 6a and 6b since bullying mediates remote work's influence on loneliness and work engagement.

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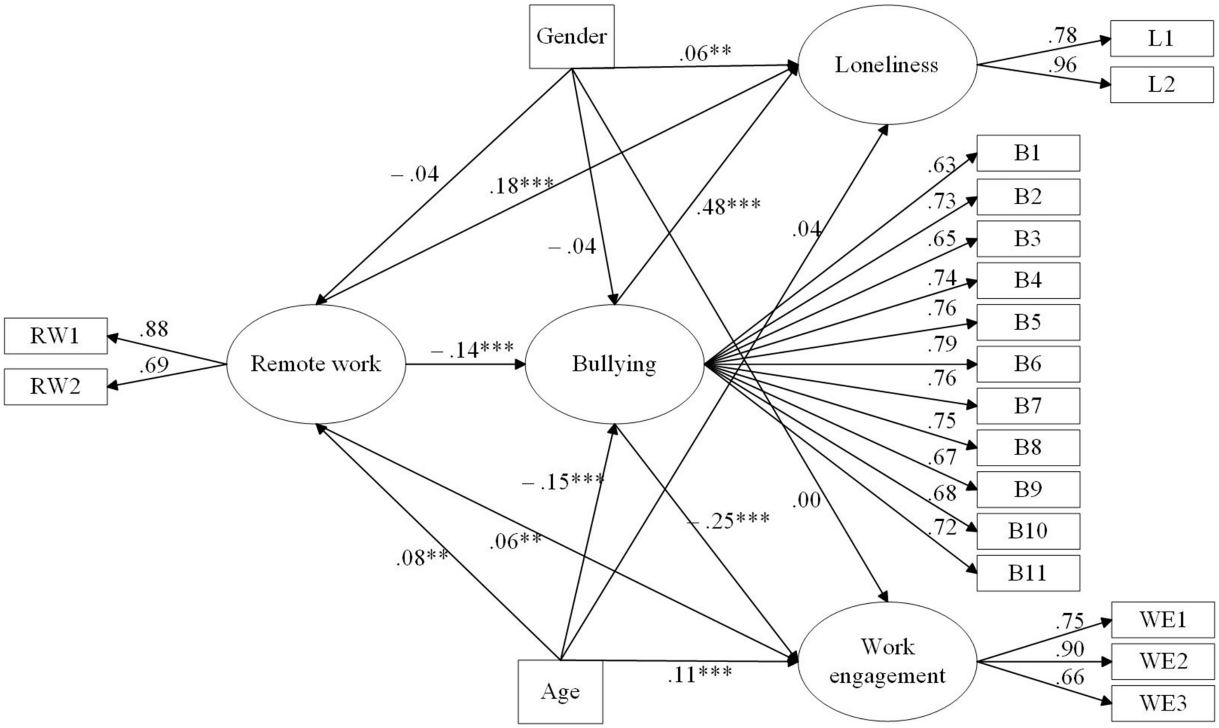

FIGURE 2
Result of structural equation modeling conducted on Norwegian workers with standardized path coefficients. Gender (0=Male, 1=Female); ** p<0.05, *** *p*<0.01.

TABLE 4 Standardized path coefficients (direct effects).

Hypotheses	Relationships	β	p
H1	Remote work→Loneliness	0.18	0.001
H2	Remote work→Work engagement	0.06	0.048
H3	Remote work→Bullying	−0.14	0.001
H4	Bullying→Loneliness	0.48	0.001
H5	Bullying→Work engagement	−0.25	0.001

TABLE 5 Specific indirect effects.

Hypotheses	Relationships	β	p
H6a	Remote work→Bullying→Loneliness	−0.07	0.001
H6b	Remote work→Bullying→Work engagement	0.04	0.001

Discussion

Research on remote work and social distancing has accelerated in the aftermath of COVID-19. However, this is the first study exploring the relationships between remote work, loneliness, work engagement, and bullying through a theoretical model that includes all factors simultaneously. The study was conducted almost two years into the COVID-19 pandemic with a large representative sample of Norwegian workers. Remote work seems to protect against bullying for workers in Norway. This finding is both interesting and important since bullying is associated with multiple unwanted outcomes (Bartlett and Bartlett, 2011; Nielsen and Einarsen, 2012; Branch et al., 2013). This study builds on previous research indicating the destructive mechanisms related to bullying work behaviors. The findings confirmed the hypotheses that bullying is negatively related to work engagement and positively related to loneliness. The findings indicate that bullying partially mediates remote work's influence on loneliness and engagement. Further, remote work is positively related to both loneliness and work engagement. Hence, these findings show that remote work leads to both negative and positive outcomes.

Remote work and loneliness

Our study provides evidence of a positive association between remote work, loneliness, and work engagement, supporting H1 and H2. These results are also supported by previous studies that highlight changes in social interactions with colleagues, exposure to social isolation, and employee engagement when working remotely (e.g., Hwang et al., 2020; Ozimek, 2020; Palumbo, 2020; Spurk and Straub, 2020; Buecker and Horstmann, 2022). The positive relation of remote work and loneliness may be explained by the increased difficulty in maintaining interpersonal relationships, which is an important element of counteracting

loneliness. Further, this positive association may be linked to the forced isolation in everyday life caused by governmental restrictions. According to Szkody et al. (2021), people living with family or friends during the pandemic could also experience heightened feelings of loneliness as a result of being cut off from other previously available resources. However, according to Heidinger and Richter (2020), people living alone reported higher levels of loneliness than those in multi-person households. Nevertheless, there was no significant difference in the perceived loneliness of those living alone before and during COVID-19. This suggests that loneliness during the pandemic could be related to isolation from life as we know it rather than simply being linked to the loss of interpersonal relationships.

Remote work and work engagement

Previous research suggests that people experiencing loneliness have lower levels of work engagement (Jung et al., 2021). Therefore, an interesting finding in our study is a dualism of remote work, which is positively related to loneliness and simultaneously, positively related to work engagement. Remote work offers more flexibility and autonomy, both of which have been shown to increase work-life balance and work engagement (Eek and Axmon, 2013; De Spiegelaere et al., 2016). Furthermore, the change in workplace removes work-related interruptions (e.g., questions from colleagues and informal discussions) and commuting time. Commuting can be stressful (Beňo, 2021), and extensive commuting has been shown to negatively affect mental health (Hilbrecht et al., 2014) and work engagement (Gerpott, 2021). In this sense, remote work can be both positively related to work engagement and negatively related to loneliness. However, Szkody et al. (2021) found that people with high levels of social support before the lockdown felt more lonely during isolation as they could no longer physically access their existing social networks. Further, levels of perceived loneliness were particularly high during the pandemic (Killgore et al., 2020). Hence, these previous studies somewhat support the findings of this study. These findings call for more research on perceived loneliness in cases of remote work. The dynamics and outcomes of remote work might change after the pandemic when employees return to their normal social lives and remote work is no longer compulsory. It will be much easier for remote workers to connect socially when the pandemic is over, at which point the negative relation of remote work to loneliness might diminish.

Remote work and bullying

Our study indicates that remote work functions as a protective mechanism against bullying, which is a very interesting finding that supports hypothesis H3. Bullying should be taken seriously as it is considered as one of the most detrimental stressors in working life (Björklund et al., 2019).

Remote work potentially involves fewer social interactions. Fewer social interactions might protect against or reduce bullying. This is supported by a study by Bacher-Hicks et al. (2022), who found a dramatic decrease in bullying during the pandemic due to fewer in-person interactions. Another study found that people who already experienced low social support benefitted from isolation (Foulkes and Blakemore, 2021; Szkody et al., 2021). In these cases, isolation can improve psychological health since it removes reminders of one's low level of social support (e.g., one no longer witnesses social lunches in the cafeteria, small talk in the hallway, etc.; Szkody et al., 2021). Scholars have also investigated the potential spillover effect where workplace bullying is transferred into cyberbullying (Stich, 2020; Ezerins and Ludwig, 2021). However, a study by Bacher-Hicks et al. (2022) found cyberbullying to decrease during the pandemic, proving that cyberbullying is strongly related to in-person bullying.

Building on this research, it can be argued that organizations can use remote work as a measure to address or reduce bullying. However, remote work must be considered carefully, as it does not solve the underlying issues of bullying and could potentially escalate relational problems if not handled properly (Keashly et al., 2011).

The mediating role of bullying

In line with other studies in the field (Ireland and Power, 2004; Rai and Agarwal, 2017; Einarsen et al., 2018; Bai, 2021), bullying was found to be positively related to loneliness and negatively related to work engagement, supporting H4 and H5. These results add to existing empirical research documenting the unwanted negative outcomes of bullying. These negative outcomes were also found in this study, conducted during the final stage of pandemic lockdown among Norwegian workers.

This study also investigated the mediating role of bullying. Interestingly, the results revealed that bullying partially mediates the influence of remote work on loneliness and work engagement, supporting H6a and H6b: bullying suppresses the positive influence of remote work on loneliness and strengthens the positive relationship between remote work and work engagement. This suggests that when victims of bullying, work remotely, they are more likely to experience lower levels of loneliness and be more engaged in their work, thus making social restrictions a welcome relief for bullied victims (Foulkes and Blakemore, 2021). Previous research indicating that in-person interactions are positively associated with bullying (Bacher-Hicks et al., 2022; McFayden et al., 2021) supports this finding. Although speculative, some of the effect may be explained by the perception of increased autonomy when working remotely (Bosua et al., 2017; Schall, 2019). Higher autonomy is positively related to work engagement (Bošković, 2021; Galanti et al., 2021) and negatively associated

with bullying (Bowling and Beehr, 2006; Balducci et al., 2011; Rousseau et al., 2014) and loneliness (Henning et al., 2021; Wang et al., 2021). This finding could suggest that when bullied victims work remotely, they experience fewer in-person interactions and higher autonomy, both of which are expected to have desired effects on work engagement, bullying, and loneliness.

Theoretical and practical implications

This study contributes to the literature on remote work by proposing a theoretical model including bullying, loneliness, and work engagement. Our findings offer valuable implications into the detrimental mechanisms related to in-person interactions for victims of workplace bullying. Furthermore, this study implicates that in-person interactions are major contributors to workplace bullying; thus, remote work and the associated perception of higher autonomy might prevent workplace bullying. Hence, implying that remote work could be considered when employees have high levels of sensitivity to the work environment, and managers could consider using this tool in periods with high levels of harassment or conflict. Based on the enormous increase in remote work during COVID-19 and the associated up- and downsides, it is important to interpret the findings in situations when the workforce returns to the workplace free of COVID-19 restrictions. Some organizations and employees may not want to return to the ways they operated before, as remote work's value has been recognized and accepted (Savić, 2020). Furthermore, many managerial tasks and HR strategies could potentially be redefined by the situation caused by the pandemic.

The results can be applied to design work arrangements with the individual—not solely the organization—in mind to present risk of bullying. Top management cannot simply implement remote work as a common standard, as individuals may need different arrangements (Gratton, 2021) due to personality differences (Bai, 2021). Therefore, work design may be a concern for local managers as they work more closely with employees. Remote work affects employees both positively and negatively. Thus, organizations should try to optimize the benefits and understand the trade-offs. As our findings indicate, during COVID-19, employees felt lonelier when working remotely. Organizations should therefore implement measures to prevent this increase in loneliness. One such measure could be "hybrid work," working from home one or two days per week. Hybrid work allows employees to maintain interpersonal relationships and regular contact with co-workers while reaping the benefits of remote work, ultimately decreasing loneliness while maintaining high levels of work engagement. However, it is important that the arrangements do not create unfairness between employees (Gratton, 2021). Moreover, this study recommends that organizations implement a remote work policy as a measure against bullying. The theoretical implications of this study indicate that bullied victims benefit the most from working remotely. By separating the bully from the target, exposure to negative acts is reduced and remote work may act as a temporary solution until the underlying issue is addressed. These theoretical implications should be further developed in forthcoming studies.

Limitations and future research

Our current study has many strengths: it was based on a representative sample of workers in Norway during the pandemic lockdown. However, some limitations must be acknowledged. The study uses a cross-sectional design, meaning that it is unable to determine the causation or direction of the effects. The pandemic brought extensive restrictions to society, interfering with our social, professional, and personal lives. This could make the participants more prone to other factors that potentially lead to loneliness. Furthermore, as the data are self-reported, the results may have been influenced due to common method variance. However, several measures such as CFA, AVE, and CR were applied to control the validity and objectivity of the study. Moreover, as our aim for this study was to investigate how remote work influences employees, self-reported appraisals are a great tool for identifying the perceptions and reactions of interest (Spector, 1994). The use of such a measure is therefore appropriate. However, a longitudinal study is likely needed to control the findings of the present study. Therefore, a before-and-after study on the impact of remote work over a period of time is an important avenue for further research. This study did not investigate the relation between loneliness and work engagement, further research should consider this relation.

Another important note is that the participants in this study were Norwegian employees during the pandemic. Thus, our findings should be interpreted with some limitations in mind regarding generalization. Similar studies at different locations could help generalize and supplement our findings. Moreover, prior relevant research studies are limited. This presents an issue for this study but also indicates the importance of expanding research to cover the gap in the existing literature.

Conclusion

In conclusion, this study explores the relationship between remote work, loneliness, work engagement, and bullying among Norwegian workers during COVID-19 restrictions. The results suggest that employees felt lonelier when working remotely but experienced increased engagement in work, illustrating that remote work affects both mental health and productivity. The results also suggest that remote work reduced bullying and played a mediating role in the associations between remote work, loneliness, and work engagement. Remote work does not affect all employee's equally, bullied victims were found to benefit most from working remotely, indicating a protective function against bullying. Hence, this study

finds that remote work is related to both positive and negative mechanisms at work. Since remote work is positively related to both loneliness and work engagement, this study illustrates a distinct advantage of remote work, but its associated issue of loneliness cannot be overlooked. Therefore, it is suggested that organizations should consider more moderate levels of remote work in the aftermath of COVID-19. This study contributes to the established literature of remote work, extending our knowledge of remote work's long-term impact on employees. Future research may examine differences in the effect of remote work during COVID-19 and after.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

VB: introduction, article drafting, literature review, implication, limitation, and discussion. J-SA: method, analysis, result, literature review, implication, and conclusion. EO: data collection, supervision, study design, revised manuscript, and assessment support. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The health-performance framework of presenteeism: A proof-of-concept study

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There is emerging research that considers presenteeism as a neutral behavior that has both positive and negative predictors and outcomes for individuals and organizations. This neutral perspective diverges from the traditional negative view of presenteeism and is aligned with the Health-Performance Framework of Presenteeism (HFPF) in which presenteeism is considered to be an adaptive behavior that aims to balance health limitations and performance demands. This proof-of-concept study aims to investigate the existence of different profiles of presentees based on their common health problems (mental and physical) and performance, and differences in attendance and job stressors among these subgroups. Latent profile analysis with 159 clerical employees and managers from the UK private sector supported the HPFP and revealed four profiles: those reporting a good health and high performance were labeled *functional presentees* (who represented 19% of the sample), those with poor health and low performance were the *dysfunctional presentees* (14%), those with relatively high performance but poor health were labeled *overachieving presentees* (22%), and those with average scores on both dimensions were the *average Joe/Jane presentees* (45%; a new profile based on this sample). There was no profile in the present sample that corresponded to *therapeutic presenteeism*, characterized by low performance but relatively good health. Although *average Joe/Jane presentees* were comparable to *functional presentees* in exposure to most job stressors, they reported poorer pay and benefits, and more health problems than the latter. *Average Joe/Jane presentees* reported the lowest number of days of presenteeism. No difference was found in absenteeism across profiles, highlighting difficulties in measuring presenteeism using a count-measure, since three profiles presented a similar number of days of presenteeism yet contrasted health-performance configurations. *Dysfunctional presentees* were systematically more exposed to job stressors compared to *functional presentees*. The results support the HPFP proposition for different subgroups of presentees who are influenced by their work environment. The study takes a person-centered approach,

disentangle presenteeism from the total count of presenteeism days, offering implications for management and intervention practice. Presenteeism can have a bright side and be functional in certain contexts when the appropriate resources are available.

KEYWORDS

presenteeism, health-performance framework, health, productivity, job stressors

Introduction

Presenteeism is defined as the behavior of working while ill (Ruhle et al., 2019). This behavior is adaptive and "serves the purpose of balancing health constraints and performance demands, especially in the case of non-contagious health problems" (Karanika-Murray and Biron, 2020, p. 244). It is a global phenomenon documented in many countries with prevalence reported to range from 30 to over 90% in different studies (Karanika-Murray and Cooper, 2018; Lohaus and Röser, 2019). In the UK, Kinman (2019) reports that 50–70% of workers attend work while ill at least 1 day per year. Because of these rates, research interest in this topic is increasing fast. For example, a Google Scholar search with the word "presenteeism" yielded 4,460 hits between 1996 (when the term was first coined by Cary Cooper) and 2010. The same search yielded 19,500 hits between 2010 and 2022. Despite its prevalence and the high costs for individuals and organizations, to date our theorizing is disproportionately weak, rendering our understanding of presentees' experiences and how presenteeism should be managed weak.

Findings from longitudinal studies concur with those of cross-sectional research on the negative effects of showing up at work while ill on individuals' mental health (Demerouti et al., 2009), physical health (Kivimäki et al., 2005; Bergström et al., 2009; Skagen and Collins, 2016), and productivity (Zhou et al., 2016). There are two issues with this line of research. First, there are inconsistencies in these findings. For example, Collins et al. (2018) found no effect of presenteeism on well-being and performance over time, which may suggest that not all presentees experience presenteeism in the same way. The popular variable-based perspective, which looks at the antecedents of presenteeism and related outcomes, implies that all presentees experience or enact the behavior in the same way or indeed that they form a homogeneous group. Furthermore, there has been an emphasis on the negative aspects of presenteeism, or what Cooper et al. (2015) called the bad presenteeism phenomenon, thus overlooking its potential positive side. Calls for a more neutral and functional definition of presenteeism (Ruhle et al., 2019; Karanika-Murray and Biron, 2020) have led to more insightful research investigating positive motives (Knani et al., 2021; Lohaus et al., 2021) and potential benefits (Wang et al., 2022) of presenteeism. For example, evidence of positive effects for working while ill comes from Lohaus et al. (2022, 2021) who identified several categories of factors, including social norms (e.g., being liked, maintain career prospects, being loyal), financial considerations, showing endurance, and getting work done. Similarly, in a qualitative study with small enterprises, Knani et al. (2021) revealed several motives explaining why workers and managers came to work despite illness. Positive motives related mainly to personal values, avoiding isolation while being ill, feelings of accomplishment and commitment, a convivial work environment, and the possibility for work adjustments. The person-centered and positive approach is aligned with the Health-Performance Framework of Presenteeism (HPFP) developed by Karanika-Murray and Biron (2020), which has yet to be empirically tested.

The present study aims to identify profiles of presenteeism and examine differences among them. It is a proof-of-concept study that is focused on the presenteeism typology proposed in the HFPF but also expands on that to examine profile differences in attendance behavior and job stressors associated with each. As such, we hope that taking a functional approach and focusing on understanding groups among presentees will address some of the debates in the field, specifically relating to the assumptions that presenteeism is a negative phenomenon and that it is experienced in the same way by all presentees. Understanding profiles and group differences in presenteeism can support better management and targeted interventions to promote employee health and performance at work.

Key debate: Is presenteeism inherently negative?

A key debate in the field relates to the overwhelmingly negative view of presenteeism. Ruhle et al. (2019) suggested that presenteeism should be viewed as a neutral behavior and that positive or negative antecedents or consequences should not be

ascribed to it. They report on debates about the definition of presenteeism, which has tended to oscillate between two main schools of thought. First, mainly in European and Scandinavian studies, presenteeism has been defined either as the "act" of *showing* up at work with a health impairment (e.g., Aronsson and Gustafsson, 2005; Taloyan et al., 2012; Marklund et al., 2015). The COVID-19 pandemic has brought several workers into telework and recent studies show that working at home despite illness [recently labeled as "workahomism" by Brosi and Gerpott (2022)] is as prevalent and perhaps even more than when workers work physically on site (Steidelmüller et al., 2020; Biron et al., 2021). This shift calls for a definition that does not necessitate physical presence at work. Second, mainly in North American studies, presenteeism is often referred to in terms of productivity losses associated with various health impairments (e.g., Stewart et al., 2003; Goetzel et al., 2004). In this line of research, presenteeism is not measured directly but is instead inferred from participants indicating how much a health impairment has affected certain aspect of their performance or productivity at work (Johns, 2011). This view, and its related measures, can be problematic as it conflates the behavior of presenteeism with its consequences and has negative connotations. However, Ruhle et al. (2019) point out that: "Research on presenteeism should refrain from evaluating and labeling the behavior as positive or negative. Further, the definition should not imply any motives or consequences (such as productivity loss or future health impairments)" (p. 3). They therefore suggest that the definition of presenteeism as the *act* of working in a state of ill-health is more accurate. This is measured by asking presentees to indicate how many times or how many days they worked while ill over a period, usually between 3 and 12 months. Yet, although straightforward and therefore popular, count measures do not allow to differentiate among possible subgroups of presentees who have different health and performance configurations and experience presenteeism differently.

Key debate: Are presentees a homogeneous group?

A related key debate in the field is about how presentees themselves are described and therefore how well their experiences are understood. Performance and productivity losses are often considered to be outcomes of the decision to work while ill ("I am working even though I should not and therefore not being very productive"), whereas health problems, individual's values, pressures in the work environment, and organizational factors tend to be viewed as antecedents ("I am ill and yet I choose to work because of such and such motives"). This is in line with Lohaus and Habermann (2019) framework that highlights several person-specific (e.g., attitudes, values, health situation), work or job-related (e.g., ease of replacement, supervisor support, job demands/workload, adjustment latitude), and organizational-level variables (e.g., reward system, paid sick leave, job security). These variables can in turn be shaped by the broader context (e.g., economy, culture). They influence the individual's decision to be absent or present, leading to several individual (e.g., health deterioration, productivity loss, exhaustion) and work/organizational consequences (e.g., higher accident rates, productivity loss). Variable-based models are comprehensive and is useful for disentangling antecedents from outcomes (variance models, which focus on explaining the maximum variance in the target variable) or understanding the chain of effects to and from a target variable (process models, which focus on what variable affects what other variable and in what order). However, variable-based models do not consider the possibility of subgroups of workers who may be affected in different ways and who may have different experiences. A suitable alternative is the person-centered approach that allows to identify subgroups of individuals who represent different configurations of several variables, including antecedents and outcomes. Person-centered research can allow us to investigate what variables predict belonging to a certain subgroup and therefore bring more clarity on the types of interventions and resources that should be deployed to foster more functional presenteeism.

The current study is offered a as way to help disentangle some of the debates in presenteeism research. Next, we summarise the proposal Karanika-Murray and Biron (2020) proposal to consider presenteeism as a function of health and performance, before developing the argument for three propositions that will be tested empirically.

Presenteeism as a function of health and performance

In line with a more person-centered and functional approach to presenteeism, Karanika-Murray and Biron (2020) proposed the following definition: "presenteeism as goal-directed and purposeful attendance behavior aimed at facilitating adaptation to work in the face of compromised health" (p. 245). Their Health-Performance Framework of Presenteeism aims to unite the two schools of thought (namely, the health focus and the performance focus) and has three elements: a definition of presenteeism as an adaptive behavior, an understanding of that behavior in terms of health and performance where functional presenteeism represents a balance between the two for the individual presentee, and an ensuing 2 × 2 taxonomy of presentees that describes their health and performance experiences (see **Figure 1**). Here, "health" refers to common health problems (e.g., musculoskeletal disorders, stress, depression, and anxiety). We start with common health problems to understand the principles, as more severe health issues may have different adjustment demands.

Using insights from a range of related fields, Karanika-Murray and Biron (2020) emphasized that presenteeism has an adaptive function for workers who act with agency in the decision-making process (Whysall et al., 2023). Indeed, recently Lohaus et al. (2022) provided in-depth evidence that presentees make their decisions with intent and a consideration of trade-offs in the decision to work when experiencing illness. The potential for adaptation means that in order for presentees to be able to respond to both their performance requirements and the health impairments that they face, they manage their health and work resources, perhaps by either striving to protect their resources (e.g., their health, relationships at work, career development opportunities, consideration from their superior, etc.) or by obtaining new resources (see Conservation of Resources Theory, Hobfoll, 1989). Because of the variability in health conditions or impairments and performance requirements or tasks (as well as the potential combinations of these), the process of adaptation could therefore serve different purposes for different individuals. As a result, the combination of high and low health and performance requirements raises four presenteeism profiles: Functional (high performance, good health), Dysfunctional (low performance, poor health), Overachieving (high performance, poor health), and Therapeutic (low performance, good health). By adopting a functional approach and aiming to understand how health impairments and performance requirements together define the presentee's experience, the HPFP differentiates among subgroups of presentees with different health and performance configurations.

Given the potential variability in health and performance status of workers who engage in presenteeism, it is important, for both theoretical and practical reasons, to understand the experiences of different groups of presentees. This study expands on the HPFP typology to examine the differences in attendance behavior among the four presentee profiles and the job characteristics associated with each. This knowledge supports managers and practitioners in developing more targeted and effective interventions to support both employee health and work performance.

Performance is not uniformly affected during presenteeism and not all health conditions are equally debilitating

The argument for differential presentee profiles is supported by research that shows variability in health conditions and their impact as well as variability in performance outcomes. This makes us question whether the experience will be same for individuals with different health conditions. First, performance and productivity loss can be a potential consequence of attending work while ill, but not universally. For example, Miraglia and Johns (2016) meta-analysis showed that presenteeism is positively related to productivity losses, but not with global performance. Note that although the two terms are sometimes used interchangeably, productivity loss generally has a within-person referent, whereas performance refers to between-person differences and is used to refer to compare to other workers doing the same type of work (Miraglia and Johns, 2016). Second, different types of health ailments have been shown to have different effects on productivity (Burton et al., 1999; Goetzel et al., 2003; Lerner et al., 2004; Schultz, 2007). Health impairments can include acute (e.g., the flu), chronic (e.g., musculoskeletal problems), and episodic (e.g., allergies, migraine) physical or mental problems, as well as behaviors that are damaging to health (e.g., smoking) (Burton et al., 2004). Each type of impairment will incur a different loss of resource on the individual and their capacity to carry out their work. Similarly, variations have been reported in how different health issues are linked to performance. Whysall et al. (2018) used a cross-sectional design with 316 workers in a utility company, found that the most frequent health problems associated with presenteeism were not the same as the ones perceived to impact performance. For example, although colds and the flu were reported by the largest proportion of employees (84%), presenteeism on these days affected performance on a limited number of days (4.3 over a year), whereas hand and wrist pain only affected a small proportion of workers (6%) but impacted performance on a substantial number of days (81.6 over a year). Common health problems (stress, anxiety, and depression) were reported as the third cause for presenteeism (by 21% of their sample) and affected performance on a moderate number of days (30 over a year).

Several individual, job, and work-related factors may help to explain these differences, as studies on productivity loss during illness have highlighted. For example, Johns (2011) found that productivity loss during illness was lower for those with higher job security, for conscientious workers, and for those who could more easily be replaced at work when ill, whereas those with more pronounced neuroticism and higher family-to-work conflict reported greater productivity loss. These effects may have a temporal dimension. Specifically, Lu et al. (2013) failed to detect a long-term impact of presenteeism on performance at 2 months, although the data supported a link between presenteeism and health (physical and mental), exhaustion, and job satisfaction. Lu et al. (2013) suggested that resources (personal and social; work and non-work) act as moderators of the association between presenteeism and performance. Similarly, Wang et al. (2022) found that presenteeism had positive effect on performance evaluation 8 months later, but only when workload was high.

Overall, this evidence suggests that the variations in health conditions and performance requirements render presenteeism experiences different for different individuals. Thus, there are different configurations of health and performance that create different presentee profiles, as the HPFP suggests. A first step to

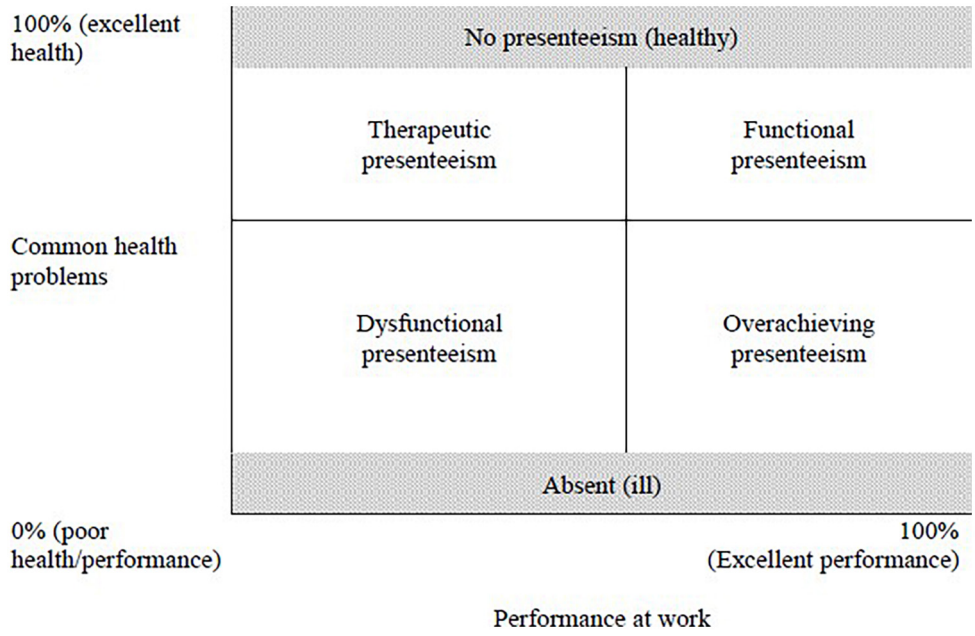

FIGURE 1
Typology of presenteeism as a function of health and performance. Reproduced from Karanika-Murray and Biron (2020), with permission from SAGE Publications.

understanding these profiles would be a proof-of-concept study to map them. Our first proposition is as follows.

Proposition 1: There are different subgroups (or profiles) among sickness presentees based on their perceived health status and performance level.

Different presentee profiles will show different attendance patterns

As the health-performance balance will differ for each presentee, these may also affect their attendance patters and choices between attending work or taking sickness absence. Thus, variations in attendance patterns can also be expected. Several studies have shown that the severity and nature of the health impairment has an impact on both the frequency and duration of attendance behavior. For example, in their meta-analysis, Miraglia and Johns (2016) used estimated population correlations to show that presenteeism and general health status were negative correlated but also that presenteeism and depression were positively correlated. This suggests that mental health problems are perhaps not considered as a legitimate cause of absenteeism among some workers. Also, workers with a depression might be unaware or in denial of their situation, and denial in cases of depression is a well-documented area (Ketterer et al., 1996). As previously suggested by Gosselin et al. (2013), the severity, chronicity, and the type of health ailments are likely to be more or less debilitating for different individuals, and therefore likely to impact on the decision to be either absent or present. Ruhle et al. (2019) suggest viewing health as a non-dichotomous state with an individual perceiving no symptoms of illness, on the one side of the continuum, and severe health impairment or multiple ones concurrently, on the other.

The current research does not allow us to conclude whether presenteeism or absenteeism will be a choice or what patterns of attendance each type of presenteeism will be associated with. A systematic review by Skagen and Collins (2016) suggests that working through illness is associated with poorer self-reported health and increased absenteeism in the future, potentially through depletion of resources. In their study with nurses, Dew et al. (2005) found that they described their work team as "family" and their workplace as a "sanctuary," which led them to engage in presenteeism behavior. This aligns with the qualitative research by Knani et al. (2021) in small enterprises who describes the concomitant presence of positive and negative (pressure-inducing) factors explaining presenteeism, but also some of their consequences. However, the relevant scarcity of research on the potential positive side and benefits presenteeism does now allow us to conclude whether it leads to negative outputs for all workers in the short vs. the long term, nor the reciprocal relationships between their health impairment, their performance, and the availability and usefulness of individual/work/organizational resources—and, importantly, how these lead to different attendance patterns. Yet, we can confidently expect that the combination of health limitation and performance demands will lead to different

attendance choices, which is important to ascertain as the first step. This leads to our second proposition as follows.

Proposition 2: Different subgroups of presentees, identified based on their common health problems and level of performance, show different attendance patterns at work.

A better look and decision at how presenteeism is and should be measured is important, in view of the fact that current research does not provide a clear picture of its impact. We suggest that count measures of presenteeism (i.e., number of days) can be used to select participants who declare presenteeism, before we then look more closely at variations of health and performance and/or other factors that influence presenteeism. As previously mentioned, most research on presenteeism to-date has adopted a variable-based approach, that focuses on identifying the variables associated with presenteeism as antecedents, moderators, mediators, or outcomes of presenteeism. This variable-based approach in presenteeism research is based on analytical approaches such as linear regression or structural equation modeling to examine the relationship between presenteeism and its correlates. While these statistical models have been appropriate for the research questions addressed, they usually assume that presentees are a homogeneous group, which we are refuting. Therefore, if presentees are not a homogeneous group, how can count measures of presenteeism days be best used for understanding presentees' experiences? The starting point is that there are heterogeneous groups of presentees since their performance and health are unlikely to be all affected in the same way by their work environment. In line with this, Ferreira et al. (2021) showed that blood markers (glycemia and CRP) affect productivity during presenteeism, thus supporting the idea that there are resources moderating the effect of presenteeism on performance or productivity. The association between presenteeism and its consequences (positive or negative) on performance and health (physical and mental) is still an area that is still largely unexplored and poorly understood. In two Taiwanese studies, no long-term effect of presenteeism on productivity and job performance (Lin et al., 2013; Zhou et al., 2016). Another study showed that presenteeism had a positive effect on innovative performance 6 months later when supervisor and colleagues support were high, but no effect on employee exhaustion (Chen et al., 2021). This points to the necessity to consider the subgroups of presentees beyond and above a count measure of the number of days of presenteeism. Indeed, two workers with the same health problem could report different number of days of presenteeism and show different levels of performance depending on the availability and relevance of different types of demands and resources. Despite being widely used, count measures of presenteeism alone may not capture variations in health and performance nor the conditions under which presenteeism could be functional. Yet, we can use count measures of presenteeism (and absenteeism) as a starting point for identifying broader groups of presentees.

Different presentee profiles may experience different patterns of job characteristics

Presenteeism has been associated with a range of job characteristics, which in this case may act as stressors for presenteeism behavior, but it is unclear what job characteristics or stressors each type of presenteeism is linked to. According to Conservation of Resources theory (Hobfoll, 1989), behavior depends on workers' resources as people strive to recover from resource loss, protect existing ones, or gain new resources. When facing stressors such as high job demands and poor working conditions, workers will capitalize on other resources available to avoid further resource loss or protect existing resources. Several studies have shown that presenteeism can be predicted by job insecurity (Heponiemi et al., 2010; Reuter et al., 2019), poor peer support (Gosselin et al., 2013) and managerial support (Mazzetti et al., 2019) work overload or job demands (Aronsson and Gustafsson, 2005; Biron et al., 2006; Miraglia and Johns, 2016), and work-family conflict (Johns, 2011; Arslaner and Boylu, 2017; McGregor et al., 2018). In their meta-analysis, Miraglia and Johns (2016) showed that job demands such as a high workload, negative relational experiences at work, and experienced stress at work were linked to higher presenteeism behavior. Some job characteristics or stressors have been found to have positive and negative associations with presenteeism. Aspects of job control such as decisional latitude, adjustment latitude, and skill discretion with presenteeism vary across studies and can possibly explain the weak correlation found by Miraglia and Johns (2016). Even social support is also sometimes positively associated with presenteeism, as workers do not want to let their colleagues down (Biron et al., 2006) or they decide to attend work as they find it therapeutic to be in a supportive family-like climate (Knani et al., 2021). Overall, job stressors have consistently been found to be related to mental (Duchaine et al., 2020) and physical health impairments (Gilbert-Ouimet et al., 2014) and increased presenteeism (Miraglia and Johns, 2016).

Therefore, to better understand the different presenteeism profiles, it is important to also understand how different job characteristics or stressors relate to different groups of presentees. For completeness, in addition to job characteristics we also explore whether the groups differ in sociodemographic characteristics (gender, age, and type of occupation), which is in line with previous studies showing certain work groups such as women and managers have higher presenteeism prevalence (Aronsson et al., 2000; Aronsson and Gustafsson, 2005). Our final proposition is therefore as follows.

Proposition 3: Different subgroups of presentees, identified based on their common health status and performance level, show different patterns in their exposure to job stressors.

Study aims

Following the three propositions developed on the basis of the literature, the first aim of this study is to test the HPFP typology (Karanika-Murray and Biron, 2020) by substantiating the existence of quantitatively distinct profiles of employees who are ill but present at work, based on their reported common health problems and levels of performance. The second aim of the study is to investigate patterns of presenteeism and absenteeism among these profiles. The third aim is to evaluate differences among presentee profiles in terms of job characteristics or stressors that are typically associated with work-related health problems, whilst also characterizing these groups in terms of their demographic characteristics. Despite the interest in the HPFP model in the literature, no one to date has attempted to test it empirically. Before going further in the development of specific interventions for each profile as suggested by Karanika-Murray et al. (2021), it is important to test whether the model holds up. This proof-of-concept provides an empirical demonstration of how the model can be tested and raises questions about how future research can continue to advance it.

Materials and methods

Participants and procedure

A total of 205 employees from a large company in the UK private sector were invited to complete an online questionnaire on occupational stress and well-being. All worked in one business unit that was divided into two operational departments. From those, 159 gave their informed consent and completed the questionnaire, indicating a response rate of 77.6%. Among these 159 participants, a total of 108 (67.9%) reported at least 1 day of presenteeism over the last 3 months. We excluded two participants from the analyses due to incoherent response pattern (multivariate outliers). The final sample consisted of 106 participants who worked while ill at least 1 day during the past 3 months.

A broad range of job roles was represented including managers and senior officials (23.1%), professionals and technicians (5.6%), administrative and clerical staff (41.7%), sales and customer service staff (19.4%) and 10.2% of workers in basic occupations that require a minimum level of school education. The sample included 58.3% women. A total of 27% had a least one child under 18, and 48.2% were single whereas 49% had a partner (2.8% were divorced or separated). The majority of participants (92.6%) were in full-time employment. In terms of age distribution, 12% were under 21 years old, 59.3% were aged 21–30, 13.9% were 31–40, 7.4% were 41–50, and 6.5% were 51–60 years old, with just 1% of the sample aged above 60.

Measures

Common health problems

Consistent with the HFPF (Kendall et al., 2016; Karanika-Murray and Biron, 2020), common health problems were assessed as *mental health*, which was measured with 11 items (e.g., constant irritability, tiredness, anxiety, difficulty concentrating, Cronbach's $\alpha = 0.91$), and *psychosomatic symptoms*, which were measured with 8 items (e.g., lack of appetite, insomnia, indigestion, $\alpha = 0.79$) from the ASSET questionnaire (Cartwright and Cooper, 2002). Both scales considered the frequency of symptoms occurring over the past 3 months and were scored from 1 (never) to 4 (often). Normative data from the UK private sector was used to compare the sample in this study to the norms and to derive percentiles.

Performance

Consistent with the person-centered approach that allows using several combination of variables to evaluate the existence of subgroups of participants (Meyer and Morin, 2016), we measured three indicators of performance in combination. First, one item from the World Health Organization *Work Performance Questionnaire* (HPQ, Kessler et al., 2003) was used to measure subjective ratings of overall job performance over the past 28 days on a scale of 1 (worst) to 10 (top performance) (Kessler et al., 2003). Second, six items from the employee version of the HPQ were used to evaluate *quality of performance relative to other workers* ("How often was your performance lower than most workers on your job?") and *quality of performance* ("How often was the quality of your work lower than it should have been?") over the past 28 days (Cronbach's $\alpha = 0.73$). Third, *productivity* over the last 3 months was measured using an item from ASSET (Cartwright and Cooper, 2002): "Over the last 3 months, how productive have you felt in your job?" Participants responded on a 5-point percentage scale (1 = Less than 70% of the time; 5 = 100% productive). Second, in this study, although the term performance is used to concord with the terms used in the HPFP (Karanika-Murray and Biron, 2020), it includes both the within- (productivity) and between-person (relative performance) constructs. Note that all items of the performance indicators exclude health-related limitations. This is to differentiate health status from performance levels and is in line with our argument that presenteeism does not systematically and uniformly affect performance and productivity.

Absenteeism and presenteeism

Absenteeism was the number of days of absence from work during the last 3 months (i.e., "Over the last 3 months, how many working days have you been off work through illness or injury?"). Similarly, presenteeism was measured as the number of days the respondent came to work despite illness (i.e., "How many working days have you been coming to work even though you were ill or injured?"). Although many studies have used a 12-month period (Navarro et al., 2019), we reduced this to a 3-month interval to reduce recall bias. Several other studies have used a shorter recall period for the same reason (Knani et al., 2018; Ruhle et al., 2019). As suggested by Johns (2010), presenteeism and absenteeism were measured using an open ended fill-in-the-blank response format where respondents indicate the number of days they were absent or present, without suggesting categories to measure both absenteeism. This avoids a priming effect where categories of responses with specific range of days are presented to participants.

Job characteristics were measured using 37 items from ASSET (Cartwright and Cooper, 2002) including *work-life conflict* (e.g., "My work interferes with my home and personal life," Cronbach's $\alpha = 0.71$), *low job control* (e.g., "I have little control over many aspects of my job," $\alpha = 0.82$), *poor work relationships* (e.g., "My relationships with colleagues are poor," $\alpha = 0.85$), *job insecurity* (e.g., "My job skills may become redundant in the near future," $\alpha = 0.68$) *unfair pay and benefits* (i.e., "Not as good as other people doing similar work," one item), and *work overload* (e.g., "I set unrealistic deadlines," $\alpha = 0.80$). These items were scored from 1 (strongly disagree) to 6 (strongly agree).

Analytical approach

To investigate the existence of subgroups, this study uses a person-centered approach. In contrast to the variable-based approach traditionally used in presenteeism research, instead of looking at relationships between variables the person-centered approach aims to "identify subpopulations presenting differentiated configurations (profiles) with regard to a system of variables" (p. 584). An advantage of the person-centered approach is that can focus on a system of variables, used in combination instead of considering them in isolation (Meyer and Morin, 2016). In this study, this system of variables includes two performance indicators and productivity, and common health problems by including both the psychosomatic and mental health scales.

We used latent profile analysis (LPA) to identify distinct profiles of presenteeism among respondents depending on their common health problems health and self-rated work performance. LPA is a model-based iterative method that defines classes of participants based on their common characteristics. The number of profiles are determined using an sequential process where classes are added until various indices (Akaike Information Criteria—AIC, Bayesian Information Criteria—BIC, entropy, class proportion < 5%, Bootstrapped Likelihood Ratio Test—BLRT) indicated the best fit to observed data (Nylund et al., 2007). Since there are no objective cut-off scores for the fit statistics, the best model was selected according to the following criteria: lowest BIC (suggesting best parsimony), highest entropy (suggesting distinct non-overlapping profiles), and non-significant BLRT test (suggesting that no additional profile is needed to improve fit). Additionally, the conceptual meaning of the iteratively derived solutions was used to select the best profile structure (Foti et al., 2011).

Latent profile analysis was conducted using Mplus 7.0 (Muthen and Muthen, 2017) with continuous (normal) indicators. To complement the main analyses, one-way ANOVAs with REGW *post-hoc* comparisons and chi-squared, were used to compare the latent profiles on a series of indicators using SAS 9.4 (SAS Institute, 2014) and conventional alpha level of 5%.

To create a visual illustration of the presenteeism typology (**Figure 2**), indicators of common health problems and performance dimensions were (1) converted into percentiles, (2) averaged within each dimension, and (3) displayed in a X-Y dot plot. Performance percentiles were computed according to sample means while, for mental health, percentiles were computed according to normative data (UK private sector).

Results

Latent profile analyses

Solutions for latent profile models ranging from 1 to 5 profiles were investigated in the 106 participants (see **Table 1**). The lowest BIC (2233.97) supported a 3-profile solution while entropy was maximal for the 5-profile solution (0.86). Bootstrapped likelihood ratio test (BLRT) was still significant for the 4-profile solution, $\chi^2(df = 6) = 22.54$, $p = 0.000$, suggesting that additional profiles may be added. However, trivial profile comprising only 1 participant was observed for 5-profile solution and the BLRT test was no longer significant ($p = 0.06$). Hence, based on these observations and its interpretability, the 4-profile solution was retained.

Estimated standardized (%) means on each of the health and performance indicators according to the 4 profiles are displayed in **Figure 2**. The first profile comprised 19% of the sample ($n = 20$) and was termed *Functional presenteeism*. It refers to workers who report a higher-than-average performance and a better mental health (low scores on mental health and psychosomatic problems scales). The second profile comprised 14% of the sample ($n = 15$) and was termed *Dysfunctional presenteeism* because it comprised individuals with lower-than-average health and performance indicators. The third profile,

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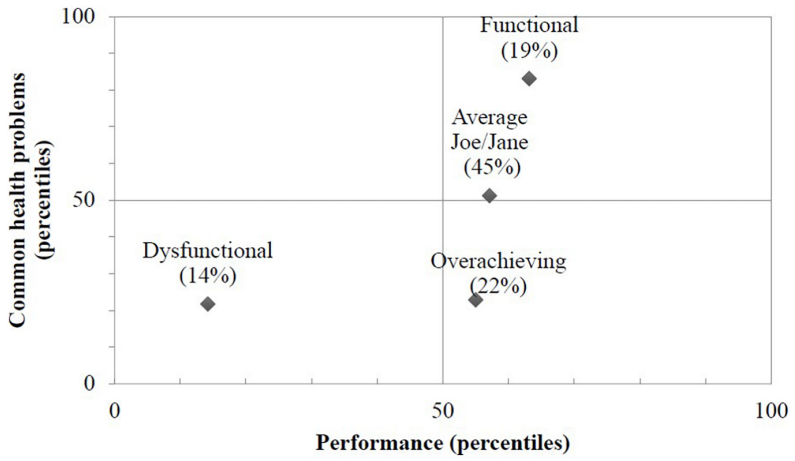

FIGURE 2
Four latent profiles of presenteeism according to performance level and common health problems.

TABLE 1 Fit indices for latent profiles analyses (N = 106).

Number of profiles	Parameters	LL	AIC	BIC	Entropy	BLRT
1	10	−1134.17	2288.34	2314.97	1	–
2	16	−1091.08	2214.17	2256.78	0.81	86.17***
3	22	−1065.69	2175.38	2233.97	0.82	50.79***
4	28	−1054.42	2164.83	2239.41	0.81	22.54***
5	34	−1044.84	2157.68	2248.24	0.86	19.15 (p = 0.06)

LL, log-likelihood; AIC, Akaike information criteria; BIC, Bayesian information criteria; BLRT, Bootstrap likelihood ratio test. ***$p < 0.001$.

TABLE 2 Estimated means (standard errors) for the common health problems and performance indicators for each of the four presenteeism profiles (N = 106).

	Presenteeism profiles			
Overall prevalence (n)	Functional (n = 20)	Dysfunctional (n = 15)	Average Joe/Jane (n = 48)	Overachieving (n = 23)
Productivity	4.3 (0.2)	1.5 (0.3)	3.2 (0.1)	3.0 (0.2)
Performance (quality)	4.1 (0.1)	3.2 (0.1)	4.2 (0.1)	4.3 (0.1)
Performance (overall)	8.1 (0.3)	5.5 (0.4)	8.3 (0.2)	8.2 (0.3)
Psychosomatic symptoms	13.9 (0.7)	32.1 (0.9)	20.8 (0.5)	31.1 (0.7)
Mental health	9.6 (0.6)	18.3 (0.7)	15.4 (0.4)	18.6 (0.6)

comprising 45% of the sample (n = 48), was labeled *Average Joe/Jane* and represented sickness presentees with and average health with average performance indicators. The last profile included 22% of the sample (n = 23) and comprised individuals with a substantially poorer health, but who manage to maintain somehow a relatively good (average) performance. Participants in this category were referred to as *Overachieving presentees* given that manage to maintain their performance level relatively high, but they do so at the expense of their own health.

The four presentee profiles based on the two dimensions (performance and health) are displayed in Figure 2. Functional, Overachieving, and Dysfunctional are in their expected positions in each quadrant, but Therapeutic was not where expected. This profile is supposedly characterized by poor performance and relatively good health, but no one corresponded to this combination. Instead, a group representing an average performance and average health was found.

Attendance patterns across presenteeism profiles

Profiles were first compared in terms of the average number of days of reported presenteeism and absenteeism over the

TABLE 3 Analysis of attendance, job stressors, attitudinal, and socio-demographic characteristics for the four profiles.

Means (standard error)	Functional (n = 20)	Dysfunctional (n = 15)	Average Joe/Jane (n = 48)	Overachieving (n = 23)	$F_{(3,102)}$
Attendance					
Presenteeism (#days)	15.20 $(3.89)_a$	16.40 $(4.84)_a$	8.10 $(1.37)_b$	14.39 $(3.44)_a$	2.60*
Presenteeism					
1–7 days	85% (17)	53% (8)	81% (39)	65% (15)	13.44*
8–30 days	0% (0)	27% (4)	15% (7)	22% (5)	
>30 days	15% (3)	20% (3)	4% (2)	13% (3)	
Absenteeism (#days)	2.20 (0.76)	2.73 (1.08)	3.30 (0.72)	2.48 (0.79)	0.40
Absenteeism					
0 day	50% (10)	40% (6)	23% (11)	44% (10)	6.05
1+ days	50% (10)	60% (9)	77% (37)	56% (13)	
Ratio hours worked to hours contracted	1.02 $(0.09)_b$	1.34 $(0.10)_a$	1.03 $(0.06)_b$	1.04 $(0.08)_b$	2.65*
Job stressors					
Work-life conflict	8.05 $(0.78)_b$	11.47 $(0.90)_a$	7.77 $(0.50)_b$	8.74 $(0.73)_b$	4.46**
Low job control	10.00 $(0.99)_b$	13.53 $(1.14)_a$	11.90 $(0.64)_{ab}$	13.57 $(0.92)_a$	2.90*
Poor work relationships (colleagues and superior)	16.60 $(1.43)_b$	25.73 $(1.65)_a$	18.23 $(0.92)_b$	20.09 $(1.34)_b$	6.79***
Job insecurity	9.15 $(0.65)_b$	12.33 $(0.75)_a$	10.35 $(0.42)_{ab}$	10.96 $(0.61)_{ab}$	3.63*
Unfair pay and benefits	2.75 $(0.39)_b$	4.20 $(0.45)_a$	4.15 $(0.25)_a$	3.87 $(0.36)_{ab}$	3.30*
Work overload	8.90 $(0.80)_b$	12.47 $(0.92)_a$	9.08 $(0.52)_b$	11.17 $(0.75)_{ab}$	4.87**
Socio-demographics[1] (%)					X^2 (df = 3)
Managers/Professional	20.0_a	46.67_b	14.58_a	34.78_{ab}	8.06*
Gender (% female)	45.00	46.67	62.50	69.57	3.84
Age (% >30)	20.00	20.00	27.08	43.48	3.83

[1]Categorical variables: % in each cell are indicated. Subscripts letters indicate differences among profiles. All perceived job stressors are scored so that higher means imply a higher exposure to each stressor. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

last 3 months using a generalized linear model for over-dispersed count data (negative-binomial distribution). Results suggest that Average Joe/Jane presentees reported a significantly lower number of days of presenteeism over the past 3 months (8.10 days) compared to presentees in the other three profiles (Functional = 15.20 days, Dysfunctional = 16.40 days, and Overachieving = 14.39 days), $F_{(3,102)} = 2.60$, $p < 0.05$. There was no significant difference in the number of days of absenteeism over the past 3 months across the four profiles (Functional = 2.20 days, Dysfunctional = 2.73 days, Average Joe/Jane = 3.30, and Overachieving = 2.48 days), $F_{(3,102)} = 0.40$, $p = 0.75$. Table 2 displays the average number of days of presenteeism and absenteeism for each of the profiles.

These comparisons were also performed using categories of presenteeism (1–7 vs. 8–30 vs. 30 days or over in the last 3 months) and absenteeism (0 vs. 1+ days in the last 3 months). Results showed a significant difference in the frequency of presenteeism across profiles, $\chi^2(df = 6) = 13.44$, $p = 0.04$. A higher proportion of Functional (85%) and Average Joe/Jane (81%) reported working ill between 1 and 7 days over the past 3 months, whereas these proportions are lower in the Dysfunctional (53%) and Overachieving (65%) profiles. No significant difference was found between profiles for absenteeism categories, $\chi^2(df = 3) = 6.05$, $p = 0.11$.

Job stressors and individual characteristics across presenteeism profiles

One-way ANOVAs were performed to compare job characteristics across presenteeism profiles (see Table 3 and Figure 3). Results revealed significant differences for most variables. Specifically, the Dysfunctional profile reported significantly higher exposure to stressors related to work-life conflict (M = 11.47 vs. 7.77–8.74), poor work relationships (M = 25.73 vs. 16.60–20.09), job insecurity (M = 12.33 vs. 9.15), and work overload (M = 12.47 vs. 8.90–9.08) (all p's < 0.05). Dysfunctional and Overachieving presentees both showed higher exposure to low job control compared to the other two profiles (M = 13.53 and 13.57 vs. 10.00). Finally, for unfair pay and benefits, Dysfunctional and Average Joe/Jane (M = 4.20 and 4.15 vs. 2.75) profiles exhibit higher scores compared to the Functional profile.

For demographics, there was a significantly higher proportion of managers and professionals in the Dysfunctional profile (46.67%) compared to Functional (20%) and Average Joe/Jane (14.58%). Gender and age group did not differ across profiles.

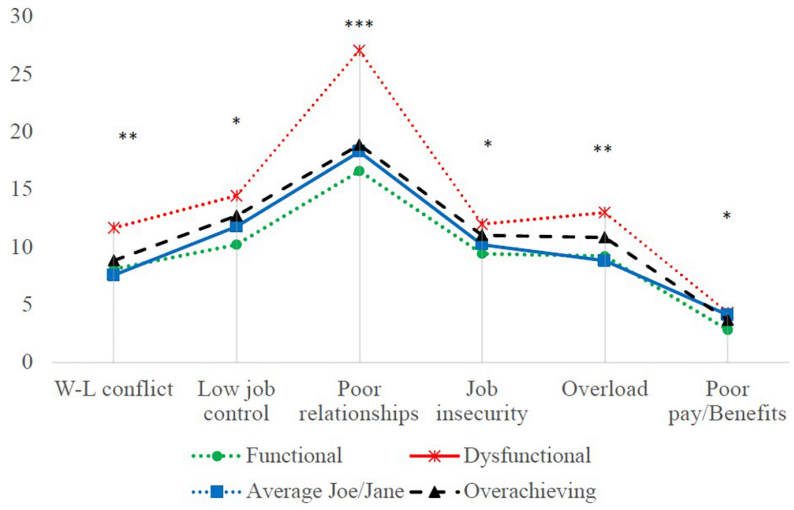

FIGURE 3
Differences in exposure to job stressors according to four latent profiles of presenteeism. *$p < 0.05$, **$p < 0.01$, ***$p < 0.0001$.

Discussion

This proof-of-concept study aimed to validate the quantitatively distinct profiles of presenteeism as a function of self-rated performance and common health problems. Proposition 1 was supported given that four distinct profiles of presenteeism were identified in this group of presentees, which is in line with the proposition by Karanika-Murray and Biron (2020) and the HPFP. Functional presentees reported fewer common health problems and higher performance than Dysfunctional presentees. Although Overachieving and Dysfunctional presentees reported comparable levels of common health problems, Overachieving presentees had higher self-rated performance levels than Dysfunctional presentees. Despite differences in the severity of their health ailments, the performance level of Overachieving, Average Joe/Jane and Functional presentees were similar. The fourth profile was labeled as Average Joe/Jane presenteeism, but as a separate category it represented nearly half of the sample (45%) with average health and performance levels. Although labeled as average, they are very similar to Functional presentees in terms of exposure to job stressors, with the exception that they reported experiencing more unfair pay and benefits and poorer health. This was reflected by their relative position in the quadrants (**Figure 2**) and their scores on psychosomatic symptoms and mental health (**Table 2**) which are lower compared to Functional presentees. The presence of the Average Joe/Jane profile with a rather large percentage of participants in it is possibly an artifact of the statistical technique. However, it is also reasonable to think that it reflects reality: It is unlikely that workers are distributed in four completely distinct and watertight quadrants, which would be tantamount to saying workers are only at the extremes of the health and productivity continuum and not at the center. It is more likely to think that for many, working with a minor health problem is a rather common occurrence and future research should investigate in what context and with what resources can help workers strike the right balance between performance demands and their health constraints. Alternatively, we could have defined the four quadrants *a priori* and classified participants in one of them based on their health-performance scores. This would imply that that the Average Joe/Jane profile would be left empty since it would not exist. The problem with this approach is that the demonstration of the existence of distinct presenteeism profiles would be created by the researchers and not driven by the data.

According to the original HPFP conceptualization, there should have been a Therapeutic profile which would include presentees who find refuge in work and who, despite a relatively good health, also show poor performance. Although we did not find any participants corresponding to Therapeutic presenteeism in this specific sample, future studies with a larger sample and also varying types of job roles should further investigate this type of presenteeism and the four configurations.

In line with Proposition 2 on differences in attendance behavior, we found that the average number of days of presenteeism was similar across Functional, Dysfunctional, and Overachieving profiles (14–16 days) whereas Average Joe/Jane presentees reported half (8 days) that number of days of presenteeism. This highlights a current problem in research when presenteeism is measured as a count, as in the number of days or times the person works through illness, without considering the severity of the health ailment or the way their performance is affected. Indeed, although Functional and Dysfunctional profiles are highly contrasted both in terms of common health problems and performance levels,

they report a comparable number of days of presenteeism. Demonstrating the existence of differences in attendance patterns among profiles of presentees is in line with Gerich's (2015) recommendation to disassociate the effects of the health component from the decision component in presenteeism research. When looking at presenteeism days as categories, higher proportions of Functional (85%) and Average Joe/Jane (81%) presentees came to work ill between 1 and 7 days, compared to Dysfunctional (53%) and Overachieving (65%). This is line with previous studies showing that presenteeism is closely related to the severity of the health ailment (Caverley et al., 2007). Surprisingly, however, we found no difference in absenteeism among the profiles, which is counterintuitive since poorer health issues would imply the need to take sick leave. This is certainly something to explore further, with a more detailed examination of health conditions and performance requirements and/or types of jobs and work environments.

As for proposition 3, several differences were found among profiles in terms of perceived job stressors. Dysfunctional presentees report systematically higher exposure to all stressors compared to other profiles, in particular Functional presentees. Surprisingly, few differences were found between Functional, Average Joe/Jane, and Overachievers (those three profiles that define the health dimension with relatively good performance), suggesting that job stressors did not discriminate among these three profiles despite the presentees' differences in terms of common health problems. Tentatively, this could be explained by the fact that the sample comprised only workers who declare themselves as presentees by reporting at least 1 day of presenteeism over the past 3 months. In the general population, these job stressors have been consistently shown to be predictive of common health problems (Duchaine et al., 2020). It is also likely that there are other moderators affecting the consequences of presenteeism. Lu and Cooper (2022) recently highlighted that there are moderators intervening in the presenteeism-outcome relationship. Their longitudinal study showed that over a 5-month period, long-working hours increased presenteeism, which in turn had a negative effect on performance but only for employees with low and intermediate intrinsic work value orientation, or in other words, those who value their job for its intrinsic factors such as feeling autonomous or competent, instead of for its extrinsic factors such as financial and social rewards. The association between presenteeism and performance was not significant for those with high intrinsic work orientation. As highlighted by Karanika-Murray and Biron (2020), presenteeism is a dynamic process that involves an interaction between individuals, their working environment, and the broader context, and that its consequences (positive and negative) can co-occur. Our results also reflect the study by Bergström et al. (2020) who showed that despite having negative effects on health in the long-term, working while ill in a resourceful environment can buffer its consequences.

Overall, this study highlights how subgroups of presentees, despite similar attendance patterns, can have very different exposure to stressors and access to resources to protect their health and their performance. This calls for broadening the scope of presenteeism to include more person-centered as well as more process-oriented studies to understand how presenteeism behavior unfolds overtime. The adaptive function of presenteeism is a choice that is made under tension for allocating resources/avoiding loss of resource at work under health constraints. This tension is exacerbated by a stressful work environment, which tends to deplete both health and performance resources. The resourceful work environment was more closely associated with the Functional presentee profile.

Finally, in terms of sociodemographic characteristics, the results showed that managers and professionals were more likely to be in the dysfunctional profile, namely maintaining a high level of performance at the expense of their health compared to other job categories. Previous studies have also found a higher prevalence of presenteeism and presenteeism propensity in managers and professionals compared to workers in other occupations (Kinman, 2019; Reuter et al., 2019). This is in line with the suggestion by Ruhle et al. (2019) to conduct more research on presenteeism in specific sectors and job types, given that there have been so far very few comparative studies. Our results suggest it would be particularly relevant to investigate presenteeism profiles across various occupations and sectors.

Contributions

At the theoretical level, this proof-of-concept study concurs with the HPFP (Karanika-Murray and Biron, 2020) to suggest that there can be a bright side to presenteeism, that of Functional presenteeism, and that heterogenous groups exist within presentees. The view of presenteeism as a strictly negative phenomenon obscures its positive adaptive potential for individuals. This bright sight appears to depend on the work context and the individual's resources to accommodate health and performance requirements in tandem. But it is important to extend this proof-of-concept study with other and larger groups in the working population. Importantly, this study can help us to move toward addressing the scarcity of research investigating interventions to better manage presenteeism in such a way as to preserve individuals' health and protect their performance. To better manage presenteeism, interventions ought to be tailored to the workers' needs. Our study suggests these needs might differ across profiles and that specific resources must be made available and used to manage presenteeism more efficiently.

These resources can vary but should be tailored according to the profile. Mori et al. (2022) conducted a study with 15,158 non-managerial workers from 7 companies that are actively engaged in health promotion activities in Japan. They used the quality and quantity (QQ) method to calculate a

presenteeism score based on the extent to which a health impairment is present or not and if affected their work. Based on health impairments that were perceived as affecting their work, participants then describe the quantity and quality of their work when they were experiencing the health problem compared with when they had no problems on a scale of 0 (unable to work) to 10 (normal). The presenteeism score is then computed by subtracting the quantity and quality impacts (ranging from 0 to 10) from 100. The superior quintile is defined as presenteeism. Their results show that (1) there is a relationship between presenteeism and perceived supervisor support for health (2) that even after adjusting for psychological distress and work engagement, this relationship is weakened but still significant. This suggest that beyond health impairments and performance demands, different types of resources come into play and influence presenteeism. It is important to note that their support for health item is in fact managerial support for both health and performance (i.e., "My supervisor supports employees to work vigorously and live a healthy life.") Although vigor at work is measured in engagement scales (Schaufeli et al., 2006), it is also embedded in performance measures. In their study (Mori et al., 2022), higher presenteeism was associated with lower supervisor support for health. This suggest that managerial support is perceived as a resource which reduces presenteeism *via* psychological states.

However, as Mori et al. (2022) rightly point out, there are other factors influencing presenteeism. Karanika-Murray and Biron (2020) suggest several types of individuals, group, managerial, and organizational resources that can affect presenteeism, and PSSH is one of them. Through encouraging employees to take care of their health, providing flexibility in managing work hours and the content/quantity of work, managers have an influence on health, and ultimately on productivity. By affecting these two dimensions, they can elicit different presenteeism profiles in their employees. In the same vein Ammendolia et al. (2016) conducted a study in a large Canadian finance company using a step mapping approach to design multi-pronged intervention program to reduce presenteeism. Since mental health was the most prominent health issue in the organization, it was the focus of their action plan. However, as the authors state, they found limited evidence from the scientific literature on effective interventions for reducing presenteeism. Their interventions were therefore based on the experiences and opinions of the participants. In this paper, we suggest that such programs could be tailored to meet the specific needs of presenteeism profiles. Interventions for dysfunctional presentees would have to prioritize the more severe health issues, whereas interventions for functional presentees would focus on resources to preserve health and performance or improve them so that presenteeism is no longer required (optimal health) (Karanika-Murray et al., 2021).

At the methodological level, this study highlights the appropriateness of a person-based approach, as it suggests that not all profiles are exposed to the same constraints. In addition, it concurs with previous researchers criticizing the conceptualization of presenteeism as productivity loss (e.g., Ruhle et al., 2019). The way productivity and performance are affected during illness is likely to vary depending on the health ailment, the work situation, or occupation, for example. Take for example a knowledge worker who is suffering from depression but is also in denial of that, who would work every day for 3 months. It is likely that this worker would not report a high number of days of working with illness but would probably be less productive than usual. However, if instead of depression, this knowledge worker suffered from a fractured leg, productivity loss would probably be lower, but the number of days of presenteeism would be high given the timeframe required to heal a fracture. It is likely that the relationship between health and performance is an idiosyncratic evaluation that only the presentee him/herself can make to decide if it is better to work or take leave, but colleagues, managers, and organizations can support more specifically and provide resources to support health and performance in tandem. This idiosyncratic evaluation is worth exploring further, as Lohaus and Habermann (2021) and Whysall et al. (2023) have sketched, by examining the decision-making process and trade-off considerations that presentees make.

The study also brings together two dimensions currently used to investigate presenteeism, namely health and performance, and disentangles them from the total amount of presenteeism days. Several studies have found that sickness presenteeism and absenteeism are correlated (Miraglia and Johns, 2016) and it has been argued that this reflects the severity of the health ailment. Considering that one of the problems of measuring presenteeism as a count measure (number of days or time) is that it simultaneously captures the tendency to choose presenteeism over absenteeism while ill, or presenteeism propensity (Gerich, 2016) along with the number of health problems, namely the person's vulnerability (Ruhle et al., 2019). Indeed, an individual declaring several days of presenteeism over a certain period is likely to be in a poorer health compared to an individual with a lower number of days. The HPFP allows to separate the health and performance factors from the count measure of presenteeism, thus disentangling the three phenomena.

Limitations

As this was a preliminary proof-of-concept study, there were some limitations. First, although adequate for the type of analyses, the sample was small and specific to one company in one country, and it is possible that a larger sample from the broader workforce will allow to detect different configurations. Perhaps a larger sample would reveal a profile that would be closer to what the HPFP defined as Therapeutic presenteeism,

and for which there is evidence in qualitative studies. This is the purpose of a proof-of-concept study, namely, to explore and test ideas in order to evaluate if the original proposition by Karanika-Murray and Biron (2020) stands with a small sample before investing more substantial resources in a major project. Another limitation is the study's cross-sectional design. The presenteeism literature is still weak on research using longitudinal designs with several time-points. A larger study is currently underway with a population-based sample and 4 waves of measurements collected during the COVID-19 pandemic. This will allow, among other things, to understand what fosters functional presenteeism, how the behavior unfolds as health and performance configurations change, and how to prevent dysfunctional presentees from further deterioration or from becoming absent.

Conclusion

Identifying the existence of subgroups of presentees and exploring differences between them can open important new avenues for research and interventions to promote both better health and performance concurrently through. As suggested by Karanika-Murray et al. (2021), once the decision to work ill is made, there must be an assessment of the worker's needs in terms of available resources and task adjustments. This assessment often involves the manager, who must be properly trained to support the worker in order to facilitate a return to more functional presenteeism, or even a return to more optimal health and performance. Organizational policies also need to be clear about what is legitimate and expected from workers when they experience health problems (Ruhle and Süß, 2020). Understanding the conditions in which presenteeism could be a functional and sustainable choice would be particularly useful, considering that work is good for health and well-being (Waddell and Burton, 2006). As Meyer and Morin (2016) highlight, person-centered approaches are complementary to traditional variable-based ones but have hardly been used in the field of presenteeism. Similar to studies of absenteeism showing different trajectories of sickness absence (Hallman et al., 2019), future research could consider trajectories of presenteeism and identify the mechanisms behind them.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of Lancaster University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

HI provided statistical support and conceptual guidance. All authors participated in the revision process and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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An impaired learning environment: Resident physicians' experience of the transition to pandemic care during the first wave of the COVID-19 pandemic in Sweden

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Introduction: Extensive studies regarding the COVID-19 pandemic have shown negative effects on physicians-in-training. Besides a high workload, their learning environment has been affected. A quality learning environment is vital for residents' physician's clinical development and also their health. Nevertheless, few studies have explored this. The aim of this study was to explore resident physicians' experiences of transition to pandemic care during the first wave of the COVID-19 pandemic in Sweden.

Method: In this qualitative study, 12 Swedish resident physicians were interviewed using a semi-structured interview guide. They were interviewed between June and October of 2020 and asked to reflect on the pandemic and, more specifically, the first wave. The empirical material was analysed using qualitative content analysis. The analysis resulted in one theme and four categories.

Results: The theme identified was *An impaired learning environment* which signifies the disruptions the resident physicians experienced during the first wave of the pandemic. The four categories, Professional role insecurity, High expectations but little influence, Stagnant clinical development, and Professional growth through experience, describe in what way the learning environment was impacted.

KEYWORDS

COVID-19, resident physician, learning environment, clinical work, experiences, Sweden

1. Background

The COVID-19 pandemic has globally had a high clinical impact. Many physicians experienced extreme workload (Eftekhar Ardebili et al., 2021), lack of support (Billings et al., 2021) and poor management (Mohammadi et al., 2021), which adversely affected physicians' mental health (De Sio et al., 2020; Leo et al., 2021; Hagqvist et al., 2022). In

Sweden, the negative health effect was more significant among physicians-in-training than senior physicians (Hagqvist et al., 2022). The COVID-19 pandemic did not only impact the work environment of resident physicians, i.e., physicians under supervised training to get a certificate of specialist expertise but severely affected the clinical learning environment for resident physicians (Dedeilia et al., 2020; Chen et al., 2021). Essential aspects of the learning environment include supervisory support, accessibility to supervisors, teamwork (e.g., peers, nurses, and other hospital personnel), mutually supportive and beneficial relationships with supervisors (Roff et al., 2005), a good work environment, and reasonable working hours (Ironside et al., 2019). However, a recent review shows that the most commonly reported effect of the pandemic on residents learning environment was decreased clinical experience and failure to meet the training requirements of the medical specialty (Chen et al., 2021). More inexperienced residents rated the supervision as poor and inadequate (Young et al., 2022). Practical elements of the specialist training, i.e., educational activities, were cancelled, and there has been a transition towards digital learning (Alam et al., 2021; Wådell et al., 2022). Time on hands-on-training in operating specialities was lost and cannot be compensated for (Wådell et al., 2022). Excessive work hours, heavy workloads, transfer to COVID-ward, and moral dilemmas have also been reported among residents (Chen et al., 2021; Farrell and Hayward, 2022; Wådell et al., 2022).

The learning environment for resident physicians is vital, not only for their professional development but for their health and well-being. The COVID-19 pandemic has significantly increased psychological distress and burnout among physicians (De Sio et al., 2020; Leo et al., 2021), not the least among resident physicians (Kaplan et al., 2021; Moini et al., 2021; Hagqvist et al., 2022). While a functioning and high-quality learning environment can play a pivotal role in preventing burnout among resident physicians (Ironside et al., 2019), it can be detrimental when quality is low (Dyrbye and Shanafelt, 2016; van Vendeloo et al., 2018; Lu et al., 2021). Factors in resident physicians'learning environment that can contribute to poor mental health have been shown to be a lack of collegial support, poor transparency, experiences of unfair decision-making by healthcare management (Mihailescu and Neiterman, 2019), high demands on education and clinical or professional development, lack of independence (Dyrbye and Shanafelt, 2016), and substandard supervision (Dyrbye et al., 2018). Moreover, when there is an imbalance between training and clinical responsibility, there is an increased risk of burnout (Lu et al., 2021). On the other hand, burnout and stress can, in turn, contribute to reduced motivation for education and clinical development (Dyrbye et al., 2018; Lu et al., 2021).

Resident physicians in Sweden are required to fulfil the learning objectives for each specialty as specified in the regulations on doctors' medical specialty training by the Swedish national board of health and welfare (SOSFS 2015:8). These required learning objectives include supervised clinical work corresponding to a minimum of 5 years of full-time work, specialist expertise courses, and external residency-terms. Thus, training, courses and supervision are central to becoming an independent attending physician with specialist competence. Statistics from the Swedish Medical Association show that as many as 69% of their member associations lag with courses and certification for resident physicians because of the pandemic (Hjelmqvist and Johansson, 2021). There is also an expressed concern among several specialist associations in Sweden that the specialist training for most resident physicians will need to be extended because of cancelled training and learning sessions (Pagels, 2021). Among OB-GYN residents in the south of Sweden, as many as 95% of the residents report an impact on their specialist training (Wådell et al., 2022).

Although the COVID-19 pandemic seemed to have had adverse effects on resident physicians' work and learning environment, few studies have explored their experiences of the environment in which they train and work. Among the studies that were found, most have focused on quantitative outcomes rather than the experiences of the residents (Chen et al., 2021). Knowledge regarding how physicians experienced the pandemic is vital to minimise the impact on resident physicians in future crises by giving them the opportunity to identify and address potential harmful effects (Asghari et al., 2020). This study aims to explore resident physicians' experiences of the transition to pandemic care during the first wave of the COVID-19 pandemic in Sweden.

2. Materials and methods

This study evolved while analysing in-depth interviews with Swedish physicians in various positions about their experiences of working during the first wave of the COVID-19 pandemic (Jacobsson et al., 2022; Nilsson et al., 2022). In the analysing process, a pattern emerged in the interview material from resident physicians, which is the focus of this paper. Thus, in this study, we seek to gain a broader understanding of how these resident physicians'in Sweden experienced the transition to pandemic care during the first wave of the COVID-19 pandemic.

2.1. Procedure

An advertisement was distributed on social media, in the journal of the Swedish Medical Association, and through the authors network. Resident physicians who were interested in participating were sent an invitation letter with information about the study.

A semi-structured interview guide was developed. The development of the interview guide was initiated in discussion between researchers and thereafter tested in five pilot interviews. After the pilots, the guide was fine-tuned before additional

interviews were carried out. The guide included discussion areas with supporting questions and probes. Examples of discussion areas in the guide were: experiences of working during the transition to pandemic care, support, work and private life, quality and safe care, leadership, and views about the future.

Interviews occurred between June and October 2020 after the first wave of the pandemic. The interviews with resident physicians were conducted by the first and the second author through online video communication tools or in a place of the interviewee's choice. The interviews took between 60 and 90 min. The interviews were recorded and transcribed verbatim by an external professional firm. Pauses and other verbal expressions were noted in the transcripts.

2.2. Participants

In total, 12 resident physicians agreed to be interviewed. The interviewees had completed an average of 3 years of their residency (1.5–4.5 years). The residents did their residency in medicine, infectious diseases, surgery, orthopaedics, obstetrics, anaesthesia, and family medicine. Six of the informants were women, and six were men. All participants had been working through the first wave of the pandemic.

2.3. Analysis

The empirical material was analysed using qualitative content analysis (Graneheim and Lundman, 2004; Graneheim et al., 2017). This method is appropriate for identifying empirically driven codes and categories. The qualitative content analysis moves from the manifest, close to the text descriptions and interpretations, to the latent content, more distant from the text but still close to the participant's reality (Graneheim et al., 2017). The second author led the analytical procedure with support from the first author.

Initially, the full transcripts were read to get a sense of context. A basic decision was to select the units of analyses. We selected following units; emotional support, organisation of work, and instructional support. Within the three units, codes were identified and interpreted, and those with related meanings and shared characteristics were sorted into sub-categories. Similarities and differences across units and sub-categories were discussed between all authors, and sub-categories were then merged into categories. Finally, one theme unifying the latent content of the four categories was formulated through reflection and discussion. The analytical process following Graneheim and Lundman (2004) is inductive, moving back and forth in the analytical steps. The research team had different professions. One was a resident physician, one a specialist nurse and associate professor in occupational medicine, and one a social scientist and professor in health sciences. This gave various perspectives in the analyses and a holistic understanding of the transition to pandemic care.

2.4. Ethics

The project was undertaken according to research ethics guidelines. The study was ethically reviewed and approved by the Ethics Review Authority (ref: 2020-02433). The material was immediately anonymised to identify data in the transcriptions of the interviews. All data were properly stored according to the Swedish Act on Ethical Review of Research Involving Humans [SFS 2003:460 (2005)].

3. Results

The analysis resulted in one theme, four categories and seven sub-categories (Table 1). The theme identified in the material was *An impaired learning environment* which signifies the disruptions the resident physicians experienced during the first wave of the pandemic. The interviewed residents expressed in the interviews concern over the risk that their diploma of specialised doctor would be delayed, which will have implications both for themselves as physicians and for healthcare.

> My training will be prolonged. That's the case for many other [residents]. It probably takes 6 months extra for me to become a specialist [receive a certificate of specialist expertise] because simply I cannot do my [required] training. […] But it will have implications on the healthcare services, there are delays for many resident physicians. [IP10].

The theme *An impaired learning environment* is signified by the categories Professional role insecurity, High expectations but little influence, Stagnant clinical development, and Professional growth through experience.

3.1. Professional role insecurity

The category *Professional role insecurity* concerns expressed uncertainty and worries as well as feelings of isolation during the initial phase of the COVID-19 pandemic by the interviewed

TABLE 1 Sub-categories, categories, and theme.

Sub-categories	Categories	Theme
Uncertainty and worry	Professional role insecurity	An impaired learning environment
Experience of isolation		
Feelings of exclusion	High expectations but little influence	
Expected to take on responsibility		
Missed training opportunities	Stagnant clinical development	
Peer support	Professional competence through experience	
Role expansion		

resident physicians. The absence of knowledge created a vacuum in which uncertainty and worries grew. The resident physicians felt invisible, citing that they were working alone with few that understood what was happening. They also felt that expectations and circumstances changed from day to day or hour to hour. The interviewees described that they experienced a lack of leadership, policy, and information from management regarding how to proceed. The interviewees described experiences of a lack of clear directives from management regarding what applied "right now" both with regard to patient care but also directives concerning protective measures. This mainly concerned the work with COVID patients and logistics such as where meetings were to be held and which information channels were applied. Unclear directives made daily clinical work more difficult.

> But then, what I would have liked, would probably have been … a little clearer decision-making, that it was not left to… to the colleague to try to figure out again and again, what to do and so on. [IP1].

The interviewees described the difficulties experienced in sorting through all the information and various directives that came about during the pandemic. Information could be communicated *via* various e-mails, websites, morning meetings, webinars, notes posted at the reception, etc. The quantity of information, the number of channels from which this information came, the unclear directives, and the lack of leadership meant that the resident physicians expressed a feeling of insecurity and frustration both in relation to the work and in relation to their training to become certified.

> On the other hand, it was a bit frustrating when things changed from day to day, and you did not really get the communicated message of what was going on effectively. [IP8].

In the void of clear directives and routines, the resident physicians experienced feeling isolated. There was a lack of reflective discussion on moral and ethical aspects nor practical medical decisions. The interviewees describe that they felt they could not influence the activities during the pandemic. They expressed that many decisions which affected them were made without being consulted. For example, the emergency room was renovated and adapted to COVID patient care. Still, despite the emergency room being staffed chiefly by resident physicians, therefore a source of experience and knowledge, their opinions about what they felt was important for the improvement of care were not requested.

> Yes, it was more or less like this that when you came in on a Monday, they were renovating, and no one knew what was going on or what was happening and how it would work and so on. And I think we probably had a lot, we as resident physicians who actually work there both day and night, probably had a lot of thoughts about what to do and how to control flows and so on and tried to think a little around that, and for a while, we were active and tried to access to the forums where decisions were made about this, but we received no response to [our inquires]. [IP8].

Feelings of isolation were also noted as one resident physician described the on-call consulting physicians were unexperienced with COVID patients, yet they had the role of support physicians to the resident physicians treating COVID patients.

3.2. High expectations but little influence

The category *High expectations and little influence* include the sub-categories Excluded and Expected to take on responsibility. The situation was somewhat contradicting or imbalanced. On the one hand, the resident physicians were excluded from important decisions, but on the other hand, these resident physicians were required to take on more responsibility than expected from a physician in training.

The resident physicians describe that they were excluded from the clinical work around patients. Medical decisions were made above their heads, and they had no way of influencing them. The interviewees felt ignored when making suggestions on patient treatments.

> I had an attending physician that did not think we should be bothered with testing and protective equipment. And when we had inpatients, there were two older patients that were here with stated COVID. I do not know if both of them had pneumonia. At least one of the patients had pneumonia and bad lungs since before. I wanted to try to give the patient antibiotics besides oxygen, maybe it would have worked, and she could have gotten better. But he [the attending] just said no, we do not do that. I think that was hard. [IP12].

Some expressed frustration as they felt pushed away from medical procedures. For instance, there were fewer surgeries, and the surgeries conducted were done by attending physicians rather than resident physicians.

The inability to influence or affect medical decisions was also made clear in the resident physicians' descriptions of how they were required to take increased responsibility for parts of the job that did not fall under their responsibility. They stated that there was an expectation to work longer shifts and extra on-call hours as well as make decisions that fell under the responsibility of the attending physician. As the principal care provider in the emergency room, the interviewees often had to answer questions about hospital management and take greater responsibility for the interns who worked there.

> [Then] I was a little worried, when we would have that meeting about what we were going to do, because it was just me as [the only] doctor there, and then it was my managers

> and the managers from the emergency room, but the one who was medically responsible for the emergency room or for infection was not there. And then it was like "[IPs name] how do you think we should do?" And it felt like this; it is completely unreasonable that you gather these [qualified] people and then ask me, as the resident physician. [IP2].

3.3. Stagnant professional development

The interviewees described that they felt that their education stagnated when most of the training sessions did not take place. During the first wave of the pandemic, the specialty expertise courses were cancelled. External residency-terms, i.e., when resident physicians work, for a specific duration of time, in other specialty units, were withdrawn for some of the resident physicians. For others, they attended one of their external residency-terms during the pandemic but found themselves without supervision.

The interviewees described that besides the cancellation of the mandatory courses and external residency-terms, other training sessions did not occur. For instance, they said that they had less supervision and did not meet enough patients. The resident physicians, specifically in the operating specialities, expressed great frustration over stagnant development as a result of cancelled operations, external residencies and a reduced patient flow.

> We have had much fewer elective surgeries, which has affected me quite a lot in my residency program, for what is to be operated on and who is to operate and so on, that a lot of such things have been cancelled, which has meant that we have had much fewer training opportunities. [IP1].

> Yes, yes, but for me it became very obvious as I was about to enter an external resident term myself just then when the pandemic came. So, then it was a decision on the part of the region not to send resident physician away, you could apply for a special exemption, but everything felt so insecure. [IP5].

These cancelled learning activities contributed to frustrations and worries that they might not get their certificate of specialist expertise.

3.4. Professional competence through experience

Despite significant changes in the work with an impact on their professional development, there are positive aspects of their experiences of working during the COVID-19 pandemic. We identified two sub-categories that contributed to the residents' growth as physicians: peer support and role expansion.

The support received from close colleagues is seen to have contributed to a positive environment and attitude to work, creating a sense of community.

> But I think it [the pandemic] has had a positive effect on the sense of community and that you support and help each other when needed. I think that shows that we are a bit understaffed but still a well-knit team. [IP6].

Although many experienced a lack of leadership during the pandemic, many also described their immediate superior as crucial for information sorting, reconciliation, and reflection. Those with this experience expressed how important the managerial role has been during the pandemic. The support from the manager and colleagues is described as something good and important.

> I think that both I and my other colleagues have been very pleased with the commitment of our boss and their drive to be quite early on things. [IP3].

The interviewees described a feeling of having been involved in something big, something they had not wanted to miss. They described that they experienced the work during the pandemic as something meaningful and that the pandemic was a training session.

> I have gained more experience… or more confidence in my clinical skills […] more moral and ethical sentiments in relation to the patients and relatives that I meet. More experience! [IP9].

4. Discussion

This study explored how 12 resident physicians in Sweden experienced The transition to pandemic care during the first wave of the COVID-19 pandemic in Sweden.

To the best of our knowledge, this is among the few articles exploring how physicians-in-training experienced the pandemic impacted them. The analysis of the empirical material resulted in the theme, *An impaired learning environment*. The theme describes that the pandemic had a negative impact on the learning environment for resident physicians. In addition to performing clinical work, resident physicians must also acquire specialist competence in parallel, which imply meeting respective learning objectives. To do that, a quality learning environment is essential (Roff et al., 2005). The four categories give an in-depth to how the resident physicians experienced that the learning environment was impaired. These were: Professional role insecurity, High expectations but little influence, Stagnant clinical development, and Professional growth through experience.

The first wave of the COVID-19 pandemic choked healthcare services, and for the physicians working there, it was an intense period (Billings et al., 2021; Mohammadi et al., 2021; Jacobsson et al., 2022; Nilsson et al., 2022). The first wave of the pandemic is, therefore, of importance to study. Overall, the interviewees experienced a lack of leadership and guidance in everyday clinical practice. There was plenty of information which sometimes changed by the hour. As shown in previous research (Billings et al., 2021; Hertelendy et al., 2021; Mohammadi et al., 2021; Jacobsson et al., 2022; Nilsson et al., 2022), there was a lack of preparedness, and the leadership had little or no information about anything. This situation brought feelings of uncertainty and worry to the resident physicians interviewed in this study. The interviewees also expressed that the situation they were in was somewhat lonesome, that they had no one to ask, and that they were alone in decisions. Good supervision and a good relationship with the supervisor are preventative factors in stressful events such as the COVID-19 pandemic (Dyrbye et al., 2010, 2018; Abdelsattar et al., 2021). Previous research also shows that an imbalance between education and clinical work poses a risk of ill health among resident physicians (Lu et al., 2021).

The results from this study showed that during the pandemic, high demands and expectations were placed on the resident physicians to navigate the huge flow of information and on advanced clinical performance. Meanwhile, as high demands were placed on the resident physicians' capacity, several experienced a lack of influence, and many decisions were made "over their heads." Shapiro (2021) describe this imbalance between high expectations on the one hand and lack of influence on the other as residents "having all the responsibility of being full-grown 'adult' doctors, while at other times needing to be protected and/or controlled, enjoying very few privileges of autonomous physicians." The pandemic has emphasised the dual role of resident physicians as both trainees and physicians (Shapiro, 2021). While increased responsibility can contribute to professional development, an inappropriate increase in responsibility can be detrimental to the resident physicians and lead to role confusion. In fact, previous research shows that inability to influence their work environment can contribute to fatigue among resident physicians (Mihailescu and Neiterman, 2019). High expectations of education and clinical development and lack of independence have also been shown to have a negative impact on resident physicians' mental health (Dyrbye and Shanafelt, 2016). Discrepancies and disparities in role perception between expectations, responsibility, and influence that affect residents negatively, particularly during crises, need to be a central aspect of any contingency plans.

The study shows that during the pandemic, many situations arose where essential pandemic care needed to be prioritised before educational elements. This stagnant clinical development has also been described in other studies (Dedeilia et al., 2020; Abdelsattar et al., 2021; Shapiro, 2021; Wådell et al., 2022). Although scheduled educational courses and teaching opportunities can be adjusted to online, hands-on training and surgery cannot (Wådell et al., 2022).

Despite an impaired learning environment, the resident physicians described that their experiences contributed to professional development. However, as Shapiro (2021) states, although resident physicians have developed the clinical skills necessary in crisis, there might still be developmental delays in their professional identity in their chosen specialty. Nevertheless, resident physicians are often those that receive patients at the emergency units. The resident physicians interviewed described being sent to the front line. As such, their knowledge and experience of the COVID-19 pandemic must be valued and in consideration for future pandemics.

The impaired learning environment now needs healing. The experiences of work and specialist training by resident physicians during the first wave of the COVID-19 pandemic can have a negative impact on their mental health (Dyrbye and Shanafelt, 2016; Dyrbye et al., 2018; Mihailescu and Neiterman, 2019; Lu et al., 2021). Previous studies show that a fractured learning environment is a risk factor for burnout (van Vendeloo et al., 2018; Lu et al., 2021). Meanwhile, a recent Swedish study showed that the prevalence of burnout among resident physicians was as high as 6.8%, which is higher than among attending and consulting physicians (Hagqvist et al., 2022). While poor learning environments can be detrimental to resident physicians' mental health, a quality learning environment can have the opposite effect (Ironside et al., 2019). It is evident that employers now must ensure a quality learning environment for resident physicians during a crisis (Abdelsattar et al., 2021; Wådell et al., 2022).

4.1. Methodological discussion

We analysed transcripts of interviews with 12 resident physicians. The data material analysed represent their experiences. The interviews were done during the first wave of the pandemic and the physicians might have been anxious in a way that affected their answers. The physician's were although very positive to participate in the study and conveyed that they were glad to share their experiences. We considered that we had a rich and saturated material (Fusch and Ness, 2015). Saturation was gained upon ceasing to result in new information related to the categories (Patton, 2002). To ensure thoroughness, the authors discussed the empirical material during the analytical process and cross-checked the data and interpretations (Cypress, 2017). Dependability was achieved through the found methodological experience among the authors and the authors' understanding of the healthcare context. The results should not be generalised, but it is likely that they can be relevant in other settings (Polit and Beck, 2004) where resident physicians have been working during the pandemic.

5. Conclusion

This study shows that resident physicians' learning environment was affected by the COVID-19 pandemic. As

healthcare must now transition from pandemic care to paying off the associated debt created by that care, clinics and regions should manage resources to prioritise the resident physicians' training and thereby ensure a good learning environment. Furthermore, contingency plans should include strategies for how to secure resident physicians learning environment, and to decrease the need for a prolonged education while saving lives. It is important the resident physicians are included and that they have access to supervision and support.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was approved by the Swedish Ethical Review Authority (2020-02433). The project was undertaken according to research ethics guidelines and written informed consent was obtained from all participants at the start of the interviews. The resident physicians were told that their participation was voluntary and that they could withdraw from the study at any time. All the participants gave oral and written consent.

Author contributions

EB designed the study and the project and conducted four interviews. KH conducted eight interviews and had the main responsibility of analysing the empirical material with support from EB. KH wrote the first draft of the manuscript and EB continued. BL gave critical comments during the analytical process and on the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Under pressure – The working situation of Swedish healthcare managers during the first wave of COVID-19

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Introduction: The aim of this study is to provide insight into the psychosocial work situation of hospital managers during the first wave of the COVID-19 pandemic.

Methods: Mixed-effect modelling was used on survey data on job demands, job resources, job motivation, and work-life balance among over 500 managers working in 55 departments of a large Swedish university hospital in 2019 and 2020. Responses from 6011 employees were then used to stratify the analysis for COVID-19 exposure. Inductive content analysis was applied to open-ended questions on the managers' views on organisational prerequisites during the onset of the pandemic.

Results: The proportion of managers reporting difficulties with role clarity, quantitative demands, decision-making authority, and emotional support, time for recovery at work, motivation deficits, or problems with work-life balance clearly increased during the first wave of the pandemic. The proportion of managers reporting negative responses was higher in departments with high COVID-19 exposure. The qualitative analysis shows that overall governance in terms of clear, fair, and well-communicated routines, resource allocation, and division of responsibilities constituted an important framework for managerial during the crisis. First-line managers also require a mandate to re-organize their roles and their teams to successfully adapt to the situation. Organisational and social support was also important resources.

Discussion: This is the first study investigating healthcare managers' work situation during the first wave of the COVID-19 pandemic in a Swedish context. As expected, it indicates an increasingly strained work situation during the crisis, but it also provides findings on organisational prerequisites that allow

healthcare managers to cope with stressful situations. In line with previous research on organisational resilience, the study provides suggestions for how higher-level managers can act in order to provide front-line managers with the organisational prerequisites they need to adapt, learn and develop successfully during times of unpredictability, insecurity, and rapid change in order to offer the best possible support to health care workers.

KEYWORDS

COVID-19 pandemic, health care managers, working conditions, job demands, job resources, Sweden

1. Introduction

The COVID-19 pandemic has placed healthcare providers under immense physiological and psychological pressures. The focus of previous research has been on the pandemic's impact on frontline health care workers (HCW), revealing high workloads and mental health effects (Cabarkapa et al., 2020; Chersich et al., 2020; Demartini et al., 2020; Salazar de Pablo et al., 2020; Vizheh et al., 2020; Busch et al., 2021). The pandemic has thus magnified psychosocial risk factors in health care work (Theorell, 2020). Studies both on the effects of the COVID-19 pandemic and other epidemics on HCWs' work situation and health point to specific needs among this group (Kisely et al., 2020; Billings et al., 2021; Busch et al., 2021). These needs include access to clear and concise information, disease-specific training, professional and emotional support, reliable access to adequate personal protection equipment, suitable working hours that enable recovery during and between shifts, and mental health screening with access to interventions for those in need. The responsibility for designing and implementing these protective measures has largely fallen on health care managers (HCM; Greenberg and Tracy, 2020; Kisely et al., 2020; Billings et al., 2021).

Managers are responsible for establishing an overview, stay focused, be positive, as well as monitoring employee health, especially during a pandemic (Bookey-Bassett et al., 2020; Theorell, 2020; Sihvola et al., 2022). Additional managerial tasks during a pandemic include the management of transfers of HCWs between departments, monitoring employees' fear of infection, communicating ever-changing work routines and providing support in daily operations (Jonsdottir et al., 2021; Akerstrom et al., 2022). Thus, during periods when health care organizations are put under stress, the need for organizational structures that support managers in their role as leaders is intensified. Frontline nurse managers have for instance highlighted the need to be prepared for a crisis, and to adapt to constant changes of procedure (Vázquez-Calatayud et al., 2022).

Even before the pandemic, organizational changes, economic constraints and sub-optimal psychosocial working conditions, i.e., an imbalance between job demands and job resources, characterized managerial work in the health care field in many parts of the globe (Kelliher and Parry, 2015; Bjerregård Madsen et al., 2016; Labrague et al., 2018), and Sweden is no exception (Johansson et al., 2013; Vinberg et al., 2015). The retention and recruitment of skilled managers has become an area of great concern for the Swedish public sector, especially within health care (Vinberg et al., 2015; Cregård and Corin, 2019). While studies from Italy and Canada indicate an even more troublesome work situation for HCMs during the pandemic (Jackson and Nowell, 2021; Giusino et al., 2022), the impacts of the pandemic on the work situation of Swedish HCMs are still largely unknown.

The Job Demands-Resources (JD-R) model poses a useful theoretical framework for capturing the facilitators and hinderances at work (see for example Demerouti et al., 2001 for an overview). The JD-R model is well-established and has been used to predict a large number of health and performance outcomes across different occupational contexts (Schaufeli and Taris, 2014; Bakker and Demerouti, 2017; Lesener et al., 2019) including public sector managers (see for example Berntson et al., 2012; Giusino et al., 2022). The model assumes that all job characteristics can be classified as either a job demand, i.e., "*negatively valued* physical, social, or organizational aspects of the job that require sustained physical or psychological effort and are therefore associated with certain physiological and psychological costs" or a job resource, i.e., "*positively valued* physical, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands, or stimulate personal growth and development" (Schaufeli and Taris, 2014). In the JD_R model it is suggested that the specific demands and resources are context specific and must be chosen in relation to the target of a study or intervention (e.g., Schaufeli and Taris, 2014; Bakker and Demerouti, 2017).

Thus, in order to strengthen health care organizations for future pandemics, the aim of this study is to provide insights into Swedish HMCs' work situation during the first wave of the COVID-19 pandemic using the JD-R model as theoretical framework. This was done through a mixed-method approach, where we first assess changes in managers' working conditions, job motivation and work-life balance during the pandemic at a large Swedish university hospital and then highlight the

Abbreviations: HCW, Health care workers; HCM, Health care managers; HR, Human resources; IT, Information technology.

organizational prerequisites managers perceived as important during the first wave of the pandemic.

2. Materials and methods

2.1. Setting

The study was conducted at Sahlgrenska University Hospital, one of the largest university hospitals in Northern Europe. The hospital provides emergency and basic care for the 700,000 inhabitants of the Gothenburg region and offers highly specialized care for the 1.7 million inhabitants of West Sweden. Additionally, there are centers of excellence in which Sahlgrenska University Hospital is a national and international leader. During the pandemic, the hospital was one of the leading institutions providing intensive care for COVID-19 patients.

2.2. Data material

In October 2019, all 647 managers and 15,870 employees at the hospital were invited to participate in a web-based survey about their psychosocial working conditions in terms of job demands, job resources, job motivation and work-life balance. The survey was distributed to all managers and employees in collaboration with the hospital's Human Resources department. The reason for the survey was to get an overview of the psychosocial work environment of the organization, in accordance with recommendations from the Swedish Work Environment Authority. In September 2020, after the first wave of the pandemic, the same population was invited to a follow-up survey. This survey also included three open-ended questions regarding managers' experiences during the pandemic, the organizational prerequisites they saw as valuable and those that were lacking. They were asked to recall their experiences during the first wave of the pandemic, with spring of 2020 as the starting point.

In total, answers provided from 617 managers (95%) in 2019 and 473 managers and 6,011 employees (88 and 41%, respectively) in 2020[1] were used for the analysis (Table 1). Participating managers were employed at 70 different departments at the hospital. The administrative departments ($n = 17$) generally had only one manager per department and were consequently grouped together into "hospital and departmental level administration," resulting in a final sample of 55 different departments (Table 2).

2.3. Measures

With the JD-R model as a conceptual framework, and inspired by Berthelsen et al. (2020) for operationalization, we used two variables to measure job demands (*Role clarity*, *Quantitative demands*) and five to measure job resources (*Decision-making authority*, *Skill discretion*, *Managerial support*, *Emotional support* and *Time for recovery at work*; Figure 1). The managers' motivation was measured with a single indicator (*I look forward to going to work*). Work-life balance was captured using three indicators (*I can set thoughts about work aside in my free time*; *I have enough energy to do other things after the end of my shift*; *I feel rested and recovered after a couple of days off*).

In both surveys, all items were presented as statements with five response alternatives (*strongly agree*, *agree*, *neither agree nor*

1 After excluding 5 individuals who did not give their informed written consent.

TABLE 1 Description of the managerial study group in 2019 and 2020 by managerial position, age and gender.

Variable	Category	Managerial characteristics	
		2019	2020
Total number of respondents, *n*		617	473
Type of manager, *n* (%)	Strategic manager	19 (3)	57 (12)
	Operational manager	390 (63)	264 (56)
	Manager with limited managerial responsibility	208 (34)	95 (20)
	Uncategorizable managerial position		57 (12)
Age, years (%)	≤29	7 (1)	2 (0.5)
	30–39	72 (12)	55 (12)
	40–49	206 (34)	140 (30)
	50–59	244 (40)	192 (41)
	≥60	82 (13)	83 (18)
Gender, *n* (%)	Female	467 (76)	365 (77)
	Male	138 (22)	106 (22)
	Other/do not want to answer	11 (2)	2 (0.5)

TABLE 2 Average number of managers, employees and COVID-19 exposure for the 55 departments during the first wave of the pandemic.

Variable	Department characteristics				
	Mean	Median	Standard deviation	Minimum	Maximum
Managers (*n*)	8.6	8.0	6.6	2.0	46
Employees (*n*)	109	86	68	20	319
Percentage of employees caring for COVID-19 patients (%)	48	49	26	2.8	95

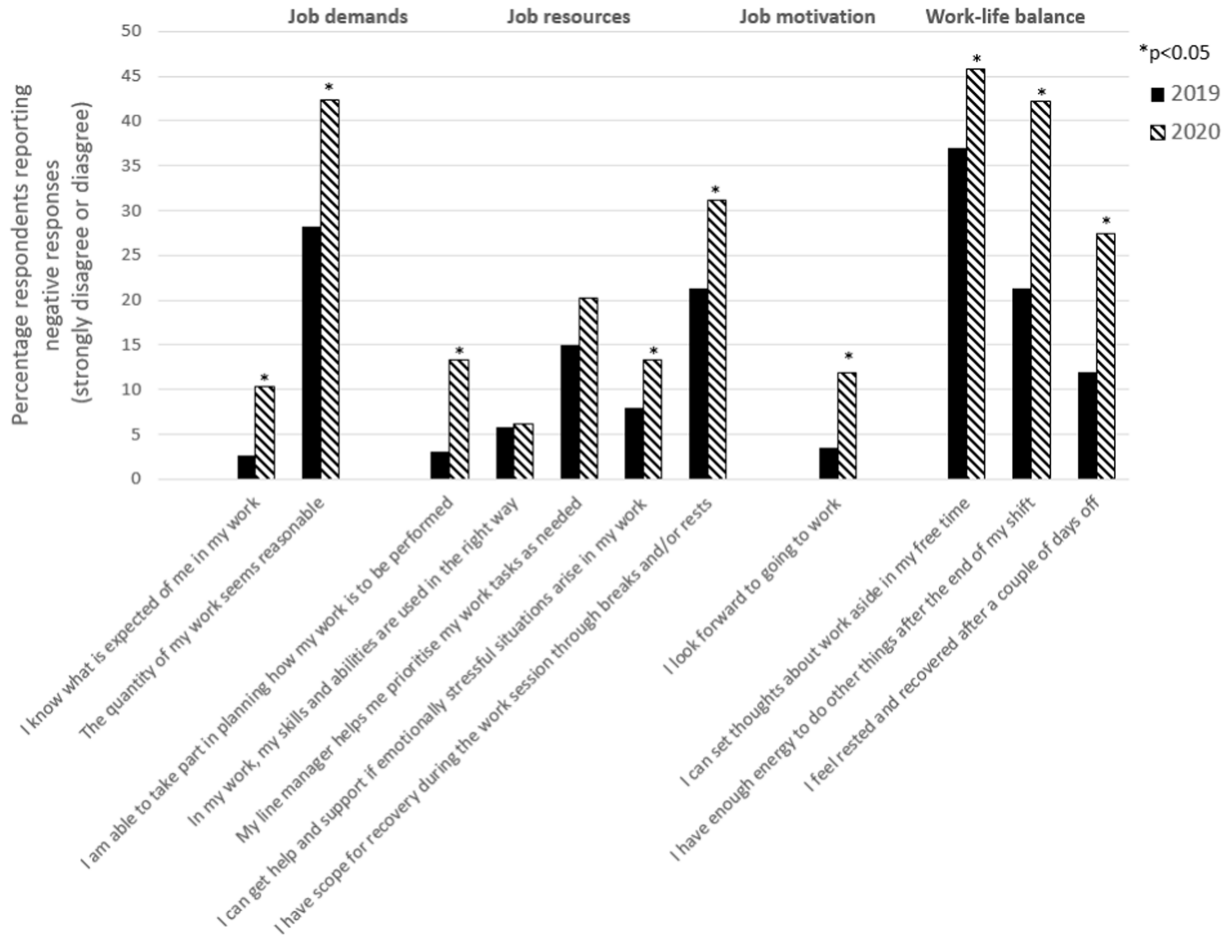

FIGURE 1
Changes in managers' working conditions. The percentage of managers who strongly disagreed or disagreed with the statements in the survey regarding job demands, job resources, job motivation and work-life balance, thus reporting a negative situation before the pandemic (October 2019) compared with during the first wave of the pandemic (September 2020).

disagree, *disagree*, *and strongly disagree*). In the follow-up survey, managers also had the opportunity to provide information about important organizational prerequisites for conducting their managerial work during the pandemic. The baseline and follow-up surveys are described in detail in Jonsdottir et al. (2021).

The level of COVID-19 exposure for each department was determined using the percentage of employees reporting that they cared for patients with COVID-19 infection during the first wave of the pandemic in the spring of 2020. In order to investigate potential differences across departments and identify associations with the pandemic, the 55 departments were divided into three equally sized groups based on COVID-19 exposure (low, medium and high). In departments with *low exposure*, less than 32% of employees reported caring for infected patients (e.g., administrative departments, plastic surgery and rheumatology), while the proportions in the groups of *medium* and *high exposure* were 32–63% (e.g., cardiology, oncology and urology) and > 63% (e.g., infectious diseases department, emergency medical services and intensive care units), respectively.

2.4. Quantitative analysis

Changes in managers' working conditions at the hospital and the variation in these changes across different departments were analyzed using the proportion of respondents in each department that disagreed or strongly disagreed with the statements in the two surveys. Mixed effects-models (Proc Mixed in SAS version 9.4; SAS Institute, Cary, NC, United States) were used with time (2019 or 2020 survey, nested within departments) as the fixed effect and information on departments as random effects (Akerstrom et al., 2021). Differences between departments were investigated by including an interaction term between the time and group variables. Hypothesis testing for fixed effects was performed using Wald tests, and tests of random effects were performed using likelihood ratio tests. Statistical significance was set at $p < 0.05$, and two-sided confidence intervals were used.

In a second step, the percentage of managers who strongly disagreed or disagreed with the statements in the survey regarding job demands, job resources, job motivation and work-life balance during the first wave of the pandemic were stratified for low, medium and high COVID- 19 exposure. Differences between these groups were tested using the mixed-effect models above, with a dummy variable for the exposure group added as a fixed effect on the second wave data only.

2.5. Qualitative analysis

The managers were given the opportunity to provide their own views on the organizational prerequisites that had been particularly important, or lacking, in their work during the first wave of the pandemic in spring 2020. Managers were also encouraged to share both positive and negative experiences from the COVID-19 pandemic. In all, the managers' answers to these open-ended questions generated about 67 A4 pages of text. The first, second and third author performed a thorough reading of all written responses, followed by an inductive content analysis (Elo and Kyngäs, 2008) of about 10 pages for each author. The last author also read all of the material thoroughly and commented on the analyses. The suggested codes were compared and discussed, and codes were grouped into tentative categories. The remaining material was then coded, and categories were divided into overarching themes after discussions between the authors. The three themes were *Overall governance*, *Re-organization* and *Organizational and social support*.

2.6. Results from the quantitative analysis

The first research question concerned overall changes in managers' working conditions between 2019 and the end of the first wave of the pandemic. When comparing the proportion of managers that were dissatisfied with their working conditions, job motivation and work-life balance at these two time points, a significant increase in negative responses was seen for nine of the eleven variables (Figure 1). In terms of job demands, the proportion of managers that disagree with the statement that they have *Role clarity* and a reasonable amount of *Quantitative demands* increased from 3 to 10%, and from 28 to 42%, respectively. When it comes to job resources, the proportion of managers that disagree with the statement that they have *Decision-making authority*, *Emotional support* and *Time for recovery at work* also increased significantly from 3 to 13%, 8 to 13%, and 21 to 31%, respectively. No statistically significant increase was found for *Skill discretion* or *Managerial support*. All three items of *Work-life balance* had a significant increase in negative responses; the proportion of managers disagreeing with the statements "*I can set thoughts about work aside in my free time*," "*I have enough energy to do other things after the end of my shift*" and "*I feel rested and recovered after a couple of days off*" increased from 37 to 46%, 21 to 42%, and 12 to 27%, respectively. Lastly, the proportion reporting that they did not look forward going to work (i.e., *Motivation*) increased from 3to 12%.

When investigating potential differences between departments, it was found that the managers' working conditions differed significantly between the 55 departments at the hospital ($p = 0.003$ to <0.001 for all items). To further investigate the differences between departments and their association with the pandemic, we stratified the managers' responses in 2020 depending on whether the department had low, medium or high COVID-19 exposure (Figure 2). The results show a statistically significant association between exposure and seven of the 11 items (*Quantitative demands*, *Decision-making authority*, *Time for recovery at work*, *Motivation* and the three variables within *Work life balance*), with a higher proportion of negative reports in the departments with high exposure compared to departments with low or medium exposure. No association between exposure and the variables *Role clarity*, *Skill discretion*, *Managerial support* and *Emotional support* was found.

3. Results from the qualitative analysis

To shed light on what organizational prerequisites managers perceived as important during the first wave of the pandemic, the results are presented following the three themes of *Overall governance*, *Re-organization* and *Organizational and social support* that emerged from the qualitative data.

3.1. Overall governance: Allocating resources, establishing routines and transferring responsibility

The way the hospital management team directed the organization through processes and routines was paramount for frontline managers' work situation during the pandemic. Routines and guidelines established to protect the staff from the virus, for testing, for treatment of infected patients and handling the

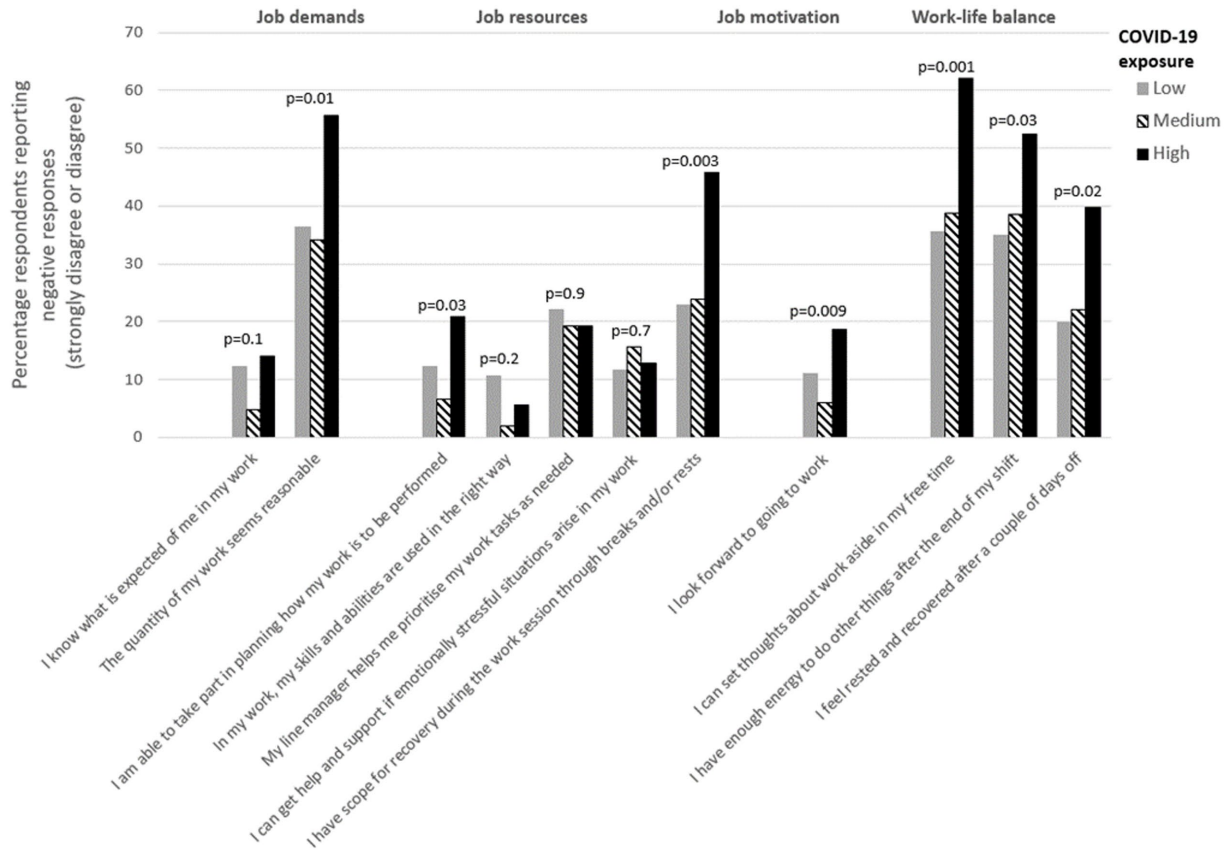

FIGURE 2
Managers reporting a negative situation during the first wave of the pandemic, stratified by COVID-19 exposure. The percentage of managers who strongly disagreed or disagreed with the statements in the survey regarding job demands, job resources, job motivation and work-life balance in the COVID-19 survey, thus reporting a negative situation during the first wave of the pandemic (in spring 2020), stratified by COVID-19 exposure group. Low, medium and high COVID-19 exposure at the department represents <32%, between 32 and 63% and >63% of the employees that cared for COVID-19 patients.

deceased changed constantly, often on a daily basis. Another important set of routines concerned staff planning and scheduling. Operative managers were responsible for lending out staff as well as receiving and introducing new staff to their units. And they were often required to shift their own work tasks, alternating between managerial responsibilities and serving in their roles as physicians or registered nurses. Furthermore, top-down strategies to re-allocate resources and decentralize decision-making authority to first-line managers were important measures taken to direct the organizations. Lower-level managers reported that being entrusted with decision-making authority to adapt workflows and work procedures to local conditions, without having to consult with upper management, was highly appreciated:

> Mandate and room to manoeuvre to make decisions in order to be able to quickly adjust and adapt operations to rapidly changing circumstances. […] Clear orders/ clarity in how to prioritize as a basis for being able to quickly adapt activities.

Middle manager, Department of Psychiatry, Cognition and Geriatric Psychiatry, middle manager.

Top-down decisions on routines, resource allocation and the allocation of responsibilities were generally perceived as clear, fair and well communicated, thus serving as important frameworks for managerial action at the operational level:

> The overall impression is that as a professional and manager, I had the freedom and space for action that I had never experienced before in my professional life.

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

> As a head of department, I have benefited from a clear direction from the hospital management team, where we all affirmed what we knew and did not know about this pandemic.

Middle manager, Department of Obstetrics.

When top-down decisions and routines were perceived to be vague or unclear, poorly communicated or impossible to

implement, this instead created a high degree of confusion and frustration, as well as feelings of organizational injustice:

> Very frustrating to see guidelines on the website but not have access to protective equipment. Referring for a long time to visors (which we had to make ourselves) and plastic aprons as "safe" equipment.

Managerial level unknown, Department of Psychotic Disorders.

> Initially, [I] experienced that there was huge ambiguity in decision-making issues. A lot took time when there was no time. The structure within the organization was wobbling.

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

Many managers were able to tolerate vague routines and an unclear division of authority in the beginning of the pandemic, but as time passed, they became less tolerant:

> I needed clearer leadership, more support within the management team, that everyone helped staff the COVID-19 intensive care units to reduce the extremely heavy load some employees were exposed to, while others worked on as if nothing had happened. A shared responsibility among managers. Not that some did as they pleased and made their own decisions. Incredibly messy in the decision-making process, staffing requirements from different units…

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

Higher-level management, both at the regional and at the hospital level, used different strategies in communicating their decisions to lower-level managers. The COVID-19 website on the intranet was an important source of information. Here, all information relevant to HCWs was gathered, and the attached newsletter was updated regularly with changes to this information. The informants also refer to the 'managerial newsletter' that was sent by e-mail to all hospital managers, sometimes several times a day, as a key resource:

> Very good to have daily managerial newsletters […]; they were clear and contained essential information. It made it easier to take my managerial responsibilities and inform the staff about the guidelines. We had daily morning meetings and brought up what was new for the day, which was needed because decisions and guidelines changed from day to day.

First-line manager, Department of Hybrid and Interventional Procedures.

However, some informants found the information flow overwhelming, both in terms of content and frequency, and sometimes even contradictory:

> Extreme loads of different/updated information and routines initially; protective equipment, cleaning routines, routines in the event of death, etc. Various information channels […]. It became much easier when that sort of things settled down after a few weeks.

First-line manager, Department of Infectious Diseases.

3.2. Reorganizing to meet the needs of the COVID-19 pandemic

A key factor for managers' ability to handle the demands of the pandemic was their ability to reshape both internal and external organizational structures. In many examples, respondents report that management teams met more frequently, used new digital techniques (often online meetings) and involved temporary members in order to facilitate decision making:

> That we got a clear management structure where the roles were clear to everyone. A head of department with whom I had daily communication about most things and supported me. Good communication with other managers in other units who had their staff on loan to us. A section leader during the daytime throughout the COVID-19 crisis, where we worked closely together and knew who did what.

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

Many managers reported that their involvement in decision-making processes increased:

> A common approach at the department level, clear information channels, participation in planning and design processes and increased room to manoeuvre and try new things to make the best of situations that arose.

First-line manager, Department of Geriatrics.

There were special work teams that were established to deal with particular aspects of the COVID-19 pandemic; for example, working teams to secure access to personal protective equipment and other COVID-19 related material. Further, there were teams established to deal with urgent staffing and scheduling issues at the hospital wards and emergency departments. There are also examples of improved collaboration between hospitals within Sweden and abroad, including departments, units and professions, to address common problems:

> In the event of disasters such as these, the framework falls and we must follow general guidelines. Working hours of 12–16 h per day, seven days a week during the first four weeks required focus to bring in resources, structure the schedule, create the best possible conditions in order to increase the security of our employees. Then it is not possible to think of ordinary frameworks. Internal conflicts must be kept away; it takes far too much energy from managers and employees!

First-line manager, Department of Hybrid and Interventional Procedures.

3.3. Organizational and social support

Many managers reported that they needed strength, motivation and the ability to take actions themselves, especially at the start of the pandemic. However, they were part of an intricate web of social relations, and the need for communication and social support between and within the hospital's organizational levels clearly intensified during the pandemic. One healthcare manager described the importance of social support and trust during a pandemic:

> Support for first-line managers is important so that they can support employees. This was a situation where we exposed ourselves and our employees to a risk of becoming infected with a potentially deadly virus at work, to save lives. […]. To handle all the reactions that arose in the employees and in ourselves… Trust is important in a high-risk situation and applies to all levels, from employees to operational managers and at the strategic level. The obligation to report on the consequences of decisions, and not only "obey blindly," usually falls on the first-line managers. But it is also something that requires courage in a hierarchical decision-making structure, such as that of a crisis organization. So trust and support for first-line managers is an absolute necessity in future crises.

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

Many first-line managers reported that their contact with their immediate manager increased and intensified during the pandemic and expressed their gratitude towards their superiors for being present, easy to access, supportive and direct in their communication. Support from the immediate manager is often mentioned as a key prerequisite for lower level managers to be the support their staff needed:

> We got a clear management structure where the roles were clear to everyone. A department manager with whom I had daily contact most of the time and who supported me. Good communication with other managers in other units who had their staff on loan to us.

First-line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

When there was a lack of managerial support, operative managers found themselves in vulnerable situations and reported feeling tremendous pressure to be strong, make decisions and take on great responsibilities with consequences for both themselves and their subordinates:

> [It was difficult] to force employees to do a job that they felt very bad about, to have crying employees daily who asked to not have to go to the COVID 19 intensive care unit. But despite appealing to my manager and HR, I had no choice but to continue sending them there, even though they had anxiety, sleeping problems stomach pains, etc.

First- line manager, Department of Anesthesia/Surgical Operations/Intensive Care.

Managers expressed a second important source of social support, which originated from managerial colleagues. Daily management team meetings and informal contacts with managerial peers both provided a platform for sharing knowledge, making quick decisions, and coordinating and reallocating resources. Being a part of a managerial team also brought emotional support, providing the comfort and security needed in stressful and confusing situations:

> The management team had daily meetings, and in that way, I got good support from my colleagues and a sense of security that we helped each other think about important issues.

First-line manager, Department of Psychiatry, Cognition and Geriatric Psychiatry.

> At the beginning, it was quite messy at the hospital, before routines were established, and sometimes a division of responsibilities was lacking. The most important thing during the spring was our strong management team. We had to come up with solutions in our own way and make the contacts we needed to secure the care we provided.

Middle manager, Department of Nephrology.

Many informants tried to prioritize their physical presence among employees during the pandemic, and pointed to the registered nurses, assistant nurses, physicians and support functions as the key resources to combat the COVID-19 crisis. The importance of being able to rely on employees to go above and beyond for their patients and for the organization as a whole in an extreme situation cannot be overestimated. It provided a source of social support for first level managers to work together as a team and share responsibility for the difficult work that needed to be done:

> [It was a positive experience] to see that you can do more than you think. To feel proud of the staff's flexibility. Most just did what was required, and that was no small task.... The sense of belonging... The staff's commitment and an ability to find solutions…

First-line manager, Department of Orthopedics.

Dealing with concerned employees who feared catching the highly contagious virus, both to protect their own health and the health of family members, was also reported to be a challenge. Furthermore, dealing with perceived injustices when some employees were willing to take on a lot of responsibility and extra work while others were not, or having to force employees to work extra shifts and not allowing staff to take leave, were also seen as frustrating among managers:

> What took the most time and energy was facing strong anxiety, especially among the immediate employees, where the anxiety was an obstacle to functioning in their professional role […]. I also had to perform some of the employees' tasks.

First-line manager, Department of Nephrology.

A last source of social support that was frequently mentioned among respondents was the relief offered by organizational support functions. Specialists in the HR, IT, communications and financial services departments assisted the managers in their daily work in issues such as recruitment, legal matters, purchases and financial planning. For example, HR tasks, such as staffing and scheduling, changed character during the pandemic and would have become both complicated and time-consuming for managers to deal with on their own.

Respondents expressed special appreciation for the care hygiene unit, which supported, guided and advised other units, managers and individuals to prevent themselves and patients from being infected with the virus.

The ability of these functions to be flexible and responsive to sudden operational needs was a necessity and highly appreciated by the managers:

> Those of us who work close to the patient have gained somewhat more influence than before. Administrative staff have worked to support us. In normal cases, it is usually the health care staff who are engaged by the administrative staff.

Team-leader, Department of Neurological Care.

> Some things that were previously difficult to implement and call attention to were suddenly done quickly (when the will obviously appeared in the right person / function). This particularly applies to challenges in ICT.

Middle manager, Department of Clinical Microbiology.

In cases where the support functions instead failed to adapt to the situation caused by COVID-19, when they were seen as distant or stuck in 'business as usual', managers felt abandoned, stressed or exhausted:

> It could have been organized so that a lot of administration, such as public transport cards, introduction of new systems, etc. could be tasks for administrators and HR. Support for managers was lacking in general. We had an extremely high workload, both first-line managers as well as section managers and operations managers.

Middle manager, Department of Oncology.

4. Discussion

This is, to our knowledge, the first study investigating HCMs´ work situation during the first wave of the COVID-19 pandemic in a Swedish context. The overall picture that appears from the analysis is that the vast majority of managers were satisfied with their work environment, felt motivated and reported acceptable levels of work-life balance both before and during the first wave of the pandemic. The proportion of managers reporting dissatisfaction with working conditions, motivation or work-life balance varied between 3% (for *Role clarity*, *Decision authority* and *Motivation*) and 37% (for the first indicator of work-life balance) in 2019. Not surprisingly, however, the results show that the situation deteriorated during the first wave of the pandemic. The proportion of managers reporting difficulties with *Role clarity*, *Quantitative demands*, *Decision-making authority*, *Emotional support* and *Time for recovery at work*, lack of motivation or problems maintaining a work-life balance clearly increased during the first wave of the pandemic. Particularly, *Quantitative demands* and the proportion of managers disagreeing with the statements '*I have enough energy to do other things after the end of my shift*' and '*I feel rested and recovered after a couple of days off*' increased between 2019 and the first wave of the pandemic. Together, these findings indicate an increasingly strained work situation for managers during the pandemic. These results are also in line with the JD-R theory, where an increased imbalance between job demands and job resources, and thus strained work situation, renders unwanted outcomes such as reduced motivation and work-life balance (see for example Bakker et al., 2014; Schaufeli and Taris, 2014).

However, no significant changes in *Skill discretion* and *Managerial support* were found.

The results show that the changes in working conditions varied between departments at the hospital. When investigating the association between managers' working conditions and COVID-19 exposure at the department level, it was found that for seven out of eleven variables, the proportion of managers reporting negative responses was higher in departments with high exposure to COVID-19. No such association was found for

Role clarity, *Skill discretion*, *Managerial support* and *Emotional support*. Thus, no association was found between these four working conditions and the degree to which employees at the respective departments cared for COVID-19 patients.

One obvious impact from the pandemic was an increased workload, not only among HCWs but also HCMs: the amount of work increased while time allocated for recovery diminished, as was also seen in other countries (Jackson and Nowell, 2021; Giusino et al., 2022). This is likely an inevitable consequence of a pandemic in the health care sector. However, there are many things top-level managers can do to alleviate this work strain. With the help of a qualitative analysis of the answers to three open-ended questions in the COVID-19 survey, three important remedies were found. First, when top-down decisions on routines, resource allocation and division of responsibilities are perceived as clear, fair and well-communicated by the managers, *Overall governance* constitutes an important framework for managerial action at the operational level. Particularly important areas for top-down routines and guidelines include information about how to work with infection prevention and how to schedule and re-allocate hospital staff. Managers at the lower levels also need the mandate to adapt workflows and work procedures to local conditions and ever-changing preconditions. Second, first-line managers need the mandate to *re-organize their roles and their teams to deal with the pandemic*. More frequent team meetings, an increased use of digital techniques, more collaboration across departments and professional groups were common measures taken to increase involvement in important decision-making processes. Other studies have expressed the importance of the team regarding support in decision making. Involving the staff in the decision making helped create a feeling of solidarity between the workers and the managers and increased their sense of belonging during the health crisis (Beogo et al., 2022). The third theme illustrates the significance of *organizational and social support* from the immediate manager, managerial colleagues and support functions such as HR specialists, experts in infection medicine and care hygiene, and the communication department. The same experience was expressed among frontline nurse managers who tried to be role models, to keep calm and carry on (Vázquez-Calatayud et al., 2022), they encouraged healthcare staff to keep going despite the constant uncertainty and ambiguity (Bookey-Bassett et al., 2020). Our study is in line with a previous study showing that higher perception of organizational support was shown to minimize managers' perception of being challenged in times of a pandemic (Gab Allah, 2021). Finally, the informants point to their employees as a key resource in their role as managers during the pandemic.

All of these factors are things that higher level management should facilitate to decrease the negative impact on lower-level managers' working conditions, as seen in the present study and similar studies (Jackson and Nowell, 2021; Giusino et al., 2022). Securing sustainable working conditions and adequate decision latitude, where individuals can make decisions and exercise control over their work and offer support to lower-level managers, will also increase the opportunity for these managers to implement preventive measures targeted at the specific needs of HCWs, as identified in the COVID-19 pandemic and previous outbreaks (Greenberg and Tracy, 2020; Kisely et al., 2020; Billings et al., 2021).

An organization's capacity to adapt, learn and develop during times of unpredictability, insecurity and rapid change is often referred to as organizational resilience. A resilient health care organization supports HCWs in foreseeing, adapting and recovering so that they can provide high quality care (Jeffcott et al., 2009; Rangachari and Woods, 2020) while being protected from negative work-related outcomes (Baskin and Bartlett, 2021). The ability to anticipate severe crises increases when organizations learn, develop, adapt and move forward after stressful events and crises. By focusing on assigning organizational capabilities and working on relationships and interactions between organizational actors in these different phases, resilient organizations create trust, empowerment and safety among individuals and teams (Duchek, 2020; Rangachari and Woods, 2020). The ability to recognize, confront and deal with harsh conditions, fear, frustration, uncertain environments and other difficulties related to a crisis is vital maintaining resilience in the future. In this way, an organization can undergo development and recovery and thrive at the individual, team and organizational level even after a period focused on mere survival. One way to be prepared for a crisis is to arrange disaster management courses to provide knowledge and confidence beforehand (see for example Cariaso-Sugay et al., 2021).

4.1. Methodological considerations and future research

The fact that individuals cannot be followed over time placed methodological constraints both on the current analysis and future analyses. In this study, managers' working conditions, in terms of job demands and job resources, were measured at the department level, assuming that the respondents represent all managers from each department. However, there was a high response rate among managers: 88% in 2019 and 95% in 2020, thus limiting the risk of bias.

Another limitation is the relatively low response rate (41%) among employees. This data was used to group the departments into low, medium and high COVID-19 exposure groups, and it is plausible that the low response rate could affect the reliability of this exposure measure. However, after reviewing the distribution of departments into these three exposure groups, the low exposure group included all administrative and psychiatric departments as well as departments with technicians, while the high exposure group included all intensive care units, and infectious disease departments. Thus, the departments are distributed as expected according to their proximity to COVID-19 patients.

When measuring both the effect and the outcome in a single survey, common method bias is a cause of concern. In this study, the main outcomes are based on two separate surveys distributed before and during the pandemic (see for instance Figure 1), or on a combination of answers provided from the managers and their employees (see Figure 2), limiting the risk of common method

bias. In addition, the analyses were performed on the workplace level, not at the individual level.

In Sweden, the majority of HCMs have a license as registered nurses, or licensed physicians. This clinical expertise legitimizes the HCMs' managerial role in the eyes of the employees giving them authority, trustworthiness, and confidence (Doria, 2015; Bugajski et al., 2017). However, it is uncommon in Sweden to let nurse managers supervise physicians or vice versa. During COVID-19 many managers were transferred to clinical work as a way to allocate resources to the COVID-19 care units. Unfortunately we have no data on the managers' profession, or on how common it was with clinical work during the study period. One major strength of this study was the availability of pre-pandemic measures of working conditions among managers. In autumn 2022, a third data collection will take place, and this will make it possible to investigate the long-term effects of the pandemic on all HCWs at the hospital.

5. Conclusion

The findings of this study point to an increasingly strained work situation for health care managers during the first wave of the COVID-19 pandemic. In line with previous research on organizational resilience, the results also provide suggestions for how higher-level managers can act in order to provide front-line managers with the organizational prerequisites they need to adapt, learn and develop successfully during times of unpredictability, insecurity and rapid change in order to offer the best possible support to health care workers.

5.1. Practical implications

There is a variation in working conditions between departments at the hospital showing that the proportion of managers reporting poorer work conditions was higher in departments with high exposure to COVID-19. We provide several suggestions what can be done to alleviate this high work strain. First, top-down decisions on routines, resource allocation and division of responsibilities need to be perceived as clear, fair, and well-communicated. Particularly important areas include information about how to work with infection prevention and how to schedule and re-allocate hospital staff. Second, first-line managers need the mandate to make decision and re-organize and support their teams to deal with the pandemic. As such, more frequent team meetings, an increased use of digital support systems, more collaboration across departments and professional groups are some of the measures that can be used to enable managers to better encounter the situation and improve the decision-making processes. Third, support from different function should be organized including immediate manager, managerial colleagues and support functions such as HR specialists, experts in infection medicine and care hygiene, and the communication department.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Swedish Ethical Review Authority (ref. 2020-04771). The patients/participants provided their written informed consent to participate in this study.

Author contributions

MA, IJ, AI, HW, and LA were responsible for data collection. MA performed the quantitative analyses in collaboration with LB and LC. LB, LC, MA, and LA conducted the qualitative analysis. LB, LC, and LA drafted the first version of the manuscript. All authors contributed to the final draft and read and approved the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Development of well-being after moving to telework: A longitudinal latent class analysis

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Introduction: Due to the COVID-19 pandemic, teleworking suddenly became a reality for many individuals. Previous research shows that there are contradictory consequences of telework on well-being: while workers have the opportunity for self-directed work, intensified work behavior as well as longer hours being worked might occur at the same time. We expect that the effects of telework vary over time and may be able to explain these contradictions. Moreover, from the perspective of the job demands-resources model besides job resources, personal resources may be relevant. The aim of this study is to investigate how the mental well-being of workers unfolds over time after the onset of the pandemic and the role of telework in this process. Additionally we seek to identify the impact of available job resources and personal resources in this extraordinary situation.

Methods: Data were collected online from 642 participants in Germany beginning in March 2020, with 8 weekly followup surveys. Mental well-being was measured using the WHO-5 well-being index. For personal resources we looked at occupational self-efficacy; job resources were flexible working hours, job autonomy, and social support. Job demands were telework and work intensification. First we used a group-based trajectory analysis approach to identify different well-being trajectories. Second we applied multinomial regression analysis to identify T1 predictors of well-being trajectory group membership and their interactions.

Results: We found three groups of mental well-being trajectories: low, medium, and high. Their progress through the investigation period was rather stable: we observed only slight improvements of mental well-being for the high well-being group and a slight deterioration for the other two groups. Only the job demand work intensification and the personal resource occupational self-efficacy had a significant relationship to group assignment. Additionally we found interactions of telework with work intensification and occupational self-efficacy indicating a buffering mechanism of telework on the consequences of high work intensification; and low occupational self-efficacy.

Discussion: Telework appears to be a useful resource that buffered high work intensification and compensated for low personal resources during the pandemic. Since data were from self-reports of a convenience sample we can't assume generalization of our results nor absence of common-method bias.

KEYWORDS

telecommuting, COVID–19, work design, flexible work arrangements, job resources, longitudinal assessment

1. Introduction

Over the past decades, the improvement of information and communication technology (ICT) and internet access has led to an increase in the adoption of telework policies (Milasi et al., 2021). Telework, also known as telecommuting or remote work, refers to the use of ICT to perform work away from a central location (Qvortrup, 1998). Previous research has shown that telework can have both positive and negative effects on mental well-being. On one hand, teleworkers often report greater autonomy in terms of timing and scheduling their work. On the other hand, there may be risks of increased work intensification and longer work hours (Dimitrova, 2003; Weinert et al., 2014). Matusik and Mickel (2011) suggest that the pressure to be constantly accessible due to ICT use may contribute to this intensification of work. In addition to work overload and work-home conflicts, telework may also lead to feelings of social isolation and information deficit, which can contribute to feelings of exhaustion (Weinert et al., 2014; Wang et al., 2021). However, there is limited research on the long-term effects of telework on mental well-being and the psychological processes involved in how individuals adapt to telework. Taking a job demands-resources perspective, this study aims to investigate the effects of the pandemic-related switch to teleworking on well-being in a cross-occupational sample over several weeks, using a time series design.

The aim of the present study is to contribute to the understanding of the effects of telework on well-being during the initial months of the COVID-19 pandemic by investigating how the mental well-being of teleworkers unfolds over time after the onset of telework; using a person-centered approach, allowing us to identify different well-being trajectories (Howard and Hoffman, 2018). Group-based trajectory modeling (GBTM) is a useful tool for examining trajectory profiles and understanding how well-being changes over time (Nagin and Odgers, 2010). GBTM allows us to identify distinct latent classes or subgroups within a population that have different patterns of change and to understand the potential drivers of these trajectories. By acknowledging and examining differing levels of trajectory profiles using GBTM, we can gain a better understanding of the complex factors that influence well-being and identify more targeted and effective approaches for improving well-being outcomes.

The COVID-19 pandemic has highlighted the need for further research on the long-term effects of telework and other flexible working arrangements on well-being (Wang et al., 2021). Previous research has called for multi-wave and longitudinal studies to examine how telecommuting outcomes change over time (Bélanger et al., 2013; Shifrin and Michel, 2022). The current study aims to contribute to this body of knowledge by examining the working situation of teleworkers in the context of the COVID-19 pandemic. Given the sudden and widespread implementation of nationwide contact restrictions in Germany in March 2020, we have the rare opportunity to study direct stressor-strain relationships in which a specific event (the pandemic) leads to a stressor (telework during the pandemic) and ultimately affects well-being (strain). In general, it can be difficult to establish direct stressor-strain relationships in occupational health psychology, as psychological variables like stress are often not directly measurable and their time of measurement may be confused with the time of their occurrence (Kelloway and Francis, 2012; Semmer and Zapf, 2018). Our study aims to shed light on these complex relationships in the context of telework during the COVID-19 pandemic.

One important aspect of this study is that it includes participants with a range of telework experience, as well as those whose jobs are better or worse suited for teleworking and who may have different preferences for working from home or on-premises. This is a departure from previous studies which may have been affected by selection bias by only including individuals who preferred to work from home (for a discussion of potential selection biases, see Delanoeije and Verbruggen, 2020). This contributes to the theoretical understanding of telework by providing a more diverse sample. In Germany for example 50% of respondents to a survey worked from home, of which more than half had no previous experience with telework at all (Ono and Mori, 2021). The pandemic accelerated many work related changes: In an effort to reduce the risk of infection, strict measures were put in place in many countries. According to Eurofound (2020) over 37% of working Europeans switched to telework during the pandemic. Although previously to the pandemic the percentage of workers with access to telework has been increasing, only about 15% of dependent workers have had experience with it, a number which soared to 40% due to the measures put in place in many countries in March 2020 (Milasi et al., 2021).

In the following sections we first develop our thoughts on possible trajectories of well-being over time and will subsequently illustrate our hypotheses regarding predictors of trajectory profile membership after the onset of pandemic induced telework building upon the job demands-resources (JD-R) model by Demerouti et al. (2001).

1.1. Mental well-being in telework from a job demands-resources perspective

Following the JD-R model (Demerouti et al., 2001) work characteristics for the development of work related burnout can be grouped into two broad categories: (1) job demands, which are psychological, physical, social, and organizational factors of work, which require a physical and mental effort that usually lasts for a longer period of time. Work-related demands include: emotional and physical stress, shift work and conflicts. They are not necessarily negative or cause negative effects. Rather, they can become stressors with negative consequences if coping with the demand requires a high level of effort over the long term and there is no adequate recovery phase, and (2) job resources, which represent the psychological, physical, social and organizational working conditions, which are relevant for the achievement of work-related goals, alleviate work demands, and promote personal growth and development (Demerouti et al., 2001). Two mental processes are assumed by the model: a health-impairment process, where stressors lead to emotional exhaustion in the long run and thus to impaired well-being; and a motivational process through which job resources, such as autonomy or social support, foster motivation and work engagement (Demerouti et al., 2001).

Meta-analytic evidence supports the validity of the model and its suitability to assess employee well-being (Lesener et al., 2019). According to the JD-R model job resources may buffer the impact of job demands on job strain (Bakker and Demerouti, 2007). An extension to the JD-R model is the inclusion of personal resources (Xanthopoulou et al., 2007). Personal resources, according to Hobfoll et al. (2003, p. 632), are "aspects of the self that are generally linked to resiliency". They serve a similar function as job resources; when job resources are in short supply, personal resources can counteract that shortage (Bakker and Demerouti, 2017). Personal resources, such as occupational self-efficacy have been shown to alleviate stress (Grau et al., 2001).

1.1.1. Different types of trajectories of mental well-being after stressor onset

A proposed extension of the JD-R model by Bakker and de Vries (2021) integrates the perspective of self-regulation and argues that the emergence of strain and ultimately burnout has ongoing high job demands and low job resources as its cause. According to them daily job demands result in the accumulation of strain, which may lead to the use of maladaptive and less adaptive self-regulation strategies, while job resources and key personal resources may buffer the negative impact of job strain (Bakker and de Vries, 2021). The integration of the conservation of resources (COR) theory, which highlights the importance of the availability of resources in coping with stressors, would further support this argument by suggesting that (a) a threat of a loss of resources (b) depletion of resources and (c) failure to obtain resources following the spending of previous resources can lead to stress (Hobfoll, 1989). According to the COR theory individuals with access to more resources are more likely to gain additional resources in comparison to individuals with fewer resources, who are more likely to suffer further resource losses (Hobfoll, 1989).

In the field of organizational stress research, temporal relationships between stressors and mental health can be explained through models such as the *accumulation* model, which states that strain arises from the accumulation of stressors and does not decrease even if the stressors disappear, and the *adjustment* model, which posits that stress initially leads to dysfunction, but after a while, adjustment occurs and functioning improves again despite the stressor not having been removed (Zapf et al., 1996). We will utilize these two models to anticipate potential variations in trajectories of well-being and propose that the occurrence of the following trajectory profiles: *stagnant*, *deteriorating*, and *improving*, *dynamic* may be explained by these two processes.

In the *stagnant* trajectory profile, there is no significant change in well-being over time, which may be due to the fact that members of this trajectory profile do not experience any change in the work environment; or that, following the accumulation model above by Zapf et al. (1996), lack of resources does not allow well-being to deteriorate further, or conversely, a sufficient level of resources does not allow well-being to increase further.

At the same time, an increase in stressors in the beginning of the pandemic could lead to a *deterioration* in well-being. Reasons for the *deteriorating* trajectory profile may include, among others, increased social isolation, worsened work-non-work balance, work overload, higher expectation of being available due to information and communication technology (ICT) use (Mann and Holdsworth, 2003; Matusik and Mickel, 2011; Weinert et al., 2014; Wang et al., 2021).

On the other hand, it is also conceivable that there may be individuals who report an *improvement* in their well-being during the initial weeks of the pandemic: for people in the *improving* trajectory profile the situation might lead to additional resources and less stressors and consequently to lower experience of strain. Reasons may include, among others, those which stem from higher flexibility due to telework in regard to timing ones work (Kattenbach et al., 2010), lack of commuting due to telework (Hoehner et al., 2012), less monitoring by supervisors (Groen et al., 2018).

Finally the *dynamic* trajectory profiles may be comprised of individuals who experience an initial drop in well-being, which subsequently improves again (U-shaped trajectory), following the adjustment model by Zapf et al. (1996); or the inverse, where well-being improves and then deteriorates again (inverse U-shaped trajectory). Here, for example, the first phase may have had a particularly strong impact on well-being. Over time, individuals of this trajectory profile became accustomed and their well-being improved, but since an end to the pandemic was not in sight, well-being deteriorated again.

Based on the considerations regarding the different trajectory profiles, we hypothesize that

HYPOTHESIS 1 (H1). GBTM will identify distinct trajectories of well-being among individuals during the initial time of the pandemic.

1.1.2. Job demand: Telework

Commonly telework is regarded with a resource perspective (e.g., Kossek et al., 2006; Curzi et al., 2020). In an overview reviewing 63 articles Charalampous et al. (2018) deal with the well-being of teleworkers: both job satisfaction and organizational commitment show a positive association with telework. Regarding autonomy, it is shown that teleworkers have more freedom to manage their time, but at the same time experience work intensification (Charalampous et al., 2018).

In two studies, Mann and Holdsworth (2003) showed that a higher proportion of teleworkers reported feelings of loneliness, irritability, worry, and guilt compared to office workers. There are indicators that previous experience with telework is correlated with higher life satisfaction (Ono and Mori, 2021). Empirical data shows an increase in professional isolation, as well as an increase in work and stress in relationship with pandemic induced telework (Carillo et al., 2021).

We intend to investigate the job demands caused by the switch to telework for many workers during the pandemic according to the JD-R model (Bakker and Demerouti, 2007). We believe that the specific circumstances of the COVID-19 pandemic can help to better understand the general requirements and stressors teleworkers are facing and thus we decided on categorizing telework as a job demand for this study, where many workers likely experienced teleworking for the first time (Milasi et al., 2021). In addition, recent studies (e.g., Wang et al., 2021) show that telework

may be associated with challenges and issues, such as isolation, information deficits, and other difficulties.

Circumstances, personal and job resources, job characteristics, and job demands differ between people. Accordingly we hypothesize that different trajectory profiles of workers' well-being, indicating how they steered through the pandemic, should become apparent. With this study we intend to identify these profiles and subsequently search for indicators of profile membership.

Since telework, especially in the initial phase of the COVID-19 pandemic, requires adjustment to the new situation and is also associated with increased job demands (e.g., Carillo et al., 2021; Wang et al., 2021), which are associated with higher risks of impaired mental well-being (Bakker and Demerouti, 2007) , we assume that

HYPOTHESIS 2 (H2). Moving to telework is negatively associated with trajectory profiles which indicate well-being.

1.1.3. Job demand: Work intensification

Green (2004) distinguishes between *scope* and *intensity* of work efforts. The former refers to the time spent at work; the latter refers to the intensity of the work during that time. According to Burchell (2002, p. 72) work intensification can be defined as "the effort that employees put into their jobs during the time that they are working." Green (2004) names technological change as one of the reasons for the increase in work intensification; as well as management behavior that is geared toward the employees' identification with the organization; implementation of incentive systems; loss of influence of trade unions and increasing job insecurity.

While work intensification was originally a term from the economic and sociological literature, it is increasingly used in a psychological context (e.g., Kelliher and Anderson, 2010; Franke, 2015; Mauno et al., 2019). Consequences of work intensification are lower job satisfaction and increased emotional exhaustion (Kubicek et al., 2015), increased fatigue and stress, as well as disturbed work-life-balance (Macky and Boxall, 2008; Boxall and Macky, 2014).

We consider work intensification as a job demand which is amplified by telework, where ICT-use is more dominant. As such, we hypothesize

HYPOTHESIS 3 (H3). Work intensification is negatively associated with trajectory profiles which indicate well-being.

HYPOTHESIS 4 (H4). The experience of work intensification moderates the effect of telework; in such a way that its negative effect on well-being trajectory membership is amplified.

1.1.4. Personal resource: Occupational self-efficacy

Bandura's (1977) model of self-efficacy describes the extent of expectation a person has regarding their competency to perform an action and to be able to cope with difficult situations by themselves. Self-efficacy is not a construct that is equally pronounced in all areas of life, but can be pronounced in specific areas (e.g., private vs. professional life). Occupational self-efficacy refers to the extent a person is confident in being able to manage the task at hand at work (Schyns and von Collani, 2002).

Self-efficacy is an important personal resource to maintain well-being: using a meta-analytic approach medium sized negative associations between self-efficacy and burnout across countries were identified (Shoji et al., 2016). Since work accomplishment in the telework context is to a lesser degree determined by external factors, research shows that self regulation strategies, such as self-efficacy, are particularly important (Mihalca et al., 2021). Additionally there exists evidence for a positive relationship between occupational self-efficacy and employee engagement, indicating a well-being promoting function of self-efficacy at work (Pati and Kumar, 2010).

Regarding adjustment to telework, higher levels of self-efficacy are associated with beneficial behavioral strategies as well as improved adjustment to teleworking; especially for people who spend more time teleworking this relationship is stronger, which indicates the importance of this personal resource in the context of the pandemic (Raghuram et al., 2003).

HYPOTHESIS 5a (H5a). Personal resources (occupational self-efficacy) predict trajectory profile membership. Occupational self-efficacy is positively associated with trajectory profiles which indicate well-being.

1.1.5. Job resource: Social support

Social support is regarded as one of the main job resources in general: it has been identified as a resource, which mitigates perceived stressors, reduces the experience of strains, and moderates the stressor–strain relationship (Viswesvaran et al., 1999). Moreover, recent studies indicate that social support is particularly relevant in telework because remote work separated by time and space can make it difficult to access social support: perceived organizational support and perceived social support had a negative relationship with psychological strain (Bentley et al., 2016).

Wang et al. (2021) found a positive effect of social support on challenges posed by telework during the pandemic. A Finnish study identified factors related to COVID-19 anxiety of workers: perceived loneliness, technostress, neuroticism, and psychological distress contributed, among others, to increased levels of COVID-19 anxiety and thus impaired well-being (Savolainen et al., 2021). Supervisor support in the beginning of the COVID-19 pandemic had a negative effect on perceived uncertainties of university' employees, which in turn mediate the negative effect of supervisor support on their emotional exhaustion (Charoensukmongkol and Phungsoonthorn, 2020).

1.1.6. Job resource: Decision-making autonomy

Job autonomy is one key determinant of employee well-being and health in major theories of work design (e.g., job characteristics model, Hackman and Oldham, 1976; job demands-control model, Karasek, 1979; and job demands-resources model, Demerouti et al., 2001) and refers to the extent in which employees have freedom

to schedule tasks, make decisions and choose work methods (Morgeson and Humphrey, 2006). According to Gajendran et al. (2015) telework is associated with favorable outcomes which can be explained by job autonomy.

1.1.7. Job resource: Flexitime

Flexitime (also flextime or flexible working hours) refers to the level of employees' freedom in deciding starting and ending time of work, as well as breaks (Hill et al., 2008; Barney and Elias, 2010). Teleworkers report more flexibility in structuring their workday (Dimitrova, 2003; Wilks and Billsberry, 2007). We see flexitime as a job resource similar to decision-making autonomy, since it expresses the leeway given to them in carrying out their work.

HYPOTHESIS 5b (H5b). Job resources (social support, decision-making autonomy, flexitime) predict trajectory profile membership. Job resources are positively associated with trajectory profiles which indicate well-being.

The negative impact of job demands may be mitigated through job resources, while interacting with them in such a way, that job resources' effect is moderated by job demands; indicating the importance of job resources when job demands are high (Bakker and Demerouti, 2007).

HYPOTHESIS 6a (H6a). Personal resources moderate the effect of the job demand telework on trajectory profile membership; in such a way that the negative effect of telework on well-being trajectory is buffered.

HYPOTHESIS 6b (H6b). Job resources moderate the effect of the job demand telework on trajectory profile membership; in such a way that the negative effect of telework on well-being trajectory is buffered.

Figure 1 illustrates our research model.

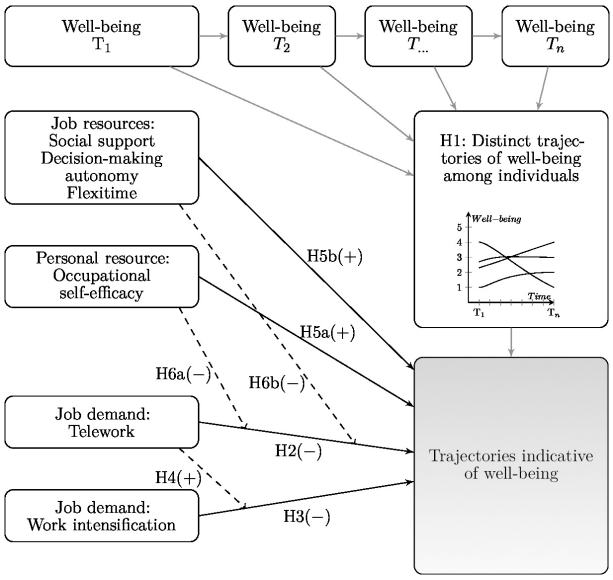

FIGURE 1
Proposed model. Dashed lines indicate moderation.

2. Method

2.1. Procedure

Data analyzed in this study were collected in Germany from 2020–03–24 until 2020–05–17, shortly after the lockdown in Germany was implemented. Participants were able to register with their email address after confirming a consent form. They then received an e-mail with a link to the survey. On the survey page, demographics and job-related questions were initially collected. The next pages included items regarding working conditions, their experience during the COVID-19 situation, and well-being.

Follow-up surveys took place every week (first five surveys). At the beginning, participants were asked whether they had worked in the previous week and whether anything had changed at work. Here, the repeated survey of working conditions wasn't offered if no changes regarding their job had taken place. Participants were reminded of missed surveys at irregular intervals (up to five times). We always offered the opportunity to opt-out of participation in each invitation and reminder email.

The study received a positive assessment from the institute of psychology of the University of Duisburg-Essen's Ethics Committee.

2.2. Study design

In this study we used the weekly measurements of well-being to model our different groups of well-being trajectories. Job demands (such as telework and work intensification), as well as job and personal resources were measured at T1, the initial survey time point.

2.3. Participants

The sample consisted of 642 participants who completed the initial survey, of whom 453 (70.6%) were women. Participants had a mean age of 39.63 (SD = 12.81; Range: 18–79) and were mostly well-educated: Highschool or below: 21.3%; Apprenticeship: 12.3%; Bachelor: 17.1%; Master: 34.4%; Doctorate: 10.4%; Other: 4.4%. 392 (61.1%) of the participants had a full-time employment, while 183 (28.5%) worked part-time. The remaining 67 (10.4%) were in marginal and/or irregular employment or doing an apprenticeship. Job tenure of the sample was 8.12 years on average (SD = 9.56). One hundred sixty-five (25.7%) participants had leadership responsibilities.

While 411 (64.0%) of the participants stated, that their tasks were possible to be carried out from home, 378 (58.9%) had previous access to telework. In the initial time (T1) of the COVID-19 pandemic and its associated lockdown in Germany 403 (62.8%) of the participants were working from home. Additional descriptive statistics are available in Table 1.

TABLE 1 Sample statistics.

	Overall
n	642
Gender = Female (%)	453 (70.6)
Age [mean (SD)]	39.63 (12.81)
Children [mean (SD)]	1.77 (0.89)
Cohabitants [mean (SD)]	2.48 (1.46)
Supervisor = Yes (%)	165 (25.7)
Job tenure [mean (SD)]	8.12 (9.56)
Job status (%)	
Apprenticeship	18 (2.8)
Employed full-time	392 (61.1)
Employed part-time	183 (28.5)
In marginal or irregular employment	49 (7.6)
Employment (%)	
Apprentice/trainee/intern	15 (2.3)
Blue-collar worker	13 (2.0)
Civil servant	51 (7.9)
Freelancer/fee-based	18 (2.8)
Self-employed	34 (5.3)
White-collar worker in public sector	225 (35.0)
White-collar worker in the private sector	248 (38.6)
Other	38 (5.9)

2.4. Measures

2.4.1. Well-being

Well-being was assessed using the WHO-5 Well-being index (Topp et al., 2015), which consists of five items, suchs as "I have felt cheerful and in good spirits" with answer options ranging from 1 = *none of the time* to 5 = *all of the time*. Cronbach's α for T1 was 0.87 (T2: $\alpha = 0.88$, T3: $\alpha = 0.90$, T4: $\alpha = 0.91$, T5: $\alpha = 0.91$, T6: $\alpha = 0.92$, T7: $\alpha = 0.90$, T8: $\alpha = 0.91$).

2.4.2. Time

Time of assessment was coded in weeks (T1–T8), corresponding to the week of participation. The first wave started on 2020–03–24. Accordingly, participants who were recruited in the second week have their initial responses coded as T2.

2.4.3. Predictors of trajectory group membership

2.4.3.1. Telework

Telework was assessed using a single item "Due to the corona crisis I am working from home." with answer options 1 = *Yes* and 0 = *No/Not anymore*.

2.4.3.2. Work intensification

For work intensification we used three items from the *self-endangering work behaviors* questionnaire by Krause et al. (2015). Sample question: "How often does it usually occur, that you work at a pace, which you felt was straining?" Answer options ranged from 1 = *never* to 5 = *always*. All five items were translated from the German original in tandem with our colleagues from the department of clinical psychology. Cronbach's α for work intensification at T1 was 0.88.

2.4.3.3. Occupational self-efficacy

We used three items from the short occupational self-efficacy scale (Rigotti et al., 2008). Example item: "No matter what comes my way in my job, I'm usually able to handle it." The answer options ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Cronbach's α for T1 was 0.74.

2.4.3.4. Social support

Social support was measured using a combination of the single item for coworker support from the Copenhagen Psychosocial Questionnaire (COPSOQ) subscales *social support coworkers and superiors*, with the wording "How often do you get help and support from your colleagues?" if participants indicated they had colleagues; together with the item for supervisor's social support, where the wording was "How often do you get help and support from your immediate superior?" (Kristensen et al., 2005). Answer options ranged from 1 = *Never / hardly ever* to 5 = *Always*. Cronbach's α for T1 was 0.75.

2.4.3.5. Decision-making autonomy

We used the subscale for decision-making autonomy from the work design questionnaire (WDQ), consisting of thee items, such as "The job gives me a chance to use my personal initiative or judgement in carrying out the work" with answer options from 1 = *strongly disagree* to 5 = *strongly agree* (Morgeson and Humphrey, 2006). Cronbach's α for T1 was 0.89.

2.4.3.6. Flexitime

Adapted and translated following Büssing and Glaser (2001) and Clark (2002) we used four items to measure working time flexibility. Example items were "I can decide for myself when I work every day" and "I am free to work the hours that are best for my schedule" with answer options ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Cronbach's α for flexitime at T1 was 0.86.

2.4.3.7. Control variables

We controlled for gender, children, cohabitants, age, job tenure, and telework experience; measured at T1. We added gender, children and cohabitants because of the specific situation of the COVID-19 pandemic, in which women were increasingly pushed back into traditional role models and suffered more from loneliness (Zamarro and Prados, 2021; Etheridge and Spantig, 2022). Gender was surveyed with a single item and coded 1 = *female*, 0 = *male*. For *children* and *cohabitants* we offered single items as well: "[...] how many dependent children do you have in your household?" and "How many persons live in your household?". Furthermore, we included information regarding age and job tenure in the explanatory model, since age and job tenure related differences regarding technostress posed by the COVID-19 pandemic could possibly represent a confounder (Ragu-Nathan et al., 2008). Age and job tenure were measured in years. Telework experience consisted of the single item "Does your employer allow you to do your work from home?" which was coded 1 = *Yes*, 0 = *No*.

TABLE 2 Descriptive statistics and correlations among study variables at T1.

	M	*SD*	01	02	03	04	05	06	07	08	09	10	11	12
Outcome														
01. Well-being	2.68	1.09												
Job demands														
02. Telework (0/1)	0.63	0.48	0.06***											
03. Work intensification	2.47	0.78	−0.28***	−0.07***										
Personal resources														
04. Self-efficacy	3.92	0.70	0.37***	0.07***	−0.06***									
Job resources														
05. Social support	3.54	0.92	0.15***	0.04***	−0.05***	0.12***								
06. Autonomy	3.64	0.92	0.14***	0.09***	0.03***	0.30***	0.15***							
07. Flexitime	3.75	1.02	0.19***	0.44***	−0.13***	0.15***	0.15***	0.34***						
Control variables														
08. Age	39.63	12.81	0.06***	−0.05***	0.21***	0.18***	0.02***	0.11***	0.01***					
09. Gender	0.71	0.46	−0.14***	−0.11***	0.05***	−0.16***	0.08***	−0.11***	−0.09***	−0.07***				
10. Job tenure	8.12	9.56	0.01***	−0.09***	0.19***	0.05***	0.00***	0.02***	−0.08***	0.65***	−0.08*			
11. Children	1.77	0.89	−0.05***	−0.11***	0.03***	0.03***	−0.07***	0.00***	−0.10***	0.18**	−0.10*	−0.02*		
12. Cohabitants	2.48	1.46	0.02***	−0.04***	−0.04***	0.01***	−0.05***	−0.05***	−0.05***	0.08***	−0.07*	0.08*	0.48***	
13. Telework experience	0.59	0.49	0.08***	0.60***	−0.04***	0.03***	0.04***	0.13***	0.40***	0.01***	−0.08*	−0.09*	−0.03***	0.00

M = mean; *SD* = standard deviation; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $N = 642$. Telework: 1 = teleworking; Gender: 1 = female; Age and tenure in years. Telework experience: 1 = yes.

2.5. Statistical procedure

We used R version 4.1.3 (R Core Team, 2021) and employed a three-step approach as described in Asparouhov and Muthén (2014). We decided to use a GBTM-approach [often referred to as latent class growth analysis (LCGA)] to assess the trajectories of our latent classes. In comparison to the often employed growth mixture modeling (GMM), which assumes the existence of distinct subpopulations, GBTM doesn't estimate within-group variability, and thus intends to approximate trajectories across population members (Nagin and Odgers, 2010). In order to deal with varying numbers of assessment time points as well as differing start times in our survey, we used the R package *LCMM* (version 1.9.3) to specify our models, which uses maximum likelihood estimation (Proust-Lima et al., 2017). To select the best fitting model, we first compared the BIC of several 1-class models with different link-functions (beta, linear, I-splines with varying number of knots) as well as varying specifications of time, allowing estimation of linear, quadratic and cubic trajectories. We used the *gridsearch* function of the package *lcmm* for automatic grid search, with 50 departures from initial values and 100 maximum iterations. In order to assess predictors of group assignment, measured at T1, we applied multinomial regression analysis, using *multinom* from the *nnet* (version 7.3-16) package (Venables and Ripley, 2002).

3. Results

3.1. Descriptive statistics

Table 2 displays the descriptive statistics and correlations among our study variables at T1. Our outcome well-being, measured with the WHO-5 well-being index, correlates negatively with job demands in terms of work intensification; and positively with personal and job resources. Job demands in terms of work intensification additionally correlate negatively with the job resource flexitime and positively with age and job tenure. As expected personal and job resources appear to be intercorrelated. Interestingly we find a negative relationship between gender and our outcome well-being and the personal resource self-efficacy as well as all job resources, except for social support, indicating slightly lower (in the case of social support higher) values for women in this study. Table A1 in the Appendix displays the correlations of well-being, as well as our focal variables at T1 with the lagged well-being measurements.

3.2. Trajectories of well-being (H1)

Table 3 displays the fit indices and entropy of our estimated models. Three groups should fit the data well enough, as can be seen

TABLE 3 Model indices of 1–7 classes for well-being.

G	npm	AIC	BIC	SABIC	Entropy	%Class1	%Class2	%Class3	%Class4	%Class5	%Class6	%Class7
1	6	6,682.52	6,709.31	6,690.26	1.00	100.00						
2	9	5,780.00	5,820.18	5,791.61	0.76	52.65	47.35					
3	12	5,463.59	5,517.17	5,479.07	0.75	22.59	32.40	45.02				
4	15	5,345.86	5,412.83	5,365.21	0.72	37.23	35.20	15.89	11.68			
5	18	5,298.52	5,378.89	5,321.74	0.73	35.83	2.80	18.54	11.06	31.78		
6	21	5,258.58	5,352.34	5,285.66	0.74	34.42	29.60	13.24	1.40	2.80	18.54	
7	24	5,231.42	5,338.57	5,262.37	0.74	18.69	33.96	27.88	2.80	1.71	13.55	1.4

G = number of groups; npm = number of iterations; AIC = Aikaike Information; BIC = Bayesian Information Criteria; SABIC = Sample Size Adjusted Bayesian Information Criteria.

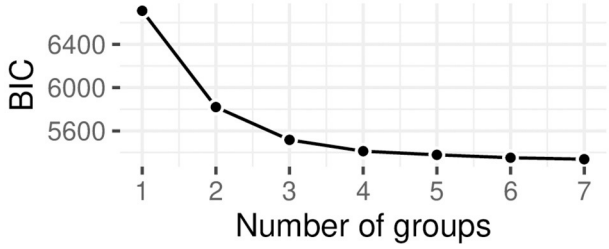

FIGURE 2
Elbow plot of BIC values for model selection.

in the elbow plot in Figure 2. Entropy was slightly lower from the two-class solution (0.76) but still acceptable with 0.75. The small decrease in BIC doesn't justify the risk of overfitting, by choosing a model comprised of more classes. Additionally we looked at the posterior probability of class membership assignment, which was above 0.8 on average for each of the classes.

The three-class model clearly differentiated three groups, which are displayed in Figure 3 using observed values with smoothed average scores. *Group: low level of well-being* consisted of 22% of the sample and is represented by an initially ever so slightly decreasing level of well-being as measured by the WHO-5 well-being index. Participants in this group on average had a higher level of well-being at the earlier time points, which deteriorated in the first couple of weeks, to slightly improve in the middle of April and consequently remain low throughout the the rest of the study. *Group: medium level of well-being* had the highest percentage of participants with 45% and is comprised of individuals with on average consistently medium levels of well-being. Similar to the low level of well-being group, we find an initial slight decline of well-being in this group, which recovers a little bit in the middle of April, to then deteriorate across the rest of the measurement time points. *Group: high level of well-being* consistently showed the highest level of well-being on average. This group displayed a continuous improvement of well-being up until May. Thereafter it declined slightly, but still stayed above the initial levels until the end of our study.

3.3. Group membership predictors, main effects (H2–H3, H5s–Hb)

Table 4 displays the result of our multinomial regression analysis, predicting trajectory group membership (AIC = 1, 252.32).

3.3.1. Hypothesis H2

We expected telework to be associated with trajectory profiles which indicate lower levels of well-being. No significant associations could be identified, neither for the change from high well-being group membership to low well-being group membership ($\beta = 0.38$, $p = 0.867$), nor for change from

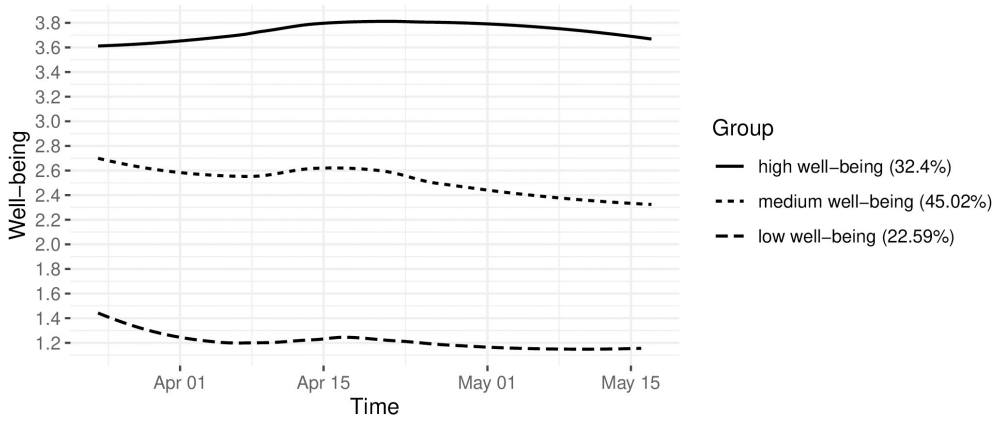

FIGURE 3
Group trajectories of observed average well-being scores.

high well-being group membership to medium well-being group membership ($\beta = 1.61, p = 0.380$).

3.3.2. Hypothesis H3

We assumed that the job demand work intensification would be associated with trajectory profiles which indicate lower levels of well-being. We found that work intensification was significantly related to well-being: with high well-being as reference, an increase in work intensification would lead to an increase of the likelihood of being a member of the low well-being group ($\beta = 1.70, p < 0.001$); this similarly applied to the likelihood of being a member of the medium well-being group ($\beta = 1.08, p < 0.001$).

3.3.3. Hypothesis H5a

We assumed that personal resources would be associated with trajectory profiles which indicate higher levels of well-being. We found that the personal resource occupational self-efficacy was significantly related to well-being: with high well-being as reference, an increase in occupational self-efficacy would lead to a decrease of the likelihood of being a member of the low well-being group ($\beta = -2.02, p < 0.001$); this similarly applied to the likelihood of being a member of the medium well-being group ($\beta = -0.93, p = 0.002$).

3.3.4. Hypothesis H5b

We hypothesized that job resources would be related to well-being group membership. No significant associations could be identified for any of the job resources included in this study, neither for the likelihood of belonging to the low well-being group (social support: $\beta = -0.22, p = 0.360$; decision-making autonomy: $\beta = 0.32, p = 0.208$; flexitime: $\beta = -0.34, p = 0.139$), nor for the likelihood of belonging to the medium well-being group (social support: $\beta = -0.05, p = 0.794$; decision-making autonomy: $\beta = 0.04, p = 0.863$; flexitime: $\beta = -0.24, p = 0.205$).

3.4. Group membership predictors, moderator effects (H4, H6a–H6b)

3.4.1. Hypothesis H4

We expected the influence of telework on trajectory profile membership to be moderated by the level of the job demand work intensification. For the low well-being group the interaction between telework and work intensification wasn't significant (telework × work intensification: $\beta = -0.68, p = 0.070$). A significant association was found for the medium well-being group regarding the interaction between telework and work intensification with a coefficient of $\beta = -0.63, p = 0.032$.

3.4.2. Hypothesis H6a

Only the interaction term of the personal resource occupational self-efficacy with telework had a significant association with the likelihood of belonging to the low well-being group ($\beta = 1.19, p = 0.007$). For the medium well-being group the interaction between telework and personal resources or job resources was not significant (telework × occupational self-efficacy: $\beta = 0.50, p = 0.163$).

3.4.3. Hypothesis H6b

Interactions of telework with all of the examined job resources were non-significant for the low well-being group (telework × social support: $\beta = -0.28, p = 0.335$; telework × decision-making autonomy: $\beta = -0.49, p = 0.129$; telework × flexitime: $\beta = -0.04, p = 0.902$); as well as the medium well-being group (telework × social support: $\beta = -0.10, p = 0.662$; telework × decision-making autonomy: $\beta = -0.24, p = 0.349$; telework × flexitime: $\beta = -0.16, p = 0.524$).

3.4.4. Control variables

For our control variables *age*, *gender*, *tenure*, and *telework experience* we found no significant relationship to group membership. The likelihood for members of the high well-being group of belonging to the low well-being group increased as

TABLE 4 Multinomial logistic regression of group membership at T1, reference group: high well-being.

	Reference group = high well-being	
	Medium well-being	Low well-being
Intercept	3.06 (1.41)*	5.47 (1.76)**
Telework (yes = 1)	1.61 (1.84)	0.38 (2.25)
Work intensification	1.08 (0.25)***	1.70 (0.32)***
Personal resources		
Occupational self-efficacy	−0.93 (0.29)**	−2.02 (0.37)***
Job resources		
Social support	−0.05 (0.19)	−0.22 (0.24)
Decision-making autonomy	0.04 (0.20)	0.32 (0.26)
Flexitime	−0.24 (0.19)	−0.34 (0.23)
Interactions		
Telework × Occupational self-efficacy	0.50 (0.36)	1.19 (0.44)**
Telework × Social support	−0.10 (0.23)	−0.28 (0.29)
Telework × Decision-making autonomy	−0.24 (0.25)	−0.49 (0.32)
Telework × Flexitime	−0.16 (0.25)	−0.04 (0.31)
Telework × Work intensification	−0.63 (0.30)*	−0.68 (0.38)
Control variables		
Age	−0.02 (0.01)	−0.02 (0.01)
Gender (female = 1)	0.19 (0.22)	0.13 (0.29)
Job tenure (years)	0.00 (0.01)	−0.03 (0.02)
Children	0.01 (0.14)	0.61 (0.21)**
Cohabitants	−0.06 (0.08)	−0.39 (0.15)**
Telework experience (yes = 1)	−0.06 (0.25)	−0.22 (0.33)

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

the number of *children* increased ($\beta = 0.61$, $p = 0.003$) and decreased the more *cohabitants* one had ($\beta = -0.39$, $p = 0.010$).

3.4.5. Graphical interpretation

To pinpoint the location and direction of our interaction effects, we plotted the group membership probability in function of our interaction terms in Figure 4. For the interaction of telework × occupational self-efficacy on well-being it becomes clear that, as occupational self-efficacy increases for participants without access to telework at T1 the probability of being a member of the low well-being group decreases. Having access to telework similarly decreases the probability of being part of the low well-being group even with low availability of occupational self-efficacy.

For the interaction of telework × work intensification on well-being we find that without availability of telework at T1 the likelihood of assignment to the high well-being group becomes rather slim as work intensification increases. Given the availability of telework the impact of increased work intensification isn't as pronounced: the likelihood of being a member of the high well-being group doesn't fall as sharply as without telework.

4. Discussion

This study intended to investigate how the onset of telework affected trajectories of mental well-being of working people and which resources were particularly helpful for coping with the new telework demands. We were able to identify three well-being groups (high, medium and low well-being), each of which showed a fairly static course over the survey period. In particular, the high well-being group tended to show a slight improvement in well-being, while the two groups of medium and low well-being deteriorated slightly.

Regarding the predictors of well-being trajectory group membership, which we measured at the initial time points, only the job demand work intensification had a significant relationship with trajectory group membership, pointing toward higher levels of work intensification being associated with lower levels of mental well-being. For the onset of telework we couldn't confirm a direct effect on well-being group membership. The personal resource occupational self-efficacy showed a direct, significant effect indicating a positive relationship between high well-being and occupational self-efficacy. No significant association were found for either of the examined job resources (i.e., social support, job autonomy and flexitime).

For our moderator hypotheses, we found an opposite than assumed buffering effect of telework. Having access to telework increased the likelihood of being a member of the medium or high well-being group even when occupational self-efficacy is low. That is, the availability of telework could compensate for a lack of occupational self-efficacy in regard to well-being group membership. Similar results were found for the interaction of telework with work intensification: the effects of work intensification were buffered by the availability of telework. Having access to telework increased the likelihood of being a member of the high well-being group even when work intensification is high. Again no significant interaction effects were found for telework with either of the examined job resources.

4.1. Theoretical implications

Building upon the *accumulation* and *adjustment* models of stress (see Zapf et al., 1996) we had assumed to identify varying trajectory profiles of mental well-being, but had to discard all of them, except for a rather stagnant, albeit slightly improving trajectory of well-being for the high well-being group and deteriorating trajectories for the medium and low well-being groups. Using the *accumulation* and *adjustment* models to explain these findings would suggest, that during the initial weeks of the pandemic, the participants of this study did not experience much of an increase in stressors or had sufficient resources to adjust to the new situation (Zapf et al., 1996).

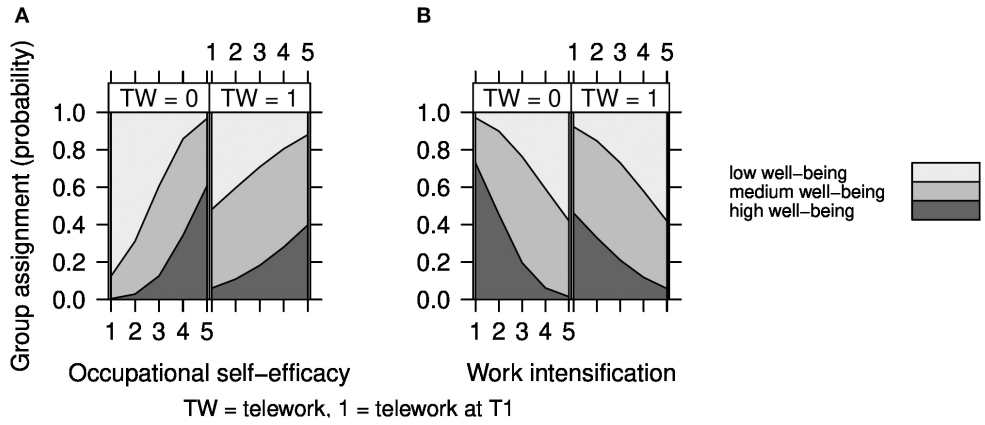

FIGURE 4
The interaction effect of **(A)** telework × occupational self-efficacy and **(B)** telework × work intensification on well-being.

We had expected to find more variation regarding trajectories of mental well-being, given that high day-to-day fluctuations of mental well-being have been reported (Totterdell et al., 2006). It is interesting to see that especially the persons with limited well-being suffered further losses, while the group with high well-being gained slightly in terms of well-being. This may be explained by the conservation of resources (COR) theory (see Hobfoll, 1989), which suggests, that individuals with more availability of resources are more likely to receive additional resources, while those with fewer resources are more likely to be threatened by resource-loss, similar to the Matthew effect: "For to every one who has will more be given, and he will have abundance; but from him who has not, even what he has will be taken away." (Matthew 25:29).

Our data did not support our hypothesis that the onset of telework is a job demand, which we had assumed to due its sudden implementation and reports of increased job demands due to teleworking during the COVID-19 pandemic (Wang et al., 2021). On the contrary, it turned out that in the initial phase of the COVID-19 pandemic, telework was a resource that could buffer the consequences of job demands in terms of work intensification and, in part, compensate for a lack of personal resources. Possibly, previous literature on telework was positively biased in the sense that mainly workers were included, who desired to telework and had favorable conditions (Delanoeije and Verbruggen, 2020); and it is not entirely clear whether telework could not also serve as a demand instead of a resource. Our article contributes to this question, because due to the forced transition to telework, we were able to survey people whose job and personal conditions were not necessarily ideal for it. This perception of telework as a job resource in the early stages of the COVID-19 pandemic is also reflected by the trend of many employees calling for a continuation of telework arrangements beyond the pandemic, which holds especially true for younger workers, as well as those with higher information and communication technology (ICT) use and those with positive experiences with telework (Georgescu et al., 2021). Additionally a recent survey found that 54% of 16,000 surveyed workers, across industries and countries, would consider quitting their job if certain amenities they experienced during the pandemic, like working from home and work time flexibility, were to be retracted (Ernst & Young, 2021; Melin and Egkolfopoulou, 2021). This classification of telework as a job resource is also supported by the significant interaction of telework with the personal resource occupational self-efficacy on well-being: the compensation of no telework availability through occupational self-efficacy is in line with and supports the assumptions of the job demands-resources (JD-R) model, according to which personal resources can compensate for missing job resources (Bakker and Demerouti, 2017).

The absence of significant main effects for the remaining job resources and their interactions with telework may possibly be explained by the specific circumstances brought upon by the COVID-19 pandemic: the effects of perceived autonomy, social support, or flexitime at the first survey time point may pale behind the importance of self-regulatory strategies in terms of occupational self-efficacy, as this may have been essential for transitioning and adapting to the pandemic situation. Similar results for teleworkers were found in France, where the job resources autonomy and organizational support didn't have as much of an impact on adjustment to telework as expected (Carillo et al., 2021). This would suggest that employees' belief in their ability to perform well in their job, regardless of the work environment, is more influential on their well-being than the resources provided by their job. The relevance of personal resources for well-being during the pandemic is in accordance with the literature (e.g., Cotel et al., 2021; Joie-La Marle et al., 2021). The lack of a significant effect of job resources on mental well-being during pandemic in this study may also inform the JD-R model, by highlighting the importance of considering personal resources such as self-efficacy in addition to job resources (Xanthopoulou et al., 2007). It is important to caution against overinterpreting the findings of our study as it was conducted during a specific situation the pandemic.

Nevertheless we found a significant association of some of our control variables with well-being group membership, in the

direction and context expected from the literature (i.e., children increasing the likelihood of being in the low well-being group; cohabitants decreasing it; Zamarro and Prados, 2021; Etheridge and Spantig, 2022), which speaks for the validity of our results, which held under the addition of these variables.

Although we had to discard telework as a job demand and rather found it being a job resource, we are able to add to the literature about personal resources in the JD-R model whose moderating relationship between job resources and the health improvement path had been recognized by Xanthopoulou et al. (2007), but not tested. Similar to our results, personal resources (i.e., optimism) were found to buffer the negative effect of low job resources on work engagement (Salminen et al., 2014).

What did we learn? Contrary to our assumptions, our study shows that telework is a job resource even in in its unfamiliar initial phase. Moreover we add to the JD-R literature by demonstrating positive effects of job and personal resources on trajectories of well-being over time.

4.2. Limitations and future research

Of course, our study has limitations that we would like to point out. We must caution about generalizing our results to non-pandemic periods and, although we surveyed longitudinally, we cannot specify cause-effect relationships because we examined only the effect of variables at T1 on well-being trajectory group membership. A clear strength of the study is that it captures well the onset of pandemic-induced changes, given that we started our survey immediately when lockdown mandates came to effect in Germany. It is conceivable that parts of our findings are due to influences of the particular situation rather than finding their genesis in the general onset of telework. Since the data analyzed here was limited to Germany, our research's applicability to other countries can't be assumed. This is equally true for the german work force in general. We can't rule out bias due to our retrospective approach of querying well-being (i.e., "How did you feel in the past week?"), as well as common method bias and using self-ratings instead of objective measures of well-being (Podsakoff et al., 2003; Schmier and Halpern, 2004). Additionally it is important to note that the majority of the convenience sample studied here was well educated, thus we can't assume absence of a socioeconomic bias either.

Future research should try to replicate our study design under non-pandemic conditions. Furthermore, it would be conceivable to use an experimental design in which long-term well-being is examined by means of occupational self-efficacy training, with and without the offer of telework, in order to be able to better analyze the individual effect facets.

4.3. Practical implications

Work intensification has been shown to be a stressor that is predictive of psychological well-being. Our results suggest that telework may contribute to improved coping with intensified work conditions. Telework can buffer the effects of work intensification and has a positive impact on well-being trajectories. In practice, it could be useful to grant stressed employees additional (or in principle) teleworking time to cope with special workloads and demands.

In addition, the study also shows that training of occupational self-efficacy can be useful to deal with special situations (e.g., when telework is not possible), since in our study the personal resource occupational self-efficacy in contrast to job resources had a sustainable effect on well-being trajectory group membership. A promising approach here could be, for example, interventions aimed at increasing psychological capital, a construct which, in addition to self-efficacy, also includes hope, optimism, and resilience (Luthans et al., 2010).

4.4. Conclusion

In conclusion, our study has shown that telework can have a positive impact on well-being by buffering the negative effects of work intensification. The results indicate that access to telework, where possible, can lead to improved outcomes in terms of well-being and can help employees cope with special situations such as the COVID-19 pandemic.

Furthermore, our study revealed that occupational self-efficacy is a personal resource that has a direct measurable effect beyond traditional job resources in the early period of the pandemic. The results suggest that training in occupational self-efficacy can be beneficial in helping employees deal with the unique stressors and challenges brought about by the pandemic. This highlights the importance of considering both job and personal resources in understanding employee well-being during the pandemic.

It is important to keep in mind, however, that the results of this study were obtained during a specific situation, the COVID-19 pandemic, and should not be generalized to other teleworking situations.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Institute of Psychology of the University of Duisburg-Essen's Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

FK and AM contributed to conception and design of the study. FK performed data collection, statistical analysis, and drafted the manuscript. AM provided the critical revision of

the manuscript. Both authors have read and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Table A1 Correlations among study variables and well-being at different time points.

	Well-being				
	T1	T2	T3	T4	T5
Well-being					
T1	1.00***				
T2	0.70***	1.00***			
T3	0.67***	0.78***	1.00***		
T4	0.61***	0.69***	0.78***	1.00***	
T5	0.62***	0.73***	0.76***	0.80***	1.00***
Predictors at T1					
Telework (0/1)	0.06	0.01	0.07	0.06	0.03
Work intensification	−0.28***	−0.23***	−0.23***	−0.31***	−0.35***
Self−efficacy	0.37***	0.32***	0.25***	0.22***	0.30***
Social support	0.15***	0.17***	0.14**	0.17**	0.15**
Autonomy	0.14***	0.11*	0.10*	0.00	0.06
Flexitime	0.19***	0.12**	0.18***	0.15**	0.15*
Age	0.06	0.04	0.02	−0.06	−0.07
Gender	−0.14***	−0.06	−0.05	−0.05	−0.09
Job tenure	0.01	0.00	0.02	−0.06	−0.08
Children	−0.05	−0.03	0.03	0.04	0.12
Cohabitants	0.02	−0.02	−0.03	0.02	0.00
Telework experience	0.08	0.02	0.06	0.08	0.02

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; Telework: 1 = teleworking; Gender: 1 = female; Age and tenure in years. Telework experience: 1 = yes.

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Working conditions for healthcare workers at a Swedish university hospital infectious disease department during the COVID-19 pandemic: barriers and facilitators to maintaining employee wellbeing

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Background: Healthcare workers (HCWs) at infectious disease departments have held the frontline during the COVID-19 pandemic. This study aimed to identify barriers and facilitators to maintaining the employees' wellbeing that may be used to increase preparedness for future pandemics within ID Departments.

Methods: In September 2020, a web-based survey on demographics and work environment was distributed to all HCWs at the Infectious Disease Department at Sahlgrenska University Hospital. Results were compared with a pre-COVID-19 survey from October 2019. A quantitative analysis of the overall effects of the pandemic on the working conditions of HCWs was conducted; in addition, a qualitative content analysis of open-ended responses was performed.

Results: In total, 222 and 149 HCWs completed the pre-COVID-19 and COVID-19 surveys (84 and 54% response rate), respectively. Overall, we found significant changes regarding increased workload, lack of emotional support in stressful work situations, and inability to recover after shifts. These factors correlated both with younger age and concern of becoming infected. The open-ended answers (n=103, 69%) revealed five generic categories (*Workload*; *Organizational support*; *Worry and ethical stress*; *Capability*; and *Cooperation and unity*) with a total of 14 identified factors representing plausible individual and organizational-level barriers or facilitators to sustained employee wellbeing.

Conclusion: Younger HCWs as well as those expressing worries about contracting the infection were found to be particularly affected during the COVID-19 pandemic and these groups may require additional support in future outbreaks. Factors both increasing and decreasing the pandemic-induced negative health consequences for HCWs were identified; this knowledge may be utilized in the future.

KEYWORDS

COVID-19 pandemic, working conditions, employee wellbeing, healthcare organizations, healthcare workers (HCW), infectious disease departments

Introduction

Since the beginning of the COVID-19 pandemic, healthcare workers (HCWs) at hospital infectious disease (ID) departments have constituted an important part of the frontline. ID departments have primary responsibility for treatment and isolation of patients with contagious diseases, as well as for providing guidance to other departments regarding infection control and prevention. Compared with neighboring countries, Sweden had many COVID-19 patients early in the pandemic, at a time when the knowledge base about COVID-19 was limited. This exacerbated the burden on hospital beds and HCWs. The number of ICU beds in Sweden is lower than in other European countries, which means that more severely ill patients need to be treated at regular wards (Public Health Agency of Sweden, 2020; Bauer et al., 2020).

During the pandemic, ID HCWs have experienced unprecedented changes in work environment and tasks. Early in the pandemic, there were reports of high COVID-19 infection rates and mortality among HCWs (Zhan et al., 2020). Previous studies on HCWs during the pandemic, focusing on health effects rather than effects on the HCWs' working conditions, have shown a negative impact on mental health, especially among frontline workers caring directly for COVID-19 patients (Ruiz-Fernández et al., 2020; Sanghera et al., 2020; Alexiou et al., 2021; Chen et al., 2021; Moradi et al., 2021; Lohela-Karlsson and Condén, 2022; Peccoralo et al., 2022). Interestingly, a large German survey on hospital HCWs showed higher levels of depressive and anxiety symptoms during the first wave of the pandemic than before, but lower levels compared to those in the general population during the pandemic (Morawa et al., 2021).

Reports on HCWs working specifically in ID departments are very scarce. A Korean questionnaire study performed during the spring of 2020 found high levels of burnout and depression among 115 ID physicians (Park et al., 2020). Similarly, a Chinese study with 2,299 participants found that the frontline medical staff, including 213 ID HCWs, were twice more likely than the administrative staff at the same hospital to suffer anxiety and depression (Lu et al., 2020). A recently published Dutch study noticed a deterioration of psychosocial working conditions for frontline workers during the pandemic, but does not state the percentage of the included participants working in an ID department (van Elk et al., 2023). A reduced job satisfaction compared with before COVID-19 was noted in a multinational survey among nurses, of which 118 ID department employees, including in Sweden (Makowicz et al., 2022). A recently published Swedish report on healthcare managers' work situation during the first COVID-19 pandemic wave found that managers of departments with high COVID-19 exposure reported more difficulties with decision-making authority in addition to a higher workload and less time for recovery, compared with managers with lower COVID-19 exposure (Björk et al., 2022).

While it is now clear that HCW distress has been increased by the COVID-19 pandemic, there is still limited knowledge about which factors increase susceptibility to and which factors can mitigate negative health consequences for HCWs during outbreaks (Pollock et al., 2020). Recently, a mixed-methods study on midwives in the United Kingdom showed changes in working practices resulting in increased job demands during the pandemic. It also suggested job resources that could help mitigate the negative health consequences on the midwives, such as ensuring adequate access to personal protective equipment as well as the importance of being valued and listened to in the workplace (McGrory et al., 2022).

Infectious disease departments have a crucial role in infectious disease outbreaks. To enable them to continue to care for patients during future pandemics, it is important to investigate how the COVID-19 pandemic affected working conditions specifically for ID HCWs.

The objective of the current study was to identify barriers and facilitators to maintaining the ID department employees' wellbeing, which may be used to increase preparedness for future pandemics. This was done by investigating how the work environment for HCWs at the ID department was affected during the first wave of the COVID-19 pandemic in Sweden.

Materials and methods

Study setting

The present study was performed at Sahlgrenska University Hospital, one of the major university hospitals in northern Europe, with approximately 17,000 employees providing care for about 700,000 inhabitants of the Gothenburg region and specialized care for the 1.7 million inhabitants of the region of Västra Götaland in western Sweden.

The study has focused on the HCWs employed at the ID Department. The Department has 62 hospital beds, including four intensive care beds. During the pandemic, several organizational changes were made: The intensive care beds were managed by on-site ICU specialists, instead of by ID specialists in conjunction with ICU

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TABLE 1 Percentage of health care workers (HCWs) at the Infectious Disease (ID) Department reporting negative responses (i.e., *disagree* or *strongly disagree*) on the work environment items in the pre-COVID-19 and the COVID-19 survey, respectively, and odds ratios for *disagree* or *strongly disagree* during, versus before, the COVID-19 pandemic.

Survey item	2019		2020		Odds ratio	
	n	%	*n*	%	OR	95% CI
I know what is expected of me in my work.	221	1.8	147	19.7	13.3	4.6–38.8
The quantity of my work seems reasonable.	221	12.7	148	51.4	7.3	4.4–12.1
I am able to take part in planning how my work is to be performed.	221	5.9	145	39.3	10.4	5.4–19.9
In my work, my skills and abilities are used in the right way.	221	5.9	146	13.7	2.5	1.2–5.3
My line manager helps me prioritize my work tasks as needed.	221	13.6	146	21.9	1.8	1.0–3.1
I can get help and support if emotionally stressful situations arise in my work.	219	6.4	145	17.9	3.2	1.6–6.4
I have scope for recovery during the work session through breaks and/ or rests.	221	10.0	147	51.7	9.7	5.6–16.7
I look forward to going to work.	220	2.3	147	27.2	16.1	6.2–41.9
I can set thoughts about work aside in my free time.	220	11.8	147	60.5	11.5	6.8–19.4
I have enough energy to do other things after the end of my shift.	220	21.4	147	63.9	6.5	4.1–10.4
I feel rested and recovered after a few days off.	222	9.9	147	57.1	12.1	7.0–21.0

CI, Wald's confidence interval; *n*, number of respondents; OR, odds ratio for answering disagree or strongly disagree during, versus before, the COVID-19 pandemic.

doctors on call. Meetings were kept to a minimum, administrative staff who were able to work from home were instructed to do so, and all employees were obliged to stay home and get tested for COVID-19 even with discrete symptoms of infection among themselves or family members. Several nurses from other, non-COVID-19 departments came to work at the ID Department and therefore needed to be trained and supervised by the regular staff. In the beginning of the pandemic, relatives of deceased patients were not allowed to visit the morgue for a final goodbye.

To limit the effect of the pandemic on the HCWs' wellbeing, the employer offered three types of preventive measures to the HCWs: scheduled meetings for collegial support; information on work environment and COVID-19; and individual debriefing sessions with the occupational health services (OHS). At the time of the study, personal protective equipment (PPE) was provided, but the COVID-19 vaccine was not yet available.

Study design

In September 2020, a web-based survey (the COVID-19 survey, designed to be completed in 10–20 min, and previously described in detail; Jonsdottir et al., 2021), was distributed to all employees at the hospital, including the ID Department. In the survey, respondents were asked to recall how they experienced their situation during the first pandemic wave in the spring of 2020. The survey contained demographic questions including age, gender, and professional role, as well as 11 single-item questions regarding work environment conditions addressing job demands, support, job motivation, and recovery (Table 1), based on the job demands-resources model. This model assumes that all job characteristics can be classified as either a job demand (i.e., physical, social, or organizational aspects of the job that are associated with physiological or psychological costs) or a job resource (i.e., positively valued physical, social, or organizational aspects that help staff achieve work goals), and that there needs to be a balance between job demands and job resources. Too high job demands in relation to available job resources have the potential to lead to health impairment, while sufficient job resources in relation to job demands can motivate workers and generate engagement, personal growth, learning, and development (Bakker and Demerouti, 2007).

All items were presented as statements with five response alternatives (*strongly agree*, *agree*, *neither agree nor disagree*, *disagree*, and *strongly disagree*). The demographic and work environment-related items had previously been examined in October 2019 within the hospital's regular systematic work environment management, offering a pre-pandemic measurement (pre-COVID-19 survey). In addition, the COVID-19 survey contained pandemic-specific items including questions regarding worries about becoming infected with COVID-19, access to PPE, and support from the employer, as well as an open-ended item: "*Which positive and negative effects have you experienced during the first COVID-19 wave in the spring of 2020?*" Since the surveys were initiated, developed, and distributed by the employer, using their own digital systems, data from the two measurements could only be matched on a department level and not on a unit or individual level.

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the Swedish Ethical Review Authority (ref. 2020-04771, date of approval October 31, 2020) for studies involving humans. Informed consent to participate was obtained from all study subjects.

The study was performed as a collaboration project with COPE Staff, a Swedish multicenter study aiming to investigate the psychosocial work environment and experiences of caring for pregnant and newborn patients during the COVID-19 pandemic.[1]

1 www.snaks.se/cope-staff

Statistical analyses

The demographic data (age, gender, and professional role), as well as data on COVID-19 specific items, and on the proportion of respondents reporting negative responses (i.e., *disagree* or *strongly disagree*) for the 11 work environment items, is presented as number and percentage.

The impact of the pandemic on HCWs' working conditions was assessed by calculating the odds ratio and 95% confidence intervals (CIs) for reporting negative responses on the respective work environment item, during the COVID-19 pandemic versus before the COVID-19 pandemic, using logistic regression analysis.

Potential barriers and facilitators to maintaining employee wellbeing were assessed by including interaction terms between COVID-19 status (pre-COVID-19 vs. COVID-19) and age, gender, professional role, and worry about becoming infected, respectively, in the logistic regression models and/or by assessing the association between the work environment conditions and these factors for the COVID-19 survey only using logistic regression analyses according to above. To keep the number of statistical tests low, when investigating these potential barriers and facilitators, we focused on six working environment conditions that were considered *a priori* important for HCWs in the ID Department. These conditions included job demands (clarity in expectations; quantitative work demands) and job resources (emotional support; ability to utilize skills and competence in the right way), as well as job motivation and recovery.

Data analysis was performed using SAS, version 9.4 (SAS Institute, Cary, NC, United States). The significance level was set at $\alpha = 0.05$, and all tests were two-tailed.

Qualitative analysis of open-ended questions

The answers were coded and grouped into generic categories with identified factors representing barriers and facilitators to maintaining the employees' wellbeing, according to content analysis as described by Elo and Kyngäs (2008). In a second step, the identified factors were stratified into barriers or facilitators of employee wellbeing, according to the job demands-resources model (Bakker and Demerouti, 2007), and grouped according to whether they worked on an individual or an organizational level (Dahlgren and Whitehead, 2007).

Results

Altogether 264 HCWs employed at the ID Department were eligible for participation in the COVID-19 survey, 149 of whom completed the survey (54%). Of these, 103 (69%) provided an answer to the open-ended question. The pre-COVID-19 measurement from 2019 yielded a response rate of 84% (275 HCWs were eligible for participation in the pre-COVID-19 survey).

Background characteristics and results of COVID-19-specific items are presented in Table 2. A total of 83% ($n = 123$) of the respondents of the COVID-19 survey were women. The majority (73%) were registered nurses or assistant nurses ($n = 72$ and $n = 35$, respectively), and 14% ($n = 21$) were physicians. The percentage of different age, sex, and professional roles was similar in the pre-COVID-19 survey ($p =$ n.s.).

Most HCWs had been involved in direct COVID-19 patient care ($n = 134$; 91%), had been working at their normal department ($n = 121$; 81%; data not shown), and always or mostly had access to adequate PPE ($n = 124$; 85%).

Impact of the pandemic on health care workers' working conditions

For all the 11 work environment items, a larger proportion of the respondents in the COVID-19 survey (range 13.7–63.9%) compared to the pre-COVID-19 measurement (1.8–21.4%) reported a negative response (*strongly disagree* or *disagree*), reflecting impaired working conditions during the pandemic. In the pre-COVID-19 survey, only one item out of the 11 had >20% negative responses, whereas in the COVID-19 survey, impaired working conditions with >20% negative responses were reported from the ID HCWs for eight of the 11 items (Table 1).

Odds ratios for reporting a negative response regarding working conditions in the COVID-19 survey versus the pre-COVID-19 survey ranged between 1.8 (95% CI 1.0–3.1) and 16.1 (95% CI 6.2–41.9), with slightly higher odds ratios for items representing job demands, job motivation, and recovery compared to job resources (Table 1).

Factors affecting the impact of the pandemic on health care workers' working conditions

When investigating factors affecting the impact of the pandemic on ID HCWs' working conditions, an overall interaction effect was seen between COVID-19 status (pre- and COVID-19 survey) and age, with a larger proportion of negative responses among younger HCWs. No interaction effects were seen between COVID-19 status and gender or professional role.

In the analysis of the effect of age and strong worry about becoming infected on the six selected work environment conditions in the COVID-19 survey, younger age, and frequent strong worry about becoming infected were associated with a higher proportion of HCWs reporting adverse working conditions. Those HCWs who, on a daily basis, experienced a strong worry about becoming infected reported a higher percentage of negative responses compared to HCWs who did not worry about becoming infected (Figure 1).

Lastly, we investigated the effect of support provided to the ID HCWs by the employer. Between 28 and 78% of HCWs used different types of support provided during the first wave of the pandemic (Table 1). Health care workers who participated in the three different provided support activities were more likely to report a lack of emotional support [odds ratio between 2.5 (95% CI 1.0–6.3) and 12.7 (95% CI 1.7–96.8)] compared to HCWs who did not use the provided support (Table 3). Furthermore, HCWs who attended debriefing sessions with the OHS were less likely to report negative responses regarding job motivation and recovery compared to HCWs who did not use this type of support [odds ratio 0.4 (95% CI 0.2–0.9); Table 3].

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TABLE 2 Professional role, age, and gender among health care workers (HCWs) responding to the pre-COVID-19 and the COVID-19 survey, and responses on the COVID-19-specific items in the COVID-19 survey.

	Pre-COVID-19 survey	COVID-19 survey
Number of respondents, *n*	222	149
Professional role, *i* (%)		
Physicians	37 (17)	21 (14)
Registered nurses	99 (45)	72 (49)
Assistant nurses	58 (26)	35 (24)
Administrative personnel	20 (9)	9 (6)
Other[1]	8 (4)	9 (6)
Age, *n* (%)		
<29 years	52 (23)	34 (23)
30–39 years	62 (28)	36 (24)
40–49 years	42 (19)	32 (21)
50–59 years	35 (16)	23 (15)
>60 years	29 (13)	24 (16)
Gender, *n* (%)		
Women	183 (82)	123 (83)
Men	30 (14)	26 (17)
Other/do not want to reply	9 (4)	0 (0)
Caring for COVID-19-infected patients, *n* (%)		
Yes		134 (91)
No		14 (9)
Strong worry about becoming infected, *n* (%)		
Many times per day		11 (8)
Daily		16 (11)
Occasionally		30 (21)
Rarely		49 (34)
Never		40 (27)
Sufficient access to PPE when caring for COVID-19-infected patients, *n* (%)		
Always or most often		124 (85)
Often		5 (3)
Occasionally		0 (0)
Rarely		1 (1)
Rarely or never		0 (0)
Not involved in COVID-19 patient care		16 (11)
Making use of the support provided by the employer, *n* (%)		
Scheduled collegial support		41 (28)
Information on work environment and COVID-19		115 (78)
Debriefing sessions with the OHS		56 (38)

[1]Other professional roles included managers, welfare officers, etc.
OHS, occupational health services; PPE, personal protective equipment.

Qualitative analysis of the health care workers' perceptions of working during the pandemic

The qualitative analysis resulted in five generic categories (*Workload*; *Organizational support*; *Worry and ethical stress*; *Capability*; and *Cooperation and unity*) related to 14 identified factors representing plausible barriers and facilitators to sustained employee wellbeing during the COVID-19 pandemic. These generic categories and factors included both barriers and facilitators on an individual and organizational level (Figure 2). The generic categories are described in detail below.

Workload

A general increase in workload was reported. The work situation was described as chaotic and stressful. There was a lot of time pressure; working overtime was more common than before, routines were changed very often, and there was a perceived lack of recovery after the shift. The HCWs experienced difficulties in maintaining a good work–life balance. Problems with technical equipment were mentioned. There was a widespread sense of exhaustion when working

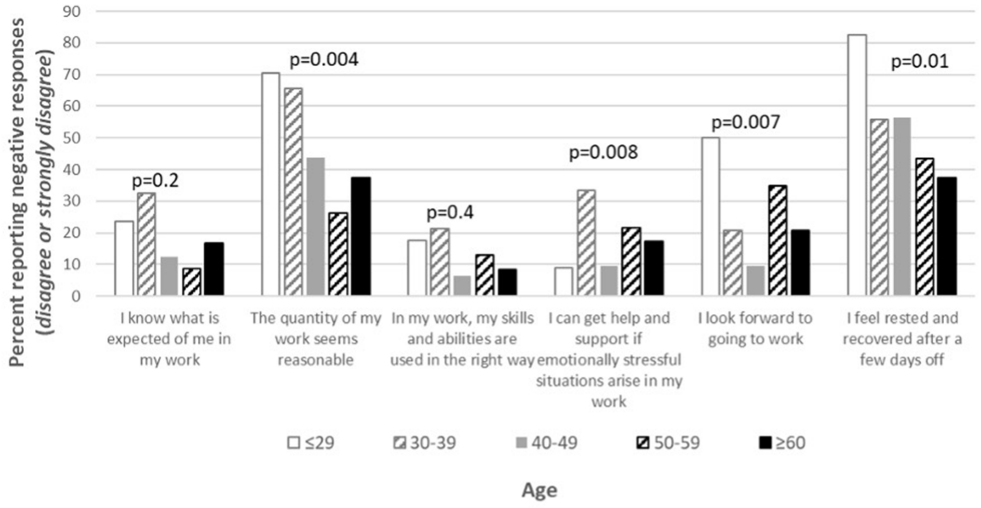

FIGURE 1
Percentage of health care workers (HCWs) at the infectious disease (ID) Department reporting negative responses (i.e., *disagree* or *strongly disagree*), stratified into age and strong worry about being infected, on selected work environment items in the COVID-19 survey.

TABLE 3 Odds ratios for reporting negative responses (i.e., *disagree* or *strongly disagree*) on selected work environment items in the COVID-19 survey if using, versus not using, the support provided by the employer.

Survey item	*n*	Scheduled collegial support		Information on work environment and COVID-19		Debriefing sessions with the OHS	
		OR	95% CI	OR	95% CI	OR	95% CI
I know what is expected of me in my work.	147	1.0	0.4–2.5	1.9	0.7–4.6	0.6	0.3–1.3
The quantity of my work seems reasonable.	148	0.8	0.4–1.6	2.7	1.2–6.2	0.5	0.3–1.1
In my work, my skills and abilities are used in the right way.	146	1.7	0.5–5.3	2.3	0.8–6.4	0.7	0.3–1.9
I can get help and support if emotionally stressful situations arise in my work.	145	12.7	1.7–96.8	2.5	1.0–6.3	3.2	1.1–8.9
I look forward to going to work.	147	1.2	0.5–2.8	1.1	0.4–2.5	0.4	0.2–0.9
I feel rested and recovered after a few days off.	147	0.8	0.4–1.7	1.9	0.8–4.3	0.4	0.2–0.9

CI, Wald's confidence interval; *n*, number of respondents; OHS, occupational health services; OR, odds ratio for answering disagree or strongly disagree if making use, versus not making use, of the support provided by the employer.

long hours in full PPE, which was exacerbated by the heat and perceived insufficient ventilation in the wards. Many employees described a shortage of staff, resulting in a feeling of being stuck in the patient rooms for hours without being replaced by a colleague. The fact that many HCWs were transferred to the ID Department and needed training added to the workload of the regular ID staff. The cooperation between employees with different professions did not always run smoothly. New research projects that were initiated during the COVID-19 pandemic also added to the workload of the personnel, whereas normal employment training programs were postponed. Some respondents described a sense of being on duty 24/7, partly because of the large media coverage and questions from friends and family.

Organizational support

Some respondents voiced their frustration with how the support systems at the hospital were managed. For example, the IT support was described as slow or dysfunctional. Frustration about long lead times at the laboratory was particularly prominent in the beginning of the pandemic. Furthermore, support and information from the Human Resources Department were perceived as insufficient. Initially, there was much frustration about the cooperation with the morgue, where the staff at the morgue were perceived as slow and were described as not making adequate decisions, for example when declining to receive visits from relatives of deceased patients.

Some respondents stated that there was a lack of information from the ID Department's management, both in general and regarding new work tasks and PPE routines. Moreover, information was shared on a "need-to-know" basis, but there were no clear guidelines about who needed to know what, which led to frustration among the HCWs. Some respondents felt that routines were not always thoroughly elaborated. It was mentioned that the Department's management should have made better use of existing competence among the staff. Planning of work schedules and staff was regarded as insufficient. There were also complaints about a lack of professional emotional support, especially for staff working nights and weekends.

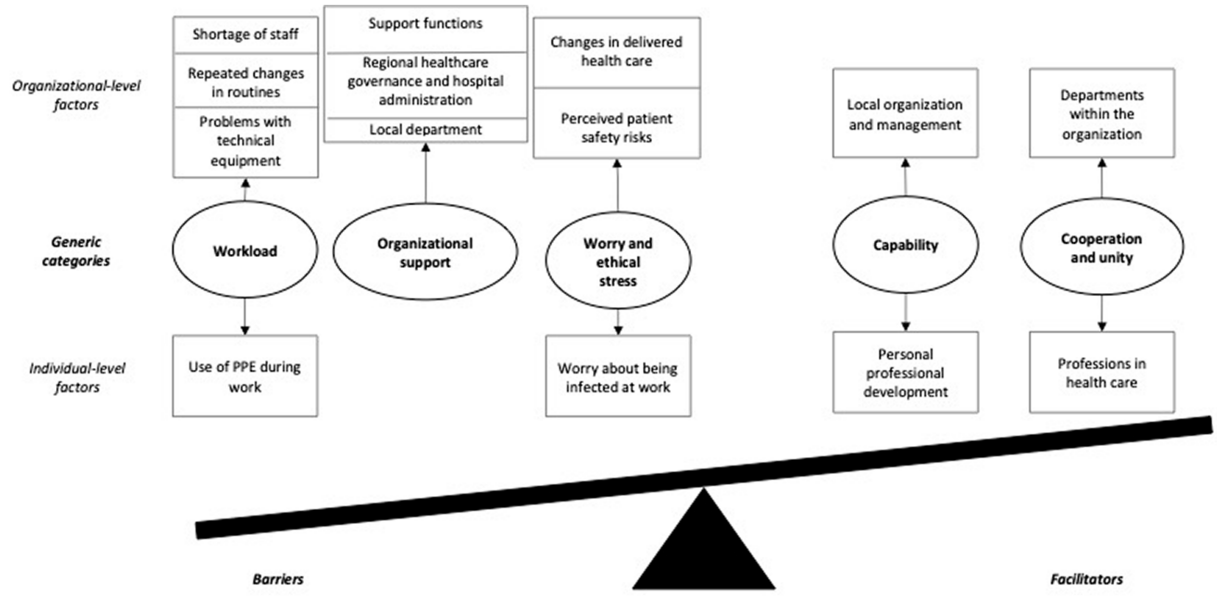

FIGURE 2
Generic categories with identified factors, stratified into barriers to and facilitators for occupational health, according to the job demands-resources model. PPE, personal protective equipment.

A perceived general lack of preparedness for the pandemic was mentioned. Lack of direct communication between the Department and the hospital's top management was also mentioned. There was dissatisfaction over the fact that personnel from the ID Department were not represented in the top level of management at the hospital during the pandemic. Some respondents mentioned that resources were distributed unequally between different departments, which led to frustration among the staff. The perceived deficits in hospital administration also affected the HCWs on a personal level, for example, vacations were canceled or reduced at short notice. Lack of economic compensation was perceived by some respondents as unfair and led to a sense of feeling undervalued by the top hospital management. Further, extra financial compensation awarded to employees working with COVID-19 patients was changed or withdrawn at short notice. The lack of hospital beds and understaffing, a known problem even before the pandemic, was exacerbated due to COVID-19. Some respondents also mentioned a lack of trust in upper hospital management and stated that they perceived a general lack of centralization regarding major decisions.

Worry and ethical stress

Concerns over patient safety were voiced. Patient transport between different departments was considered unsafe. Because of the large number of COVID-19 patients, there was a shortage of some drugs, and as a result, new medications had to be used. Insufficient instructions regarding these new drugs, new work tasks, and new equipment led to a fear of reduced patient safety. The magnitude of the workload and the long shifts of the ID HCWs contributed to these concerns.

A fear of contracting the infection was stated by several HCWs. For some respondents, difficulties preparing for a constantly changing work situation led to a general sense of insecurity. Lack of medical knowledge regarding COVID-19 caused worries. Work was perceived as emotionally challenging. In addition, some respondents worried that the hospital would run out of PPE. The uncertainty about the HCWs' annual summer leave also contributed to raised worries for their own health.

Several situations leading to ethical stress were mentioned. A lack of holistic perspective was perceived, where because of the high workload, HCWs had to focus only on emergency care and not provide the emotional support that they were used to providing. Some patient meetings were very difficult and a sense of insufficiency regarding contact with patients' relatives was described. The fact that, in the beginning of the pandemic, patients' relatives were not allowed to visit the morgue caused distress among the HCWs.

Capability

A high proportion of respondents praised the adaptability in the organization of the ID Department. The clear leadership, exercised both at unit and at department level, was highly appreciated. Decisions were perceived as measured, which led to a sense of calm and security. Some respondents appreciated that new guidelines were immediately put into effect. Access to PPE was considered adequate. The Department was generally perceived as well functioning. Crisis management was offered by the unit managers. The fact that the organization made extra resources available was appreciated. Given the patient safety risks mentioned above, the drug shortage situation was perceived as well handled, with clear instructions given. COVID-19 testing of staff was organized within the Department, which was valued by the respondents.

Several respondents emphasized the joy of learning new professional skills. Research initiatives were likewise appreciated by some. The staff felt a sense of fulfillment in working with tasks that they were trained for and in finally testing their skills in a real pandemic. Some mentioned a feeling of confidence regarding their personal professional skills. The staff valued the care relationships formed with COVID-19 patients. The continuous real-life process improvement was appreciated and led to a sense of building preparedness for future epidemics and serious events.

Cooperation and unity

The cooperation between different departments within the same hospital organization, i.e., the Internal Medicine, ICU, and ID Departments, was perceived as excellent by some respondents. In addition, great help was received from various other departments in the hospital, by contributing additional medical staff. The distribution of patients between different departments was deemed fair. It was helpful that new ICU patient beds were created, both at the ID Department and elsewhere. It was also greatly appreciated that the support from the Human Resources Department improved over time and that hospital transport and cleaning services extended their services.

Several respondents praised the interprofessional cooperation between different professions. There was a widespread feeling of unity within the work groups. A general, very strong sense that everybody was willing to work hard and support each other was emphasized, as well as the joy of going to work. Emotional support between colleagues was perceived as strong. Furthermore, widespread appreciation from the general public was gratefully acknowledged. Some respondents mentioned getting a boost out of being in the center of events.

Discussion

The results from our study show that HCWs at the ID Department experienced both increased job demands and a decrease in job resources during the first wave of the COVID-19 pandemic, compared to before the pandemic. Overall, the negative effect was larger for the job demands than for the job resources. A similar deterioration in working conditions during the pandemic has previously been described among hospital HCWs in a Spanish multicenter study (Gálvez-Herrer et al., 2022). In our study, no differences were seen between different types of HCWs, which is in contrast with previous research (Chatzittofis et al., 2021). However, being younger, and having frequent worry about contracting COVID-19 were factors associated with perceiving more adverse working conditions compared to others. The same tendency has previously been described for other HCWs including those in, but not restricted to, ID departments during both the COVID-19 and other infectious disease outbreaks (Kisely et al., 2020; Bueno-Notivol et al., 2021; Peccoralo et al., 2022), indicating that specific groups may need extra attention during extraordinary situations in health care.

Lessons from previous epidemics, especially severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), have pointed at the importance of adopting a qualitative approach to better understand the needs of, and find the best support for, frontline HCWs during pandemics (Maunder et al., 2006; Cabarkapa et al., 2020; Billings et al., 2021). When analyzing the open-ended item, both negative factors, plausibly acting as barriers to promoting employee wellbeing, and positive factors judged as facilitators, were identified. The negative factors experienced during the pandemic, which might partly explain the perceived deterioration in the HCWs' working conditions, can be summarized as an increased workload, a perceived lack of organizational support, worries about becoming infected, and ethical stress from not being able to perform patient care as usual. More specifically, the HCWs described challenges related to: use of PPE and technical equipment; repeated changes in routines; and staff shortages; as well as perceived lack of support from internal support functions, their own department, the hospital's top management, and the regional healthcare government; perceived patient risks; and worry about becoming infected. Similar negative effects on the working conditions were also described in a qualitative study including predominantly HCWs at ID wards in another Swedish county (Rücker et al., 2021), where focus group interviews with 51 participants revealed two main themes: "Concerns about the risk of infection and transmission to others" and "Transition from chaos to managing in a new and challenging work situation."

Among the positive factors, increased capability, and cooperation and unity were judged as facilitators that might partly counterbalance the plausible effect of a poor work environment on employees' health and wellbeing. The increased capability was experienced as personal professional development in the ID Department, but also as development of the department and management, where staff were able to follow protocols and routines which, previously, they had only been using in training scenarios. The increased cooperation and unity were found both between different departments at the hospital and between different professions and individuals in the ID Department. Interestingly, the recent Swedish study from Lohela-Karlsson et al., found negative health consequences in HCWs who were involved directly in COVID-19 patient care compared to HCWs who were not, but the consequences were less grave than in countries with a higher COVID-19 burden during the first pandemic wave (Lohela-Karlsson and Condén, 2022).

The discussed barriers and facilitators could be used to identify effective preventive measures in the context of the challenges at hand—measures that have the potential of increasing the resilience of a healthcare organization (McFillen et al., 2013). Consequently, for the ID Department, securing access to internal support functions, including the IT Department, increasing the vertical communication and trust within the organization, increasing the communication concerning changes in routines and patient safety, securing enough support for less experienced HCWs, and addressing the HCWs' concerns of getting infected may all be important preventive measures to increase the resilience of the Department for future critical situations. In addition, measures that promote the positive findings concerning the increased capability and increased cooperation and unity could also improve working conditions at the ID Department even during normal operations.

The qualitative analysis also demonstrated that factors underlying the identified barriers and facilitators that may affect HCWs' wellbeing were found at both an individual and an organizational level, highlighting the need for a multi-level approach when improving HCWs' working conditions (Hasson, 2005; Martin et al., 2016). Therefore, to successfully implement preventive measures at the ID Department based on the above, measures aiming to improve the organizational preconditions, such as securing sufficient resources for managers to enable their active involvement in the daily operations, and further developing the psychosocial safety climate, need to be included (Demartini et al., 2020).

Our results also indicate an imbalance between the job demands and resources, possibly with a resultant decrease in job motivation and possibility for recovery during the COVID-19 pandemic, compared to before the pandemic. Such effects on job motivation and possibility for recovery have previously been seen to be a result of high work demands and may lead to adverse effects on HCWs' wellbeing and health, as has been described for other frontline workers during the pandemic (Chersich et al., 2020; Salazar de Pablo et al., 2020; van Elk et al., 2023). However, more distal health effects, such as sickness absence and

employee turnover, could not be investigated as part of this study because the surveys were designed and distributed by the employer and restricted to items mainly concerning the HCWs' working conditions.

To reduce potential negative effects on the HCWs' wellbeing during the COVID-19 pandemic, the employer offered three types of support at an individual and/or group level (scheduled sessions for collegial support, information on work environment and COVID-19, and debriefing sessions with the OHS), which were used by 30–80% of the HCWs at the ID Department. When comparing perceived working conditions between HCWs who used these support measures with those who did not, results revealed that HCWs using the support to a larger extent perceived a lack of emotional support compared to others. One speculation is that HCWs lacking emotional support were more likely to seek, or be referred to, these support measures, thus indicating that the measure targeted the right group. These findings further highlight the need for a multi-level approach when improving working conditions. Health care workers attending debriefing sessions facilitated by the OHS experienced a somewhat smaller negative effect on job motivation and recovery compared to those not attending the sessions, indicating that debriefing sessions may potentially play an important part in reducing adverse effects on employee wellbeing during the acute phase of a pandemic.

Strengths and limitations

One strength of this study is the mixed method design including a pre- and post-COVID-19 measurement of perceived working conditions and qualitative data on HCWs' experiences of working during the first phase of the COVID-19 pandemic. Our study focuses particularly on HCWs at the ID Department, who not only possess the skills to treat severely ill patients with contagious diseases, but also play an important role in the healthcare organization as experts during a pandemic, and therefore need to maintain a functioning service during extraordinary events.

A limitation of the study is the use of aggregated data, which enabled us to compare the pre- and post-measurements on a group level, but not to follow the responses of individual participants over time, nor make adjustments for employee turnover. Another limitation was the somewhat low number of items in the survey, which prevented us from investigating a potential impact on more distal health effects. Moreover, although the selected items represented the job demands-resources model, there may be other effects on HCWs' working conditions, which were not investigated in this study.

Conclusion

This mixed method study with pre-COVID-19 and COVID-19 measurements has pinpointed both increased job demands and a decrease in job resources for HCWs at a large ID Department during the pandemic. Factors both increasing and decreasing the pandemic-induced negative health consequences for HCWs were identified, which may be useful knowledge for future disease outbreaks. An increased workload, a perceived lack of organizational support, concerns about becoming infected, and ethical stress from not being able to perform patient care as usual were found to be barriers to employee wellbeing. Meanwhile, increased capability and cooperation and unity were found to be facilitators of employees' health and wellbeing. In addition, younger HCWs and HCWs with a strong concern about contracting the infection may require additional support in future outbreaks. By ensuring emotional, managerial, and peer support, especially directed at these groups, we may be able to lessen the burden on frontline HCWs in future pandemics.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Swedish Ethical Review Authority (ref. 2020-04771, date of approval October 31, 2020) for studies involving humans. The patients/participants provided their written informed consent to participate in this study.

Author contributions

MV, KL, VS, YC, IJ, AD'I, LA, HW, and MA: conceptualization. MV, KL, and MA: methodology, formal analysis, and original draft preparation. YC, KL, VS, MV, MA, IJ, AD'I, LA, and HW: review and editing. KL and YC: funding acquisition. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychosocial risks emerged from COVID-19 pandemic and workers' mental health

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This paper examines the impact of work in a pandemic context on workers' mental health. Psychosocial risks have always been a challenging aspect of workplace health and safety practices. Moreover, the COVID-19 pandemic has affected workplaces in all sectors causing unexpected changes in work organization and working conditions, leading to the emergence of new psychosocial risks for health and wellbeing of workers. This mini-review aims to identify the main work stressors during pandemic period and related mental health problems to suggest recommendations and adjust health and safety practices regarding workplace mental health. A literature search has been performed using MEDLINE/PubMed, ResearchGate and Google Scholar databases, selecting articles focusing on work-related stressors and workers' mental health problems related to the pandemic. Specific psychosocial risks have been identified, including fear of contagion, telework-related risks, isolation and stigmatization, rapid digitalization demands, job insecurity, elevated risk of violence at work or home, and work-life imbalance, among others. All those risks can lead to elevated levels of stress among workers and affect their mental health and wellbeing, especially in terms of psychological distress, anxiety, and depression. As one of the social determinants of health, the workplace has an important and moderating role in workers' health. Therefore, in the pandemic context more than ever health protection practices at the workplace should be devoted to mental health problems. Recommendations provided in this study are expected to contribute to workplace practices to preserve and promote workers' mental health.

KEYWORDS

psychosocial risks, workplace stress, mental health, COVID-19, pandemic

Introduction

Since the World Health Organization (WHO) in 2020 declared the coronavirus outbreak an international public health emergency, which was soon declared as a pandemic (World Health Organization, 2020a) peoples' lives have changed in many ways. Fear and uncertainty, adaptation to new ways of living and working and consequently high levels of perceived stress have affected peoples' mental health. In the context of work, COVID-19 pandemic has affected workplaces across different sectors causing unexpected changes in work organization and working conditions, leading to the emergence of new psychosocial risks to workers' health and wellbeing

(International Labour Organization, 2020a). Psychosocial risks have always been a complicated aspect of workplace health and safety practices (European Agency for Safety and Health at Work, 2012). However, the pandemic has exposed workers to diverse psychosocial hazards impacting their health and wellbeing. Therefore, the aim of this mini-review is to identify the main work stressors during the pandemic period and related psychological and mental health problems among the most affected working groups, such as healthcare professionals and teleworkers.

Psychosocial hazards are defined as "those aspects of work design, work organization and management, and their social and environmental context that could potentially cause physical or psychological harm" (Cox et al., 2000). According to Cox et al. (2000), the sources of psychosocial risks are numerous: job content, workload and work pace working hours and shift work, workers' autonomy, control and participation in decision-making, organization climate including poor communication, poor leadership and perceived injustice, job insecurity, role problems such as ambiguity or role conflicts, interpersonal relationships, lack of social support or adverse social behaviors, such as harassment and violence, work-life imbalance, among others.

Psychosocial risks can affect workers' physical and psychological wellbeing through stress experience.

According to WHO, work-related stress is "the response people may have when presented with job demands and pressures that do not match their knowledge or skills and which challenge their coping abilities" (World Health Organization, 2020b). During the pandemic, workers' regular abilities to cope may have been exceeded in front of new pandemic-related psychosocial hazards, which could have resulted in high levels of work-related stress. Especially situations such as emergencies can lead to a state of chronic stress in which person may feel overwhelmed or unable to cope (World Health Organization and the International Labour Organization, 2018).

Many occupational groups have been directly affected by the pandemic. To large extent frontline workers responding to health emergencies could have experienced many sources of stress, such as the lack of personal protective equipment (PPE), consequences of wearing PPE, the fear of being infected and infecting family members, the conflict between safety procedures and providing care or performing tasks, long working hours, multitasking and the stigmatization of those working in high-risk environments (World Health Organization and the International Labour Organization, 2018; Giorgi et al., 2020). Workers employed in activities necessary for functioning during the pandemic (e.g., healthcare workers, police and civil protection, or services like delivery, transport or shops) have been exposed to numerous stressful situations. On the other side, many workers suddenly had to switch to telework and work in a home-setting, which has exposed them to different psychosocial risks such as balancing responsibilities of work, childcare and homeschooling, unstructured working time, imbalance between private and work part of the day and rapid digitalization (Bouziri et al., 2020; International Labour Organization, 2020a). It is important to note that one part of the workers faced an exceptional stressor such as the fear of losing their job or a circumstance of a job loss due to business closure during lockdown (International Labour Organization, 2020a).

Undoubtedly, work during the pandemic has been perceived as uncertain and stressful, causing a wide range of stress responses in workers, and consequently mental problems like mood changes, exhaustion, anxiety and depression, burnout and suicidal thoughts as well as reduced motivation and behaviors such as increased use of alcohol, tobacco, and other unhealthy habits (Stansfeld and Candy, 2006; International Labour Organization, 2020a). Regarding mental health, the COVID-19 pandemic is likely to exacerbate existing symptoms or worsen pre-existing mental health problems (International Labour Organization, 2020a). People with mental health problems could have difficulties to cope with multiple stressors related to the pandemic. According to the newest WHO statistics it is suggested that the pandemic has triggered an increase of 25% in the prevalence of anxiety and depression (World Health Organization, 2022). Data suggest that women tend to report higher levels of anxiety and depression in normal times and in emergencies. Possible explanation could be over-representation of women in more affected sectors (such as services) and frontline occupations (such as healthcare workers, e.g., nurses). Furthermore, women experience more burden of childcare and care for other members of a family, as well as household tasks (International Labour Organization, 2020a; International Labour Organization, 2020b). On the other side, men, especially if they are expected to provide family finances, have vulnerabilities related to job insecurity and loss of employment.

Identifying and assessing new psychosocial risks that emerged from pandemics, related mental health problems and groups at risk is the key step for implementing preventive measures to protect the health and wellbeing of workers in the context of the COVID-19 pandemic.

Methodology

A literature search was performed between September and November 2022 using MEDLINE/PubMed and ResearchGate databases as well as Google Scholar search engine. The search was restricted to recent articles, published since January 2020 and in English language, focusing on psychosocial risks, workplace stress, and workers' mental health problems, all in relation to the pandemic context. Initial search was performed using terms "psychosocial risks AND pandemic," "workplace stress AND pandemic," "work AND pandemic" and "mental health AND pandemic." In order to obtain more articles, the term "pandemic" was substituted with "COVID-19." Furthermore, a manual search of references to extend the search was performed. Finally, available full-text articles focusing on work-related psychosocial risks and related mental health in the context of the COVID-19 pandemic were considered for this mini-review. Besides scientific articles, relevant publications containing guidelines, recommendations or interventions for the work population published by recognized institutions such as WHO or International Labor Organization (ILO) were included, as well as articles explaining broader context of the research topic.

Psychosocial risks emerged from the pandemic

Although publications presented numerous psychosocial factors arising from the pandemic, for purpose of this article specific work-related psychosocial hazards will be discussed, including fear of contagion, stigmatization, telework-related risks, isolation, rapid

digitalization demands, job insecurity, elevated risk of violence at work or home and work-life imbalance.

During the COVID-19 pandemic, many workers have been exposed to a greater likelihood of being infected. Fear of infection, as well as workers' perception that their health and safety was threatened by their work environment could have generated work-related stress through workers' awareness, suspicion or fear that they were exposed to harm (Levi, 1984; Cox et al., 2000). In the pandemic context, exposure to the potentially dangerous virus, in a combination with a lack of information and, in some cases, lack of protective measures and equipment, could have caused stress among workers. Fear of contagion was the most common among frontline workers, such as healthcare and medical workers, workers in jobs that require contact with the public, workers in shops, restaurants, public services, school or transport service, as well as workers in sectors that had to continue to work in high-density environments such as factories or call centers (International Labour Organization, 2020a).

Related to the fear of contagion, a highly present psychosocial hazard during the pandemic was stigmatization. Social stigma in the context of the pandemic is "the negative association between a person or a group of people who share certain characteristics and a specific disease" (World Health Organization, 2022). WHO stated that during an outbreak stigma may cause people to be labeled, discriminated against and treated separately because of a perceived association with a disease (World Health Organization, 2020c). International Labour Organization (2020a) confirmed that work-related violence and harassment tend to rise during infectious disease outbreaks. Discriminatory behaviors related to increased social stigma could have contributed to work-related violence and harassment, both physical and psychological, which is considered to be psychosocial risk of high importance. In addition, the literature suggested that the most exposed to discrimination and stigma were infected people and healthcare workers (Giorgi et al., 2020).

On the other hand, many workers during the pandemic had to change their usual workplaces for home settings, exposing them to different telework-related risks. Inadequate ergonomic or working conditions (such as noise from the household) and factors like inadequate work equipment could have resulted in increased levels of stress. Further psychosocial risks associated to telework, such as unstructured working time, isolation and blurred boundaries between private and work part of the day, limited social interactions, domestic tasks and childcare created extra stress and difficulties in balancing work and family responsibilities (Bouziri et al., 2020; International Labour Organization, 2020a). Kotera and Vione (2020) suggested that new ways of work, including telework, could have impacted positively workers' work engagement, work-related flow, and connections between employees. However, telework could have also negatively impacted workers' psychological state increasing mental demands and causing fatigue. A study among Brazilian workers found differences between workers who voluntarily teleworked before the COVID-19 pandemic and those who did not have telework experience before the pandemic (El Kadri Filho and de Lucca, 2022). Workers with previous telework experience declared reduced ergonomic and psychosocial risks (El Kadri Filho and de Lucca, 2022). This led to conclusion that obligatory and unprepared switch to telework could have been especially stressful for workers.

Furthermore, digitalization of work is part of normal and expected technological change, however, that change has never been more rapid than during the pandemic. The pandemic required rapid adaptation to nonstandard ways of performing job tasks. Although it was shown that digitalization reduced costs and increased efficiency and information sharing among colleagues (El Kadri Filho and de Lucca, 2022), digitalization also triggered an intensification of work, increasing time pressures and disrupting social contact among workers (Palumbo and Cavallone, 2022). Digitalization and the rapid need for new skills development became a psychosocial hazard, especially for those workers whose skills did not match job demands. In addition, it was noticed that working from home also increased domestic violence. Studies suggested that forced proximity, along with economic stress and emergency related instability, were risk factors for aggression and home violence (Pedrosa et al., 2020).

Finally, changes in workload have affected workers in different ways. Frontline workers were exposed to augmented workload leading to symptoms of anxiety, depression and burnout. However, a certain part of workers had reduced workloads during the pandemic which was related to loss of economic status and consequently poor mental outcomes. As well, pandemic-related uncertainty manifested in job insecurity and economic problems, which was a major work-related stressor. Authors declared that uncertainty about the future and the lack of guaranteed employment were associated with increased stress, anxiety, depression and burnout (Kim and von dem Knesebeck, 2015). Finally, remote workers could have experienced technostress and home–work imbalance.

Similarly, Lulli et al. (2021) identified five important topics related to psychosocial aspects in the workplace during the COVID-19 pandemic: job insecurity and financial stress, work competence and adequate training (especially in healthcare workers), changes in workload and job demand, home-work balance and finally, support from colleagues and organization being a protective factor for mental health.

Ultimately, regarding potential work-related stressors in the post-pandemic period, predictions can be made based on previous pandemic outcomes. Authors pointed out that besides posttraumatic stress disorder related to the recovery from a life-threatening illness, it seemed that identified factors such as stigmatization, financial issues and job insecurity may have a long-lasting effect after COVID-19 (Hamouche, 2020).

Mental health during the pandemic and groups at risk

As mentioned before, working in the pandemic was characterized by high uncertainty, fear and high levels of stress. Thus, different authors reported a range of mental health problems among workers. The main reported mental health problems related to the pandemic were stress, anxiety, depression, insomnia, denial, anger, fear, post-traumatic stress disorder and sleep disorders, alcohol, and drug misuse (Giorgi et al., 2020; Gaspar et al., 2021). It was also shown that mental issues related to the pandemic were more likely to affect healthcare and emergency workers, migrant workers, young workers, workers in contact with the public and people with existing mental illnesses (Giorgi et al., 2020; Gaspar et al., 2021).

The majority of the selected studies on occupational stress during the pandemic time considered healthcare workers (Giménez-Espert

et al., 2020; Huang and Zhao, 2020; Morgantini et al., 2020; Ruiz-Fernández et al., 2020; Stelnicki et al., 2020; Wang et al., 2020; Franklin and Gkiouleka, 2021; Galbraith et al., 2021; Herraiz-Recuenco et al., 2022; Moreno Martínez et al., 2022; Tomaszewska et al., 2022), showing that they are a high-risk group for developing mental health problems derived from the pandemic (Giorgi et al., 2020; Franklin and Gkiouleka, 2021). For example Gaspar et al. (2021) found that health professionals were among those who suffer most from psychological stress and had the highest risk of burnout, and consequently greater risk of long-term symptoms, specifically chronic stress, depression and anxiety, increased substance use and finally, absenteeism from work. Furthermore, Franklin and Gkiouleka (2021) identified, except anxiety and depression disorders, symptoms of psychological trauma and posttraumatic stress, sleep disturbances, insomnia and fatigue, psychical and emotional exhaustion and burnout among healthcare workers. More specific data among the Spanish healthcare workforce showed high percentages of healthcare workers suffering from major depressive disorders (28.1%), generalized anxiety disorders (22.5%), panic attacks (24.0%), post-traumatic stress disorders (22.2%), and substance use disorders (6.2%) (Alonso et al., 2021). Similarly, research on healthcare workers in Italy showed that 49.38% of them had post-traumatic stress symptoms, 24.73% had symptoms of depression, 19.80% symptoms of anxiety, 8.27% insomnia and 21.90% high perceived stress (Rossi et al., 2020). Those are worrisome data indicating an urgent need to offer support for most exposed frontline workers during the pandemic.

On the other side, researches on working from home showed both positive and negative effects of telework on mental health and quality of life (Lulli et al., 2021; Platts et al., 2022; Zhang and Chen, 2022). However, one of the most important factors to be considered is that in the pandemic context, telework was enforced for a large number of workers, and the effect of mandatory telework could be much different than voluntary or optional, especially in the context of lockdown, restrictions and limited social interactions. One of the studies of mandatory telework during the pandemic (Platts et al., 2022) showed that telework could have had more negative impact on workers with existing mental health conditions. In those without mental health conditions, more stress and depressive symptoms were experienced by women and workers under 45 years (Platts et al., 2022). Women in general seemed to be more affected by the pandemic and telework than men.

The main pandemic-related psychosocial risks and mental health problems are summarized in Figure 1.

Workplace as determinant of health

Work is considered to be social determinant of health (Wilkinson and Marmot, 2003), one of the non-medical factors that influence health outcomes in positive and negative way (World Health Organization, 2023). It can expose workers to different hazards from work environment, however, it can be beneficial for workers' health assuring healthy physical and psychosocial working conditions. Therefore, occupational health and safety practitioners should consider the social context of work in order to minimize the negative effects of work to workers' health and foster the positive ones. Furthermore, in the pandemic context more than ever health protection practices at the workplace should be devoted to mental health problems.

World Health Organization and International Labour Organization (2022) recommends an integrative approach to the management of mental health at the workplace, focusing on three main aspects: (a) prevention, (b) protection and promotion, and (c) support. Key interventions regarding prevention consider adequate psychosocial risk assessment intending to minimize those risks and prevent workers from experiencing work-related stress and mental health problems. The aspect of protection and promotion includes raising awareness and strengthening skills, recognizing and early acting on mental health issues to protect and promote the mental health of all workers, mostly through education and training. It could also include activities toward enhancing employees' resilience and better stress-coping strategies. Finally, support considers activities toward workers with mental health problems to continue working. In general, activities addressing different aspects of the work environment (organizational measures) combined with individual interventions are shown to be the most effective solution to prevent psychosocial risks at work (Eurofound and EU-OSHA, 2014).

Referring to specific measures, it was found that during the COVID pandemic, when occupational stress was at very high levels, peer support was a key factor for managing work related stress. Another important factor related to workers' mental wellbeing was organizational support, which refers to employees' global beliefs regarding "the extent to which the organization values their contributions and cares about their wellbeing" (Kim and von dem Knesebeck, 2015). Social support at work was recognized throughout the literature as a protective factor against occupational stress, mitigating negative effects of high job strain, therefore it was beneficial for mental health (Karasek and Theorell,

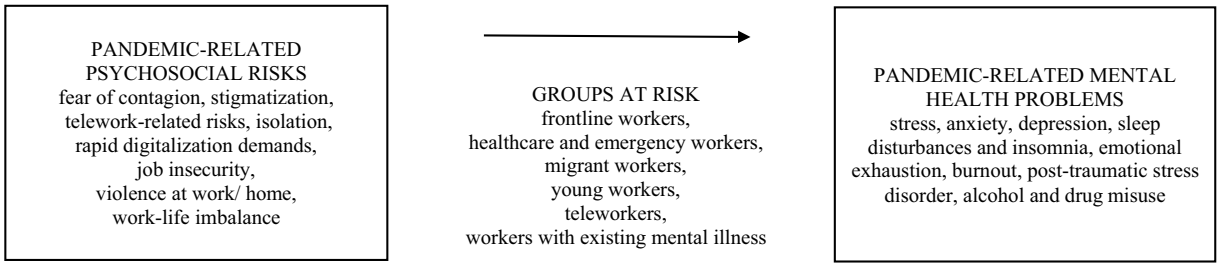

FIGURE 1
Main pandemic-related psychosocial risks and mental health problems.

1990; Hamouche, 2020). Furthermore, measures that were found to be successful in managing psychological distress among healthcare workers during past outbreaks included clear communication, access to adequate personal protection, adequate rest, and both practical and psychological support (Kisely et al., 2020).

Conclusion

From the perspective of occupational health and safety, although the pandemic has exposed workers to new risks and increased levels of stress, it has also raised awareness about the need to manage work-related stress and mental health problems. Creating healthy workplaces and a positive psychosocial environment is the way that employers can foster workers' resilience and promote mental health, especially in times of emergencies. This article provides employers, occupational health and safety specialists and stakeholders with key factors to consider in psychosocial risk assessment in the pandemic context in order to implement measures for protection and promotion of workplace mental health based on so far known information. However, not all long-term psychosocial consequences can be known at this moment, so further research will be needed as the situation evolves.

Author contributions

HK, MM, and MB contributed to conception and design of the study. MC, JČ, LB, and BB performed databases search. BB and PB selected and organized the relevant articles. HK and MM wrote the first draft of manuscript. HK, MM, MB, PB, and PJ wrote sections of the manuscript. All authors reviewed the manuscript and approved the final version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Challenges in preserving the "good doctor" norm: physicians' discourses on changes to the medical logic during the initial wave of the COVID-19 pandemic

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Introduction: The COVID-19 pandemic was a tremendous challenge to the practice of modern medicine. In this study, we use neo-institutional theory to gain an in-depth understanding of how physicians in Sweden narrate how they position themselves as physicians when practicing modern medicine during the first wave of the pandemic. At focus is medical logic, which integrates rules and routines based on medical evidence, practical experience, and patient perspectives in clinical decision-making.

Methods: To understand how physicians construct their versions of the pandemic and how it impacted the medical logic in which they practice, we analyzed the interviews from 28 physicians in Sweden by discursive psychology.

Results: The interpretative repertoires showed how COVID-19 created an experience of knowledge vacuum in medical logic and how physicians dealt with clinical patient dilemmas. They had to find unorthodox ways to rebuild a sense of medical evidence while still being responsible for clinical decision-making for patients with critical care needs.

Discussion: In the knowledge vacuum occurring during the first wave of COVID-19, physicians could not use their common medical knowledge nor rely on published evidence or their clinical judgment. They were thus challenged in their norm of being the "good doctor". One practical implication of this research is that it provides a rich empirical account where physicians are allowed to mirror, make sense, and normalize their own individual and sometimes painful struggle to uphold the professional role and related medical responsibility in the early phases of the COVID-19 pandemic. It will be important to follow how the tremendous challenge of COVID-19 to medical logic plays out over time in the community of physicians. There are many dimensions to study, with sick leave, burnout, and attrition being some interesting areas.

KEYWORDS

COVID-19, medical logic, physician, discursive psychology, neo-institutional theory, healthcare, pandemic response

1. Introduction

During a crisis, established routines must be changed and adapted to the prevailing situation. Crises are unexpected and characterized by uncertainty, which means that there is room for different interpretations and options for action (Schatzki, 2016). In other words, a crisis such as the COVID-19 pandemic was a natural experiment (Gross and Krohn, 2005; Gross, 2009), and knowledge of how to handle the acute situation that arose in the spring of 2020, especially in the Swedish healthcare, sector was poor (Nilsson et al., 2022). An earlier study shows that the organizational logic in Swedish healthcare changed when hospitals had to respond to the COVID-19 pandemic (Jacobsson et al., 2022). Furthermore, the challenges that physicians in Sweden faced in their working conditions during the pandemic's initial phase impacted their care provision experiences (Nilsson et al., 2022). In times when physicians can no longer trust their professional judgment and clinical expertise, they must instead find other ways to handle the medical responsibility of making good clinical decisions about immediate patient needs. This situation is often referred to as a situation of medical uncertainty (Han et al., 2011). Medical uncertainty can have aversive psychological effects on physicians, including thoughts and feelings of vulnerability, and can lead to a lack of decision-making and action. Physicians manage these effects and their experience of uncertainty itself through various strategies (Han et al., 2021), but the principal among these is the effort to seek information to reduce uncertainty. However, during the pandemic, no or very little information and knowledge existed (Nilsson et al., 2022). For physicians, there was a sense-making process when they had to interpret the encounter with the COVID-19 pandemic, a new condition that could not be understood and handled by the use of existing medical practices and guidelines (Weick, 1995; Weick et al., 2005). When new knowledge has to be created and established routines are no longer functional, this can be perceived as a disruption and something negative, but there can also be room for positive changes (Schatzki, 2016).

The norms of professional conduct for physicians include discourses of the good doctor, in which physicians have high-level evidence-based competence and professional judgment, balanced with great responsibility (Whitehead, 2011). Norms suggest that a "good doctor" uses both individual clinical expertise and the best available external evidence in clinical decision-making, and neither alone is enough (Sackett et al., 1996). The historical concept of the "good doctor" comprises a complex array of attributes and behaviors that physicians, already in medical school, learn to aim for (Whitehead, 2011). A recent review identified six different attributes that signify a "good doctor" (Steiner-Hofbauer et al., 2018). O'Donnabhain and Friedman (2018) list as many as 11 traits and seven behaviors of a "good doctor." Based on these two publications, typical identity attributes building up the "good doctor" are strong interpersonal skills, communication, patient involvement and ethics (including being compassionate, empathic, a good listener, responsive, humane, and honest), leadership (i.e., motivates and supports colleagues, teaching and supervision, and persistent), and sound clinical decision-making (i.e., medical management, remain current with the medical knowledge and evidence base, and contributes to a scientific understanding of disease).

Modern medicine involves three pillars of knowledge that physicians, to fulfill the identity of the "good doctor," need to integrate when making patient-care decisions: published evidence, clinical judgment, and the patient's values and preferences (Sackett et al., 1996). The focus on evidence in medicine is supposed to safeguard the patients and provide quality care, and practicing evidence-based medicine means integrating clinical expertise with the most recent clinical research in making decisions about the care of individual patients (Sackett et al., 1996). Being a "good doctor" underlies many physicians' view of their profession as a calling (Dzau et al., 2018). However, the COVID-19 pandemic has, by no doubt, been one of the most significant challenges to the practice of evidence-based medicine (Carley et al., 2020; Pacheco-Barrios and Fregni, 2020), impacting the foundation of being a "good doctor" at its very core (Pacheco-Barrios and Fregni, 2020). In this study, we make use of neo-institutional theory and discourse psychology to gain a more in-depth understanding of a situation when physicians are challenged in their profession and practicing modern medicine. In specific, the aim was to explore how physicians in Sweden narrate how they position themselves as physicians in relation to practicing modern medicine during the first wave of the COVID-19 pandemic. To the best of our knowledge, this is the first article with this approach.

1.1. Theoretical approach

In this study, our point of departure is the ***medical logic*** which we define as one part of the overall institutional logic in healthcare. Institutional logic is a concept used within the neo-institutional theory (Powell and DiMaggio, 2012) to visualize different spheres with different belief systems that maintain different types of relationships in and between organizations. We use this theory to get a deeper understanding of how physicians relate to organizational conditions when they have to carry out medical assessments. Logics are about the rules, routines, and values that give legitimacy, stability, and meaning to how individuals act and communicate within organizations.

Medical logic includes rules and routines combining research-based evidence with practical experience that condition clinical decision-making. Medical logic is foundational when it comes to physicians diagnosing, explaining, and treating the physical bodies of patients (cf. Rosenberg, 2007) and thus central in the discourse to form the concept of the "good doctor."

Different circumstances in the healthcare institution condition physicians' clinical decisions. These circumstances are what Scott (1995) terms regulative, normative, and cognitive elements. These elements both structure and constrain behaviors in institutions, fostering the identity of the good doctor (Whitehead, 2011). *Regulatory* elements (must do) are laws and formal regulations, often formulated as clinical guidelines, that set the framework for the activities within the organization for the physicians. The regulatory elements give physicians a certain degree of autonomy in their work. They can, to a certain extent, act independently when it comes to medical decisions (Forsberg Kankkunen and Bejerot, 2017). In addition, according to regulations in Sweden, physicians can delegate some responsibilities to other professionals.

The *normative elements* (should do) are more prescriptive and are based on standards, values, and norms that will guide members within the organization. In their clinical work, evidence-based medicine sets a range of normative elements of what physicians should do (Sackett et al., 1996) and for sound clinical management (O'Donnabhain and Friedman, 2018; Steiner-Hofbauer et al., 2018). *Cognitive elements* (want to do) are about cultures and routines that are taken for granted, the "common sense." Physicians are taught already in medical school that common sense aligns with the norm of being the "good doctor" (Whitehead, 2011).

Normative and cognitive elements scaffold individuals in organizations to pursue a learned, correct socialized behavior. The regulatory elements provide yet another firmer structure intended to regulate and limit more extreme versions of "incorrect" behaviors. Each of these elements draws on one or more sources of legitimacy by being legally sanctioned, morally authorized, and culturally supported. When regulative elements are weak, normative and cognitive elements change (Jacobsson et al., 2022).

To better understand how physicians construct their versions of what happened during the pandemic and how it affected their medical logic, we are inspired by discursive psychology. Discursive psychology is both a theoretical orientation and a methodological approach when it comes to studying language as a medium of human action (Potter, 2012). With the help of discursive psychology, we can capture how physicians, with the help of language, take certain positions in relation to organizational conditions. Language is not considered a mirror of the real world; language creates particular versions of the world and is situated in a given context. The language will be analyzed from a micro perspective but will be interpreted from a broader macro perspective since it is linked to ideologies, cultures, and contexts (Wetherell, 1998).

To find out how the physicians made sense of changes to the medical logic and how the discourses of a good doctor were challenged during the initial wave of the COVID-19 pandemic, we identify ***interpretative repertoires*** in the interview material. Interpretative repertoires refer to "recurrently used systems of terms used for characterizing and evaluating actions, events, and other phenomena" (Potter and Wetherell, 1987) (p. 149). The interpretative repertoires provide actors with different subject positions. The subject position is defined as the individual's "location within a conversation" (Edley, 2001), which means that positions are adopted and become relevant within a specific conversation. Wetherell (1998) emphasizes the individual's multiple positions and the possibility of showing the variety of available subject positions that are negotiated in talk and interaction. Parts of previous positions persist in the current situation and could be seen as a sedimentation of past discursive practices (Potter and Wetherell, 1987). The individual can vary positions within a conversation as well as between conversations, which means that they both produce and are a product of different repertoires. When individuals choose possible, preferable, rhetorically effective, or available repertoires, the subject position is *untroubled* (Wetherell, 1998; Staunæs, 2003). When individuals are using repertoires that are not interpreted as preferable, by themselves or by others—the position is *troubled* (ibid).

When individuals end up in troubled positions, ideological dilemmas can arise. Billig et al. (1988) used the concept of "***ideological dilemma***." According to Billig et al. (1988), ideology can be described as "common sense" in a specific time and context. Ideological dilemmas are embedded in different forms of knowledge. Scientific knowledge and scientifically trained expertise have high value and are guarantors for facts and evidence in medical contexts, alongside experienced-based knowledge based on long clinical experience. This can produce a dilemma between competing types of knowledge. Billig et al. (1988) argued that a dominant culture exists within each community, consisting of authorities and experts that have been approved by society. In the medical context, the doctors' voices as experts are strong.

In this study, we analyze how physicians talk about their experiences of the COVID-19 pandemic in terms of medical logic. The overall aim was to explore how medical logic was challenged during the first response to the pandemic. The interviews were conducted during the summer after the first wave of the COVID-19 pandemic. We believe that it is important to capture the experiences that the physicians had during the initial and ongoing crisis. These initial reflections can be critical since significant insights may be lost if interviews are conducted in retrospect.

2. Materials and methods

This study applies a qualitative research design using neo-institutional theory and discursive psychology to gain in-depth knowledge of Swedish physicians' experiences working during the COVID-19 pandemic. This study gained ethics approval from the Swedish Ethical Review Authority (2020-02433). All participants gave their consent to participate both verbally and written.

2.1. Interviews

Invitations to participate in the study were advertised on social media and in the journal for physicians in Sweden. Those interested contacted the research team and were sent a more extended invitation with a description of the project and information about consent. All those who were initially contacted by the researchers also consented to be interviewed. Most (n=24) interviews took place in virtual meeting rooms and five in a location chosen by the interviewed physician. Data were collected between June and November 2020 by two authors (EH and FB). A semi-structured interview guide was designed using discussion themes, supportive questions, and probes. Themes were derived from previous research on psychosocial working conditions, physician wellbeing, and management and change in healthcare systems. The interview guide was tested in pilot interviews, and minor changes were made before the rest of the interviews were conducted. The discussion themes in the guide concerned experiences from the transition from regular care to pandemic care, leadership and organization during the transition, a normal day during the pandemic, patient care and quality of care, existential health and moral stress, work, and private life and the future (see Supplementary material for the full interview guide). All participating physicians were asked the

same supportive questions while the probes differed depending on the experiences of the physicians and their willingness to talk.

Due to early reports from Italy and China that healthcare professionals working with patients infected with COVID-19 showed symptoms of post-traumatic stress disease (PTSD), each interview proceeded with initial questions screening for PTSD. None of the participating physicians showed clear symptoms of PTSD, and interviews could proceed. Interviews took between 60 and 90 min and were audio-recorded and transcribed verbatim by an external part.

2.2. Participants

A total of 28 hospital-based physicians were interviewed. The physicians worked in different geographical locations and regions in Sweden. Their experience as a physician ranged from 8 to 27 years. In total, five were consultants, 12 were attending physicians, and 11 were resident physicians. They were specialists or under specialist training in internal medicine (including infectious diseases), neurology, orthopedics, pediatrics, and anesthesiology. In total, 17 of the interviewed physicians were women, 15 were living with a partner and had children, two were living alone with shared custody of children, and two were single with no children.

2.3. Data analysis

In reading and analyzing the empirical material, we identified interpretative repertoires within medical logic. In the analysis, we searched for patterns in the empirical material based on subject positions and interpretative repertoires (Potter and Wetherell, 1987; Wetherell, 1998; Staunæs, 2003). The analysis process was led by authors MH and MJ. All four authors regularly met to discuss the analysis and results throughout the analysis process.

The analyzing process began with a close reading of transcribed interviews. The coding was initially inductive and descriptive. After that, occurring themes or ways of talking were identified. Keywords and recurring themes were grouped with an interpretive approach to gain into what is being said and *how* it was said (Seymour-Smith, 2017), which means that we were looking to identify how the physicians articulated their understanding of *if* and, in that case, *how* their thoughts on medical decision-making changed during the initial wave of the COVID-19 pandemic. To study *how* the interviewed physicians verbally constructed their versions of what happened during the pandemic, we initially analyzed three of the interviews more thoroughly with central concepts from discursive psychology and neo-institutional theory which was discussed between authors. Subsequently, interpretive repertoires were identified by, in more detail, studying discursive constructions in relation to subject positions (Wetherell, 1998) and ideological dilemmas (Billig et al., 1988). An interpretive repertoire can be described as a recognizable way of describing, framing, or talking about a phenomenon (Potter and Wetherell, 1987). Thus, the full research process was abductive, which means combining induction and deduction and altering between empirically studying the material and theoretically analyzing (Dubois and Gadde, 2002).

3. Results

The result shows that the interviewed physicians faced extremely challenging situations during the initial wave of the COVID-19 pandemic. They were challenged with an unknown disease with symptoms among patients who did not follow traditional utterances, leaving them without research-based medical evidence and without knowledge from practical clinical experience. This left the physicians without clinical guidelines, structured rules, and routines to support their clinical decision-making about how to treat COVID-19-infected patients best. On top of that, COVID-19 was an unclear yet highly infectious virus, and the supply of personal protective equipment (PPE) was limited. In addition, the interaction and communication with the patient and their relatives were negatively impacted.

Overall, in the initial phase and throughout the first wave of the pandemic, a knowledge vacuum occurred (Jacobsson et al., 2022) that deeply challenged physicians' medical logic. The three knowledge pillars of modern medicine, published evidence, clinical judgment, and patient communication (Sackett et al., 1996) were all impacted, challenging the possibility of acting in line with what is expected of a good doctor.

In our analysis, we have identified four interpretative repertoires: *medical evidence, clinical judgment and prioritization, patient communication,* and *risk*. In these repertoires, the physicians talked about factors related to regulative, normative, and cognitive elements that affected their decisions and behaviors and how their positions as physicians changed during the pandemic.

3.1. The repertoire of medical evidence

The repertoire of medical evidence illustrates the vacuum that arose in the lack of regulative elements and having no evidence-based knowledge. The physicians described the symptoms of the COVID-19 virus as unfamiliar. They could not use their current knowledge to safeguard and treat the patients since patients reacted in unpredictable ways. Since there was no, or limited information from traditional and formal channels, such as the hospital management or scientific guideline committees, other sources of information became important. Colleagues at different hospitals and/or in other countries that could contribute with updated information on social media became important.

The COVID-19 virus behaved in other ways compared to previous SARS viruses. Patients infected had unrecognized symptoms and responded to traditional treatments in a non-traditional way. The state of knowledge changed rapidly, and there was a clinical need to be updated several times a day. In the initial stage, there were no clear and stable clinical guidelines on how patients should be treated. The treatment strategy in the morning was sometimes out of date in the afternoon (IP6), and according to the interviews, this created a feeling of an experimental treatment for this "unknown" disease. At first sight, the patients seemed to be well; they were texting their relatives on their phones, but suddenly, in the next moment, they collapsed.

> *"And when I actually got scared, that was when you started to realize that these patients could have neurological problems, and we had a patient lying with seizures, and the neurologist was there, and they told us, but we have just had our first patient with haemorrhagic encephalopathy, so some kind of general bleeding brain and then it became like this ohh I do not want to hear this, I thought this was a respiratory infection."* (IP 14)

In the excerpt above, the physician described a medical dilemma. The symptoms of the patients with a suspected COVID-19 infection did not show the expected symptoms of a patient with respiratory disease (IP6). More suspicious was that despite oxygen treatment, patients did not improve. However, COVID-19 turned out to affect not only the patient's respiratory but also neurological symptoms such as seizures that later turn out to be a result of a brain hemorrhage (IP14). Informants described how their positions changed and that they became more dependent on support from colleagues. At the clinics, daily physical meetings, formal and informal discussions, and seminars, continuous updates on the state of the pandemic contributed with support in complex cases. As the patients showed new severe and extraordinary symptoms, informal networks with colleagues provided vital knowledge and support.

> *"So that helps, it makes you feel not so lonely, and you do not feel alone when you meet your colleagues, but even when you cannot, it probably feels like you know that you are not alone. Then if there is a particular decision that is tricky or so, but it would be exceptional, you can still ask many, and then you will not be alone about it either."* (IP16)

In the excerpt above, the interviewed physicians emphasized the problems with the position of being "alone" several times. For the interviewed physicians, social media (chatrooms and face-to-face conversations) became an important platform not only for providing knowledge and updated information about COVID-19 but also for establishing formal and informal networks with colleagues, both nationally and internationally. Earlier research has shown that online groups help people to improve their psychological wellbeing during the COVID-19 crisis (Marmarosh et al., 2020). The physicians described how these informal groups offered an opportunity to discuss the pandemic and exchanged experiences of how their work around the patients was organized and that it was important to belong to a group to find support in the knowledge vacuum.

The repertoire of medical evidence expressed by the interviewees shows that the medical logic changed during the pandemic. Since there was no or little empirical research and regulative elements, they could not lean on relating to what they must do. They had to find new informal groups where they could discuss medical decision-making in relation to normative and cognitive elements, what they should do, and what they wanted to do. The lack of knowledge and guidelines created dilemmas about what treatments to use for certain patients, which created conflicts between colleagues.

> *"And then yes, as I said, not to be allowed to give, not to be allowed to try even with antibiotics when you want to, and I do not know, it may not be ethical, but it is, for me, it was, not to be allowed to try a treatment that might have worked and that was not as expensive as... It was not like rocket science."* (IP 18)

3.2. The clinical judgment and prioritization repertoire

In the *clinical judgment and prioritization* repertoire, the interviewees described how they had to manage appropriate and safe care for many patients. A large number of seriously ill patients needed care, and it became clear that the capacity would not be enough. A big dilemma occurred when existing resources had to be prioritized. At the hospitals and care facilities, a discussion between physicians was initiated concerning treatment limitations. The interviewed physicians described that the preliminary statistics had shown excessive mortality among the patient group aged over 70. This created feelings of concern for physicians since this knowledge influenced how the resources such as medicines (IP 18) and visits to clinics (IP7) were prioritized. Before COVID-19, the healthcare system had no such restrictions, and this new experience created a feeling of "I could have done more."

> *"To not get, yes partly with this prioritization of place, that you leave a place empty just in case there might be someone who will need that place better, it was disgusting anyway."* (IP18)

There occurred an ambiguity about how the separation of the patients would take place. For the patients who had respiratory symptoms, it was obvious that they should be isolated. However, patients with no symptoms ended up in regular wards where routines and guidelines on PPE were not as obvious, so there were some descriptions where both patients and personnel were infected by COVID-19.

> *"We got corona to a department probably through staff. But it could just as easily have been some patient that we had and then moved from the admissions department, and the tests are not 100%, so above all, it is about sampling technique and how deleterious it would be if you missed such a case, that it is then added a corona patient into another department and then spreads. I think we had four deaths linked at least to one where it was spread on a regular department, so to speak. And that fear and anxiety, it was really hard, in fact, psychologically hard for oneself."* (IP15)

Clinical judgment and prioritization were also affected by the lack of personal protective equipment (PPE). PPE had to be prioritized between the departments and personnel. Since the PPE was limited and they only could visit patient rooms, when necessary, nurses and physicians coordinated their tasks. This resulted in physicians doing nurses' work tasks and nurses doing physicians' work tasks if possible. The physicians described these changed positions as challenging but also developing. Physicians and nurses supported each other and moved across

their safety zones, not in a dangerous way, but more as a helpful collaboration. (IP28). In the interviews, the physicians experienced this teamwork as positive and contributed to better communication between professions.

> "*But we have a good structure, so we have tried to help each other, the physicians, the assistant nurses, and the nurses, we have tried as well. You cannot go in [to the patient] as many as you like, as often as you like, so we have, as it were, do each other's tasks with more or less success sometimes. When you as a physician go and have to make your assessment, and then you have taken the food tray, done the checks, tried to put some intravenous needle that you have not done in 20 years, it went very badly, so we have tried to help each other as well. And it's because when someone goes in [to the patient], we have to do as much as possible right then, so many parts have become very positive in our teamwork here as well. We help each other, and we move across our comfort zones but not in a dangerous way but more in a helpful way as well.*" (IP28)

There was not only a shortage of PPE but also a lack of critical medicines such as oxygen, antibiotics, and medical equipment such as hoses to ventilators in the ICU. This meant that the treatment strategies needed to be re-evaluated and re-prioritized. The lack of drugs could lead to unorthodox treatments; for example, in the ICU, anesthetic gases were used as sedatives instead of regular intravenous medicine (IP23). Lack of medicine, oxygen, and beds in the ICU challenged the normal procedures of safe and quality-secured medical management of patients.

> "*For me, it is probably most important to tell this damn feeling when you could not help and did not get [to help] and then that you had to, that some, I had, these two specific, these patients who did not get the chance in the respirator and then… these two [patients] that I wanted to try antibiotics and did not get to do so and so, this feeling of not doing, I opt out of patients, that's it, it's like how hard it was and that the decision was not mine. But there are probably many who have experienced the same thing; I do not think I am alone in this.*" (IP18)

The proportion of seriously ill patients who sought care was more significant than the healthcare system had previously experienced. However, the already limited resources were not enough, and the lack of medication, equipment, beds, and personnel made it impossible to provide care as they had done a few months earlier. Instead, the interviewees describe how they had to negotiate with colleagues to prioritize resources between the patients. This repertoire also shows how the physicians and other personnel changed positions, helped each other, and tried in conversation with each other to expand the normative elements agreeing on what they should do to provide the best care for the patients in their clinical work.

3.3. The patient communication repertoire

The patient communication repertoire was about how the interviewed physicians experienced changes in relation to the patient, not being able to use the usual behaviors to interact effectively and ethically with patients and their relatives. The strict visiting restrictions at the hospitals led to reduced meetings between physicians and their patients, and visits from non-infected patients with non-emergency situations were canceled. According to the interviewees, they were prompted to book appointments by telephone or digital appointments, although, in some cases, this was not possible. Many of the patients belonged to vulnerable groups that had difficulty communicating, for example, patients with dementia and neurological diseases. Communication was also hampered by the fact that digitalization in healthcare had not been well developed and prioritized. Many physicians did not have the necessary equipment to have digital appointments (IP2). The canceled meetings affected the patients who were dependent on regular contact with the treating physician for adjustment of ongoing medication.

> "*…the kind of questions you want to ask your Parkinson's nurse, you want to tell that now it has gotten worse, or you have problems with increased symptoms or you wonder what to do with a caring-related problem or what to do if something gets worse or when you get side effects. Those questions were delayed or unanswered.*" (IP4)

Established communication channels between healthcare professionals and patients in physical meetings did not work, and the interviewed physicians were worried that the patients would not receive the help they needed. They also expressed that there were communication problems with patients in the clinics since the communication was constrained due to the PPE as visors and face masks. When wearing face masks, many of the patients were not able to hear what the physician said, and this led to many misunderstandings. In addition, for those patients who did not speak or understand Swedish, it became even more complicated to understand as no relatives or interpreters were allowed to attend to explain and translate.

> "*We especially had one [patient] that I remember, I worked at infection [department], a man from Somalia with mild dementia and did not understand any Swedish and did not understand anything, so he did not understand, he was very seriously ill and then with this mild dementia basically and so not know any Swedish. You could see the horror shine in his eyes, and it was so awful, and so I had to call his daughters and say please, please you cannot come, no you cannot come here, maybe if he gets much worse so that we think he will not make it, then maybe one of you may come, but not all may come.*" (IP 14)

Another communication problem in relation to patients was the physicians' contact with relatives. Due to the restricted visiting policy, the relatives were not allowed to visit their seriously ill and dying family members. This was very difficult for relatives to accept, and many of them reacted with anger. One example of a troublesome situation that came up in an interview was when a family had been notified that the prognosis for their family member was pessimistic. According to the existing restrictions, the physician had to refuse the relatives to visit.

> *"...and say it to the patient, of course, this will go well, but I still think you should take the opportunity to call and talk to your wife. Okay, what do you really mean? Should I say goodbye to my wife because it will not work, or should I listen to you, it will go well?"* (IP 23)

The physicians describe how difficult it was to argue in favor of the restrictions, not allowing relatives to come to the hospitals and visit the patients (IP 28). Moreover, communication with relatives that regularly occur at the bedside had to be moved to telephones. Physicians spent a lot of time describing the situation of the patient to their relatives.

In the patient communication repertoire, the physicians described ideological dilemmas that ethically occurred. They came in troubled positions and had difficulty finding other, new, and good ways to communicate with the patients and relatives, given the restrictions.

3.4. The risk repertoire

The risk repertoire concerns how the physicians experience a threat to health and wellbeing. The risk included the patients' lives, their own and their colleagues' lives, and also the risk that they would infect their relatives. The risk repertoire also concerns the unpleasant situations physicians faced when they had disagreements with colleagues (IP 10) and/or the management (IP3).

The interviewees gave several examples of when they were worried about the risk of being infected with COVID-19. One example was when a colleague became seriously ill and died following a COVID-19 infection (IP3). Another example was when a COVID-19-infected colleague had complications with diffuse symptoms and long-term sick leave (IP17). The situation was expressed by the interviewee to be out of control. One of them said that she questioned her work and was even considering quitting her current post as a physician. The realization that healthcare did not act as expected created an identity crisis about being a physician.

> "*And we have always felt that Sweden is an incredibly good place to be in if you are not if you are such a dutiful person, and now the whole world has collapsed for both my husband and me, really this whole bubble has just burst, there is nothing. I cannot trust my colleagues; I cannot trust that the health care will take care of me because they have not really done that, they had not taken care of me when I was sick, they have not wanted to take me now, I still have symptoms, it's like… it's the biggest crisis of my life.*" (IP17)

In the excerpt above, the interviewee uses an extreme case formulation (Pomerantz, 1986): the "biggest crisis of my life" to emphasize how COVID-19 has changed her life and her view on healthcare. The repertoire of risks was both concerned with becoming infected but also about "bringing" the infection home to the family. There are descriptions of how the physicians organized special arrangements with separate places to live to avoid exposing the family to the risk of being infected (IP 9). They looked, for example, into their life insurance (IP14). One of the interviewees married her spouse to secure the future of the family (IP 9). Another expressed that one of the hardest issues in his family life was that he had suddenly difficulty focusing on his children and being a part of their activities (IP1).

> "*I was afraid that I would unknowingly have Covid or be mildly ill and pass it on to someone else; I was very worried about that. So, I tested myself many times before I got it; you could say, out of that fear, I have small children at home.*" (IP15)

The interviewees talked about their workdays as overwhelming with a stressful and chaotic clinical situation, with many departments overfilled with patients. The physicians noted an increased risk of missing important changes in the patient's status and treatment when there was limited time to document correctly (IP2). With the extraordinary work situation, many expressed concerns about how to handle the workload and long working hours. Many of the interviewees described how the intense work situation made it difficult to unwind when getting home and that they had sleeping problems and nightmares. Sometimes, the interviewed physicians had patients on their minds when they came home. In some cases, they were worried that the patient they had met could have been treated differently and perhaps survived (IP28). One of them expressed it as follows:

> "*But this woman was not cared for where they usually care for that type of condition, either at the surgery department or the gastrointestinal department, but was cared for in isolation at infection (department) because we did not know if it was possibly a COVID infection and this woman passed away. And it's probably one of them; you asked me if I have had sleeping disorders, that is a patient that has been recurring in my mind because it was a very sad ending for that patient……so, she died alone in the room because our staff was occupied, we did not have the opportunity to be in the rooms with these seriously ill patients. So, this is a patient who has followed me a little in my mind, and the relatives have for very obvious reasons been very sad and disappointed.*" (IP28)

The interviewed physicians described several situations where conflicts arose because they had different opinions or did not want to work in COVID-19 departments. Some did not dare to say no to volunteering to work at the COVID-19 department because of the risks that it could provoke colleagues and lead to conflicts. One physician described choosing to remain at her department to wait for further instructions from the closest leader. One of her colleagues was provoked by the fact that the physician did not volunteer to help at the COVID-19 department and started to yell and scream (IP10). Another of the physicians described how expressing conflicting views on principles for sampling for COVID-19 in patients led to threats on social media and aggressive e-mails from colleagues, creating a completely unexpected work situation.

> "*I feel that no one listens at work, so I wrote on, you know that there is a physician-Facebook group and asked what it looks like in other Regions if, for example, you test people who have*

> *already had COVID-19, which [home Region] will not try, they have said no here. And at 11:30 p.m. I got threatening e-mails, yes, from colleagues at my clinic; it's true; I have saved everyone, taken screenshots, and so on. I have not talked to anyone except my husband, but yes, since then, I have not slept very well, I can say, and I go to work with a lump in my stomach and think, why I am here. If no one wants to listen to the facts, if no one even wants to discuss that maybe someone else has a different opinion, I may have, I'm wrong, I may not be right, but no one wants to discuss, but this is how the authorities have decided this, and you just have to keep quiet. And that is, it is very new to me, it was completely unexpected, it was unpredictable.*" (IP17)

Conflicts also arose between colleagues from different clinics from disagreements about prioritizing patients. The disagreements between physicians from different clinics were often related to when the patients from a specific department with COVID-19 needed to be isolated.

The need to belong is strong in humans, and therefore, the risk of not belonging becomes a serious risk. The interviewees narrated that expressing a different opinion concerning chosen treatment strategies was compatible with the risk of ending up on the "outside" of the group. One interpretation of this is that the physicians came in ideological dilemmas. Should they position themselves in untroubled positions in relation to the group and say nothing, or should they follow their assessment and put themselves in troubled positions in relation to the group?

> *"And then I think that it is my conclusion now then after so many months that there is an incredible fear of conflicts, you must absolutely not contradict because then you have to argue for your cause and maybe you are the troublemaker or like… yes you want to belong to a group, you want to belong to.*" (IP17)

In the risk repertoire, the ideological dilemma was expressed as a risk for the patients' lives as well as their own and colleagues' lives, including the risk that they also might infect their families. In the analysis of the empirical material, fear of the unknown and losing control seemed to be important where disagreements and conflicts with colleagues were present.

4. Discussion

In this study, the empirical material resulting from interviews with 28 Swedish physicians was analyzed using neo-institutional theory and discursive psychology. The overall aim was to explore how medical logic was challenged during the first wave of the COVID-19 pandemic. The analysis resulted in four interpretative repertoires: medical evidence, clinical judgment and prioritization, patient communication, and risk. In the physicians' narratives, it appears that they experienced major identity challenges when key attributes of the "good doctor," clinical knowledge, as well as evidence-based knowledge, were no longer available. The COVID-19 virus and the symptoms patients with COVID-19 presented with did not respond to the established clinical "common sense." Thus, without their professional identity foundations available, i.e., medical evidence, clinical judgment, and patient communication domain (Sackett et al., 1996), a knowledge vacuum was created. In this knowledge vacuum, the interviewed 'physicians' regulative, normative, and cognitive elements changed, creating medical uncertainty (Han et al., 2011). The repertoires used by the interviewees showed how they were dealing with dilemmas that arose and that they had to change positions as physicians to deal with these unexpected crises and related uncertainties. The change in position challenged them in relation to the norm of being a "good doctor." Clinical judgment and prioritizing are essential aspects of being a physician. The decision should be made based on both individual clinical expertise and the best available external medical evidence (Sackett et al., 1996). The main finding in this study was the vacuum that arose as physicians could not use their well-established medical logic and that they could not lean on existing regulatory and normative elements. In this vacuum, physicians still were responsible for clinical decision-making without a solid evidence base to fall back on. This knowledge vacuum challenged core attributes in the identity of being a "good doctor." When identities are being challenged, strong emotions can be excited (Bååthe and Norbäck, 2013). Wright et al. (2017) draw attention to emotions and affective mechanisms in the processes of institutional work.

From the interviews, it was clear that no guidelines were available, and patients did not respond as expected when treated with help from previous experiences. The lack of guidelines posed stress to physicians and changes to the organizational logic (Jacobsson et al., 2022; Nilsson et al., 2022), contributing to the knowledge vacuum. These results align with the findings by Pacheco-Barrios and Fregni (2020), who suggested that the COVID-19 pandemic posed a tremendous challenge to the foundation of being a good doctor.

In the medical logic, patient safety and quality care were also disrupted, which brought moral stress to the physicians. At least in the initial wave of the pandemic, Pacheco-Barrios and Fregni (2020) suggest it also caused "patients" harm. The medical code of ethics also clashed with the need to prioritize certain patients for treatments and ICU care. The shortage of medicines, such as oxygen and antibiotics, and beds indicates that the physicians had to prioritize treatment for those patients who were estimated to survive a tough treatment and then rehabilitation. Physicians were not able to apply their interpersonal skills, and communication with patients and relatives was disrupted. As suggested by Carley et al. (2020), evidence-based medicine was challenged by the COVID-19 pandemic. However, in the interviews, physicians described how they, from their troubled positions, became active to find their own (new) solutions to rebuild a sense of medical evidence. For instance, groups on social media were a great unorthodox source of knowledge. Social media has been used by physicians from other countries as a source of current knowledge of the best practices for COVID-infected patients (Shekar and Aravantagi, 2020). Connecting with other physicians through the use of social media also contributed to an experience of not being alone. This finding corroborates previous research finding that social belonging has a positive correlation with wellbeing (Salles et al., 2019). This innovative

way, and physicians becoming active in finding new ways out from the troubled position, resonates with Pratt et al. (2006), who concluded that identity construction is triggered by an experienced mismatch between what physicians did and who they strove to be.

In conclusion, during the first wave of the COVID-19 pandemic, a knowledge vacuum arose among physicians. In this vacuum, physicians could not use their common medical knowledge nor rely on published evidence or their clinical judgment. They were thus challenged as the "good doctor." It will be important to follow how the tremendous challenge of COVID-19 to medical logic plays out over time in the community of physicians. There are many dimensions to study, with sick leave, burnout, and attrition being some interesting areas.

4.1. Implications

One practical implication of this research was to provide a rich empirical account where physicians are allowed to mirror, make sense, and normalize their own individual and sometimes painful struggle to uphold the professional role and related medical responsibility in the early phases of the COVID-19 pandemic. As authors, we hope this research can contribute to physicians noticing that one's own early COVID-19 experiences were shared and reasonable, given the odd situation with "a vacuum of knowledge." Maybe this can contribute toward creating a sense of normalizing and belonging. This empirical research can possibly contribute toward healing invisible yet painful wounds that individual physicians can have received during the early phases of COVID-19 when upholding the professional identity of "a good doctor" was severely challenged. Indeed, this knowledge is also important for HR and managers in their essential task of taking care of the care providers so that the providers can take care of the patients (Bodenheimer and Sinsky, 2014). For future pandemics with high impact on healthcare, healthcare organizations need to support physicians through, for instance, forums where ethical and moral dilemmas and medical evidence can be discussed.

4.2. Strengths and limitations

In qualitative research, the purpose was not to extend findings derived from selected samples to people at large but rather to transform and apply the findings to similar situations in similar contexts (Polit and Beck, 2004). A strength of this article was that we analyzed material from 28 physicians with various specialities who, during the COVID-19 pandemic, worked in hospitals in different geographical areas in Sweden. This sample of physicians provides insights and reflections on the types of dilemmas and priorities faced during the pandemic.

In this study, we use discourse analysis on a microlevel, which provides a nuanced view of institutional processes. It is a method to study socially constructed ideas that underlie institutions and to question macro-institutional goals. We accept that any interpretation is one of many possible interpretations, but the findings in this article should be understood as relevant to physicians in similar contexts phased with a major crisis and as such valuable for future pandemic preparedness.

We have analyzed the material based on discourse psychology and new institutional theory, where we have focused on regulative, normative, and cognitive elements. What we may not have managed to capture with these analytical tools are the interviewees' underlying emotional reactions, which may be interesting to further study.

Data availability statement

The interview data analyzed during the current study are available from the corresponding author upon reasonable request. Due to the sensitive content in the material, and the Swedish Ethical Review Authority, the data is shared with caution.

Ethics statement

The study gained ethical approval from the Swedish Ethical Review Authority (2020-02433 dnr:2020-06110). All participants gave their consent to participate both verbally and written.

Author contributions

EB conducted 26 interviews and wrote most of the background and discussion. MJ and MH conducted the analysis and wrote the result section and discussion and knowledgeable in the theoretical approaches of discourse psychology, and MJ is also knowledgeable in the neo-institutional theory used in this study. FB conducted two interviews, participated with text and in the discussion of the results, and gave valuable comments on the manuscript. All authors contributed to the design of the study. This study is a collaboration by all authors. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The reviewer TT declared a shared affiliation with the author EB to the handling editor at the time of review.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1083047/full#supplementary-material

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Telework-related risk factors for musculoskeletal disorders

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Telework has become considerably more common during the ongoing pandemic. Although working remotely may have numerous advantages, negative impacts on workers' health and safety should also be considered. Telework is a major contributor to the development or aggravation of work-related musculoskeletal disorders where unsuited workstation ergonomics, sedentary behavior, as well as psychosocial and organizational factors play a role. This paper aims to identify telework-related risks and their impact on musculoskeletal health as well as provide recommendations that may be useful in constructing future preventive measures. A comprehensive literature search regarding the topic has been performed. Teleworkers experience musculoskeletal pain and discomfort mostly in low back area, neck, shoulders, arms, and hands. Poor ergonomic solutions when it comes to workstation design resulting in prolonged sitting in non-neutral positions contribute to the development and aggravation of musculoskeletal disorders in teleworkers. Working with inadequately placed screens and laptops and sitting in maladjusted seats without usual functionalities and ergonomic support is associated with musculoskeletal pain and discomfort. Extended working hours with fewer rest periods to meet increased work demands, social isolation, and lack of support from work colleagues and superiors as well as blurred work-home boundaries and omnipresence of work are commonly stated psychosocial and organizational factors associated with musculoskeletal disorders. Environmental factors such as poor lighting and glare, inadequate room temperature, and ventilation or noise, are frequently overlooked remote workstation risk factors. For a certain part of workers, telework will remain a common way of work in the post-pandemic period. Therefore, it is essential to identify telework-related risk factors for musculoskeletal disorders and address them with timely preventive measures tailored to each remote workstation's risks and individual workers' needs.

KEYWORDS

telework, musculoskeletal disorders, ergonomic risks, psychosocial risks, COVID-19, pandemic

Introduction

Computer work has previously been associated with poor musculoskeletal health where ergonomic (1), psychosocial (2), and individual (3) factors seem to play a role. Prolonged static posture and repetitive movements along with mental and visual strain arising from processing information and prolonged screen time are commonly associated with musculoskeletal health

in office workers (1). Musculoskeletal disorders (MSDs) affect up to 72% of office workers who commonly experience neck, low back, shoulder, elbow, and wrist pain (4).

Research suggests that remote work may furtherly exacerbate MSDs in workers switching to remote working. Studies have shown that up to 61% of workers who transitioned to telework experience aggravation of musculoskeletal pain (5) often of moderate to severe intensity (6). When compared to office workers, teleworkers have an increased risk of pain in all body areas as well as an increased risk for pain severity (7). Commonly present increased working demands (5) and long working hours (8) with less frequent breaks (9) lead to prolonged exposure to computer-related risks while simultaneously adding new ones arising from characteristics of telework. A conceptual model describing factors, moderators, and mediators arising from job characteristics, remote work environment as well as from individual differences that may influence teleworkers' health and well-being while teleworking has been proposed by Beckel and Fisher (10). It has been accentuated that frequently present poor ergonomic solutions when it comes to workstation design and equipment in remote setting result in prolonged static load in awkward positions with negative affect on musculoskeletal health (11). Often overlooked environmental factors such as poor lighting and glare, inadequate room temperature, and ventilation are workstation factors affecting body posture with significant association with MSDs (12). Most commonly reported psychosocial concerns arising from telework with a potential role in the onset or aggravation of MSDs include frequent interruptions due to household noise as well as a work-family imbalance caused by the omnipresence of work (13).

Before the pandemic, telework has shown to be prevalent in ICT-driven working sectors and encouraged as a mean to increase work productivity and quality, decrease a company's costs and improve employees' time management and quality of life (14, 15). The COVID-19 pandemic prompted the implementation of flexible work arrangements by imposing the need for social distancing to decrease person–to–person transmission of SARS-CoV-2, resulting in a significant increase in the number of workers that started to engage in flexible working arrangements. Research suggests that only 11% of workers in the European Union telecommuted in the pre-pandemic period with tripling percentages since the start of the pandemic (16). For some employees, telework has become a new and unknown way of working for which they were not adequately prepared, while in others telework evolved from part-to full–time working arrangement. Pandemic-related confinement led to a sudden transition to remote working, often with other household members, causing workers to perform their job in an unsuited setting with different risks that may potentially harm musculoskeletal health. Additionally, pandemic-related stress itself arising from fear of contagion and health deterioration as well as fear of financial problems may have an additional effect of pain/discomfort experienced in workers with pre-existing MSDs (17).

Considering the detrimental effect of musculoskeletal pain and disability on workers' and organizational well-being, understanding factors arising from telework that may contribute to the onset or aggravation of MSDs that could be a potential target for preventive interventions is of great importance. Therefore, this mini-review aims to identify telework-related factors associated with the onset or aggravation of MSDs in teleworkers as well as provide recommendations that may be useful in constructing future preventive measures.

Materials and methods

The MEDLINE/PubMed database was searched using MESH terms "teleworking" and "musculoskeletal pain." Due to a limited number of articles ($N = 3$), the search was broadened using non-MESH terms (("teleworking"[MeSH Terms] OR "teleworking"[All Fields] OR "telework"[All Fields]) AND musculoskeletal [All Fields]). Two authors independently reviewed available articles and decided on suitability for the current mini-review. References of selected articles were also reviewed to ensure the complete inclusion of relevant research. Only original research papers examining the association of telework conditions with musculoskeletal discomfort/pain were considered for inclusion.

Results

The MEDLINE/PubMed search revealed 272 papers. Upon exclusion of papers unrelated to telework ($N = 163$), we furtherly excluded papers unrelated to musculoskeletal pain/discomfort ($N = 75$) as well as secondary publications, recommendations, and theoretical research ($N = 6$). Of the remaining 28 papers examining musculoskeletal pain/discomfort in teleworkers, 11 did not examine the association between telework working conditions and musculoskeletal discomfort. Finally, 17 research articles were included in the present mini review with one additional article obtained from references of included articles, resulting in 18 original research articles in total. Identified telework-related factors that showed association with the onset/aggravation of MSDs in teleworkers are shown in Table 1.

Discussion

The current mini review focused on telework-related factors associated with the onset or aggravation of MSDs in teleworkers. Factors arising from poor ergonomic solutions when it comes to workstation design, poor environmental conditions as well from increased workload with fewer breaks are most commonly reported. High job demands with frequent distractions as well as blurred work-family boundaries seem to be the most frequently observed psychosocial factors associated with MSDs in teleworkers.

Available research suggests that poor ergonomic workstation design is more prevalent in flexible ways of work (18) compared to office work. Teleworkers seem to frequently substitute office desks with dining, kitchen, or children's desks and chairs (18–20) and may commonly be found working from a couch or bed in awkward and constraining postures. Additionally, they are more inclined to substitute traditional work setups consisting of desk computers, keyboards, and a mouse with other types of information and communication technology such as laptops, tablets, and phones (18, 21) with an additional negative impact on body postures (34). Prolonged static loading in awkward postures, along with prolonged sitting bouts and repetitive movement characteristic of computer work, may additionally negatively affect musculoskeletal health. Several selected studies (18–21) associated poorly designed ergonomic furniture with reported musculoskeletal pain/discomfort; however, due to the cross-sectional design of the studies causality cannot be determined. Snodgrass et al. (18) furtherly investigated differences in workstation settings and sitting postures in

TABLE 1 Factors associated with MSDs in teleworkers.

References	Factors with significant correlation/ association with MSD
Gosain et al. (11)	WH, dedicated workspace, psychological stress, breaks, eye strain, PA, gender
Yoshimoto et al. (17)	TW experience, psychological stress, PA
Snodgrass et al. (18)	Non-ergonomic equipment, postures
Radulović et al. (19)	WH, interruptions, non-ergonomic equipment, breaks, age
Du et al. (20)	WH, non-ergonomic equipment, gender
Garcia et al. (21)	TW frequency, living with more than one person, non-ergonomic equipment, prolonged sitting, lighting
El Kadri and Lucca (22)	Dedicated workspace
McAllister et al. (23)	Non-ergonomic equipment, perceived discomfort, ergonomic training
Matsugaki et al. (24)	TW frequency, dedicated workspace, spacious desk, lighting, air quality
Matsugaki et al. (25)	TW frequency, dedicated workspace, spacious desk, lighting, air quality
Minoura et al. (26)	TW experience, living with children, psychiatric disorders, cancer, smokers
Wütschert et al. (27)	Perceived privacy, relaxation
Gupta et al. (28)	WH, pre-existing MSD, sedentary time, gender
Oakman et al. (29)	Quantitative demands, work–family conflict, workstation comfort, gender
Rodríguez-Nogueira et al. (30)	Pre-existing MSD, gender
Tezuka et al. (31)	TW frequency
Dannecker et al. (32)	Self-rated health
Houle et al. (33)	Pre-existing MSD

TW, telework; MSD, musculoskeletal disorders; PA, Physical activity; WH, working hours.

computer workers before and during the COVID-19 pandemic with results showing a decrease in good and an increase in poor sitting postures during confinement. Reason for such findings may be the limited availability of working equipment in the remote setting during the pandemic, particularly in shared households. As mentioned before, the pandemic has caused a sudden transition to new ways of work for which employees may not be adequately prepared. It is possible that multiple members of a household suddenly transitioned to working or schooling from home limiting working space and equipment, and with the need for mutual usage and sharing. El Kadri and Lucca (22) observed differences in ergonomic risks concerning previous experience in telework suggesting higher ergonomic risks in workers starting telework during the pandemic, with unpreparedness as a possible explanation. However, considering that research has been conducted one and a half year after the start of the pandemic, authors suggest that, along with the novelty of the pandemic, organizational and individual lack of initiative for evaluation and adaptation of employees' working conditions may contribute to poorer working conditions in inexperienced workers (22). Studies have previously pointed out the lack of organizational support for teleworkers when it comes to providing ergonomic equipment as well as support and guidance in installation and usage (35). Research suggests that besides providing ergonomic furniture and equipment, education on how to properly set up workstations may be of as much importance. However, studies have also shown that almost 60% of teleworkers do not receive basic guidance on setting up their workplaces (14). By showing the interaction of reported MSDs with a model consisting of non-ergonomic furniture, perceived discomfort, and ergonomic training, McAllister et al. (23) additionally pointed out the importance of education and ergonomic training in setting up a remote workstation in the prevention of MSDs.

Perceived discomfort may only partially be related to workstation design. Environmental working conditions such as air quality and temperature, inadequate lighting, and noise are significant sources of distraction and discomfort affecting office workers' physical and mental health (12). Inadequate air temperature, poor lighting, or glare as well as noise related to conversations, telephone calls, and notifications cause distractions and psychological distress that relate to musculoskeletal discomfort in office workers. Similarly, an association of poor lighting and air quality (21, 24, 25) with the occurrence of MSDs in teleworkers has been observed in several selected studies. Matsugaki et al. (24) showed that teleworkers are generally satisfied with their environmental conditions at home with only 16% of them reporting poor lighting and 25% reporting poor air quality. However, more than 77% of queried teleworkers reported that they have a dedicated place to work, which may relate to perceived positive experiences regarding environmental working conditions. Similarly, Montreuil and Lippel (14) have previously reported that teleworkers are more satisfied with domestic working conditions where they might experience more control over air quality and noise compared to office work, but only the ones having a dedicated place to work.

Lack of a dedicated place for work (11, 22, 24, 25) as well as experiencing frequent interruptions (19) by surrounding household noise or other household members (21, 26) are important psychosocial factors associated with MSDs in teleworkers. Frequent distractions and low perceived privacy (27) observed in teleworkers cause psychological distress and affect musculoskeletal health. Research suggests that women, in particular, may experience increased psychosocial demands due to multiple household roles and may be at an increased risk of negative mental and physical health outcomes while teleworking (36). A significant association has been observed between being a female and reporting MSD while teleworking (11, 20, 28–30). Women seem to be more frequently affected by work-related MSDs when compared to men regardless of occupation and work setting (37–39). Although reasons for such findings are yet unknown, previous research suggests that work and household demands as well as work-related physical and psychological demands may have a role in the greater prevalence of musculoskeletal discomfort in women (1). Paradoxically, women seem to perceive a greater value in teleworking when compared to men, seeing it as an opportunity for better work-family balance (40, 41). However, long working hours and high job demand frequently imposed on teleworkers may have the complete opposite effect on work-family balance. "In exchange" for greater flexibility in scheduling working hours, employers may raise expectations regarding employees' workload and availability (42, 43) blurring the boundaries between work time and family time resulting in work–family conflict (27). Studies have shown that setting spatial and temporal boundaries between work time and family time activities as much as possible may be beneficial for work-family balance and teleworkers' mental health in general (44).

Studies have shown that the pandemic brought an additional workload on teleworkers. Snodgrass et al. observed an increase in the frequency of teleworking in part-time teleworkers during the pandemic from an average of 28% to 48% of total working time (18) with increasing daily working hours as well (20, 28). Du et al. observed that despite contracted 7 h working days, workers spent an additional hour and a half working during the pandemic confinement (20). Reasons for increased working hours may arise from perceived job insecurity commonly reported in teleworkers during the pandemic (17) making them work harder to meet increased job demands, as well as in more frequent distractions due to an increased number of household members starting their work or school remotely. Several selected studies showed increased working hours as well as the frequency of teleworking to be associated with reported MSDs (11, 19, 20, 24, 25, 28, 31) probably due to physical and mental overload arising from ergonomic and psychosocial factors of telework.

Psychosocial, ergonomic, and environmental risks arising from telework may furtherly be worsened by observed changes in levels of physical activity and time spent in sedentary behavior during the pandemic (17). The aforementioned changes may be attributed to the nature of telework as well as pandemic-related confinement. Home-based work enables work without the usual office interruptions with less need to stand up and less mobility than within the company causing prolonged bouts of sitting behavior (17). Research suggests that home-based workers spend longer engaging in single bouts of sitting behavior when compared to office workers (45, 46). Additionally, high working demands and long working hours associated with telework may furtherly increase sedentary time altogether. On the other hand, by imposing lockdowns, the pandemic affected both work-related and leisure-time physical activity. Time spent in healthy ways of commuting such as walking or cycling has decreased (30). Leisure-time activities shifted from aerobic activities predominately performed outdoors (running, cycling, walking, swimming) toward strength and flexibility activities that can easily be performed at home (30). A systematic review analyzing changes in physical activity and sitting behavior during the COVID-19 pandemic reports a 5%–11% decrease in physical activity and a 6–67% increase in sitting behavior (47) with almost 60% of people unable to meet the required 150 min/week of moderate physical activity and therefore meeting the criteria for physical inactivity (48). Lockdown stringency level, as suggested by Wilms et al. (47), may play a role in the magnitude of the aforementioned changes. Sitting behavior and physical inactivity have previously been related to numerous negative health outcomes (49) including the onset or augmentation of musculoskeletal pain in the working population (50). The observed increase in sedentary behavior and decrease in physical activity in teleworkers is associated with musculoskeletal pain in several studies (11, 17, 21, 28), but not all (30, 51) implicating the need for further investigation of work-related and leisure-time physical activity in etiology and augmentation of chronic musculoskeletal pain.

Conclusion

For a certain part of workers, telework will remain a common way of work in the post-pandemic period. Therefore, it is essential to identify telework-related risk factors for musculoskeletal disorders and address them with timely preventive measures tailored to each remote workstation's risks and individual workers' needs. Risk assessment of hazardous working conditions may be the first step in addressing risk factors for MSDs in teleworkers. However, resources enabling risk assessment in an organizational setting may not be always available in a remote setting making it difficult for employers to control teleworkers' working conditions. For example, direct measurements and observational methods commonly used to assess biomechanical loads arising from working postures and repetitive movements in on-site workers are hardly applicable to home-based workers. Targeted checklists and questionnaires may be beneficial in the initial recognition of ergonomic hazards that may lead to increased biomechanical loads in remote setting (52). Quantification of biomechanical workloads in more advanced setting may be performed using wearable devices incorporating inertial sensing technology (53). In addition to risk assessment, organizational support in terms of equipment and education of teleworkers in preparing ergonomically suitable workstations as well as in taking regular breaks and reducing sitting time is essential (21, 54). Psychosocial risk assessment in remote settings may be performed using standardized tools commonly used in an on-site setting while taking into account specific telework-related psychosocial risks as well as specificities related to information and communication technology (55). To prevent psychosocial risks arising from high job demands and blurred work-family boundaries organizations should actively include teleworkers in decision-making regarding job requirements and deadlines (56). Teleworkers, on the other hand, may benefit from setting different forms of boundaries between work and family time to decrease distractions and maintain a good work-family balance.

Author contributions

MM, HK, KB-K, and MB contributed to the conception and design of the study. JN and PJ performed the databases search. LB, BB, JČ, and MC selected and organized the relevant articles. MM, HK, and KB-K wrote the first draft of the manuscript. HK, MM, KB-K, MB, JN, and PJ wrote sections of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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What helps hospital staff in times of crisis: qualitative results of a survey on psychosocial resources and stressors in German hospitals during the COVID-19 pandemic

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Background: Even before the COVID-19 pandemic, hospital workers faced a tremendous workload. The pandemic led to different and additional strain that negatively affected the well-being of employees. This study aims to explore psychosocial resources and strategies that were used by hospital staff.

Methods: In the context of an intervention study, employees of three German hospitals were questioned in writing in summer and fall 2020. Five open-ended questions about the pandemic were asked to capture corresponding effects on daily work routine. Answers of 303 participants were evaluated using structuring qualitative content analysis.

Results: Significant stressors and resources were identified in the areas of work content and task, social relations at work, organization of work, work environment and individual aspects. Stressors included, for example, emotional demands, conflicts, an increased workload, time and performance pressure. Important resources mentioned were, among others, the exchange with colleagues and mutual support. Sound information exchange, clear processes and guidelines and a positive work atmosphere were also important. In addition, the private environment and a positive mindset were perceived as helpful.

Conclusion: This study contributes to a differentiated understanding of existing psychosocial resources of hospital staff in times of crisis. Identifying and strengthening these resources could reduce stress and improve well-being, making hospital staff better prepared for both normal operations and further crisis situations.

KEYWORDS

COVID-19, resources, psychosocial working conditions, hospital, Germany, stressors

1. Introduction

Suboptimal working conditions in hospitals, such as staff shortages or non-transparent work processes, can negatively affect employees' health and pose a risk to patient care (1–3). The pandemic led to additional demands, like an increased workload, more frequent interruptions or the pressure to increase test capacities, which negatively influenced the well-being of employees (4–7). However, workplace-related causes for stress were present in German hospitals even before the COVID-19 pandemic. These included increasing treatment figures and excessive workload at times (2, 8) and were attributed to political changes in the healthcare system and a related limited scope for improving working conditions (9).

This already critical situation in German hospitals was exacerbated by the COVID-19 pandemic. Several studies addressed pandemic-specific stressors experienced in hospitals and/or the pandemic's consequences on the mental health of employees in the healthcare sector (4–7, 10–17). It is therefore evident that stress prevention in hospitals is essential (18, 19).

Resources become especially important in times of crisis (20). Empirical studies have indicated that stressful working conditions can be better managed when strong resources are available (20). Occupational psychology developed different theoretical models to explain the connection between various work demands, resources and stress. One of these is the "job-demands-resources-model" (JD-R theory) by Bakker, Demerouti et al., which hypothesizes that job strain results from an imbalance between the demands that employees are exposed to and the resources available to them (21–23). Demands refer to "all physical, psychological, social or organizational aspects of the job that require sustained physical and/or psychological (cognitive or emotional) effort or skills and are therefore associated with certain psychological and/or physiological costs" (21). Demands are not necessarily negative. However, they can become stressors if they are combined with a high level of effort from which employees cannot recover (21). In this model, resources are defined as the physical, mental, social or organizational aspects of work that serve the achievement of work goals, reduce work demands and promote individual growth, learning and development (21). Yet, individual resources such as self-efficacy and optimism can also play a similar role as work resources (22). After the COVID-19 pandemic, the authors updated the JD-R theory by also including home and personal demands and resources, proposing that these interact with organizational and job demands and resources (24).

Compared to the large amount of literature on stressors during the COVID-19 pandemic, there are overall mainly quantitative studies on psychosocial resources of hospital staff during this crisis (4, 7, 10). These studies report, among other things, that the resilience of nursing staff was largely influenced by working conditions (4) and that family, friends and leisure time were also important resources among hospital workers (7). Caregivers who also worked outside the hospital assessed the key resource of interpersonal relations most positively (25, 26). Qualitative studies can be useful to fully understand quantitative data, or to provide further insights we may not know that are missing from quantitative studies (27). To our knowledge, qualitative approaches concerning psychosocial resources of hospital staff during the COVID-19 pandemic have received less attention in the research literature. An interview study from the United States examining coping strategies reported that healthcare workers and first responders managed to better cope with the crisis by gathering information and strategies, by seeking support and by practicing self-care (28). Another qualitative study from Italy reported that individual adaptability and engagement, mutual support and teamwork, leaders' support as well as information and communication technologies and personal protective equipment, among others, were perceived as job resources by healthcare workers (29). Both qualitative studies were concerned with the first wave of the pandemic in their respective countries.

The present study, in which hospital workers from different occupational areas were questioned during the first two waves of the pandemic in Germany, is meant to capture individual impressions and perspectives in order to deepen existing knowledge on the topic by adding the second pandemic wave to the few existing qualitative studies on resources. The aim of this study is to identify specific resources that were mentioned as helpful in the context of stress during the COVID-19 pandemic in Germany and that may not have been captured in previous studies on the topic. Exceptional situations can be useful in order to learn for both crises and day-to-day work. The qualitative method allows us to explore subjective assessments of hospital staff regarding helpful resources and strategies as well as stressors during the COVID-19 pandemic. Studies indicate that reinforcing existing resources of employees can have a positive impact on the handling of stressors in general and on the overall working situation (30). Therefore, we address the following research question: What psychosocial resources and strategies were useful for hospital staff in order to counteract stressors faced during the COVID-19 pandemic?

2. Methods

2.1. Data collection and study participants

The present study was conducted as part of the collaborative project "SEEGEN–Mental Health at the Workplace Hospital," which was implemented from 2017 to 2022 at three hospital sites of different sponsorship in Germany (8). Of the three participating hospitals, one was a university hospital, one was a community hospital and the third was a hospital owned by a private company. The aim of the research association was to develop and evaluate a complex intervention for health promotion at the hospital workplace. In this context, written surveys at three different times of measurement were planned. Detailed information on the SEEGEN study design has already been published (8).

The SEEGEN study was registered in the German Clinical Trials Register (DRKS) under the DRKS-ID DRKS00017249. Positive votes from the ethics committees involved were obtained (University of Ulm: 501/18, University of Heidelberg: S-602/2019, University of Düsseldorf: 6193R). Inclusion criteria for the study were age between 18 and 70 years, written informed consent and sufficient knowledge of the German language. All employees of the three hospitals in the 18 cluster units (6 clusters per hospital) being involved in patient care and meeting the inclusion criteria were eligible to participate in the SEEGEN study. Baseline recruitment took place from October 2019 until March 2020 through information events at each site. Within the cluster-randomized trial, $N = 5{,}654$ individuals were eligible to participate. After 466 participants had been recruited, 407 persons took part in the baseline survey at the end of 2019, which represents a response rate of 88.1%.

After the outbreak of the COVID-19 pandemic, five open-ended questions were developed ad hoc and posed in the two planned written follow-up surveys (T1 and T2) to assess the impact of the pandemic on the participants' work routine (Figure 1). The present study is based on the answers to these questions, posed only in T1 and T2. At that time, information on the pandemic and its related impact was still scarce, hence the added open-ended questions were kept simple in order to be able to cover a broad range of possible impacts and changes. The inclusion of open-ended questions in surveys is considered a pragmatic approach to obtain deeper insights into complex questions in a timely manner (31). The first follow-up survey (T1) took place in summer 2020 and followed phase 1 of the pandemic in Germany, which was characterized by the novelty of the disease, an increase in infections and the non-availability of uniform procedures and guidelines (32). The second follow-up survey (T2) took place in fall 2020, which came after the so-called summer plateau phase characterized by milder infections (32). A total of 317 and 267 persons took part in the T1 and T2 surveys, respectively. Out of these, 303 employees answered at least one of the questions in one of the two written follow-up surveys. Of these 303 individuals, 173 participated in both T1 and T2, and 130 participated in either T1 or T2 only.

Due to the fact that the five open-ended questions concerning the pandemic were embedded into the SEEGEN survey, there was no separate sampling for potential participants of our study. As data were collected through a written survey, no relationship was established between the researchers and the participants. Further, the written survey format did not allow us to ask participants more in-depth or comprehensive questions. For this reason, thematic saturation could not be strived for (see limitations). After completion of the SEEGEN project, results were reported to participants. However, these were limited to the complex intervention and did not include the results of the present study.

2.2. Data analysis

The pandemic was characterized by highly dynamic situations and at times rapid developments. In order to represent a preferably large spectrum of hospital working conditions during the COVID-19 pandemic, both time points were analyzed together. Yet, we indicated significant differences between both points in our analysis.

1. What has changed about your work situation because of the COVID-19 pandemic?
2. What makes/made you feel especially stressed at work in the COVID-19 pandemic?
3. What is/was especially helpful for you at work in order to better deal with stress in the COVID-19 pandemic?
4. Has the COVID-19 pandemic led to developments at your hospital that you would not have expected?
5. Do you think that certain aspects have improved at your hospital because of the COVID-19 pandemic, particularly concerning your work situation?

FIGURE 1
Items/open questions of the written follow-up surveys.

The qualitative content analysis of the five open-ended questions was conducted through manual coding by an interdisciplinary team of researchers, which is an established method for the qualitative analysis of open-ended survey questions (31, 33). Four of the authors (KS, LG, MG and MK) were involved in the coding process in order to reduce researcher bias. At the time of data analysis, these four authors had different levels of experience in qualitative research analysis as well as academic backgrounds: PhD in Medical Anthropology (KS), bachelor's degree in English Studies and master's degree in Literary Translation (LG), Diploma in Educational Sciences (MG), undergraduate student of Work and Organizational Psychology (MK). This variety facilitated a profound and diversified analysis of the data. KS, LG and MG were employed as academic staff in the context of the SEEGEN project, while MK was a student research assistant (see affiliations). In order to further avoid bias, the manuscript was revised and commented by the remaining authors, who represent various genders and backgrounds (mainly psychology and medicine) and some of whom work as hospital staff themselves.

The coding process was divided into four steps. In the first step, the answers of the paper questionnaires were digitalized and fed as documents in the MAXQDA software together with the already digitalized data from the online surveys. The analysis of the open-ended questions via qualitative content analysis following Kuckartz (34) was conducted by MG and MK in a multistage procedure using the MAXQDA software. We used deductive categories derived from central features of work design according to the recommendations of the Joint German Occupational Safety and Health Strategy (GDA; Beck et al. 22. November 2017) and inductive categories formed from the data to build categories. Following this methodology, we established definitions, examples from the material as well as coding rules and reviewed and slightly adjusted the code system based on a sample of 50 transcriptions. In the second step, KS and LG performed an additional quality check of the coded material using MAXQDA 2020. The code system was further developed by going through the material two more times and by further adjusting existing categories in an iterative process using consensual coding (34). During this stage of the coding process, KS and LG met once a week and discussed categories and codes considered insufficient, missing or misclassified, deciding through consensus. In this process, the category system was further augmented with inductive dimensions that emerged from the data and were not represented by the features of the GDA. Discussions and changes in the category system from the code meetings were recorded in minutes.

Our code system operated on three levels: First level (codes), second level (sub-codes) and third level (characteristics). The first two levels addressed the thematic domain (e.g., organization of work (code) and work time (sub-code)), whereas the third level categorized these contents as positive, negative or neutral. Through the third level, we aimed at identifying possible resources (positive characteristics) and stressors (negative characteristics) and to omit statements from our analysis that could not be clearly classified in either way (neutral characteristics). The resulting code system for the first two levels is shown in Table 1. We aimed at a high quality of coding by consensual coding and verified it through intercoder reliability (34). Both KS and

LG coded a sample of 50 documents (25 from each T1 and T2) according to the developed code system. The function of the intercoder agreement in the MAXQDA software yielded suitable values of matching coding (74% for T1 and 86% T2). We also added demographic data of the participants that had been collected in the baseline survey to the dataset.

In the third step, we conducted exploratory analyses to identify anomalies in the code and sub-code frequencies as well as important contents and possible patterns related to demographic characteristics. For this purpose, we conducted frequency analyses using the crosstabs function in MAXQDA. We further identified the most frequent resources, stressors and neutral demands. In the fourth step, we created content summaries of the most frequent stressors and resources.

3. Results

The sociodemographic characteristics of the study participants, collected in the baseline survey, are shown in Table 2. A total of 303 participants answered at least one of the open-ended questions in the T1 and T2 surveys, with an overlapping of 173 participants who participated in both surveys. We considered all answers as stand-alone, regardless of the survey time. Thus, no comparisons regarding changes across time were made. Many stressors and resources were present at both survey time points. Nevertheless, there were fluctuation patterns that can be explained by the temporal development of the pandemic and thus by changes in the work routine at the hospital. We have indicated cases where these patterns differed between survey time points.

In order to illustrate the background of stress, we will first present the most frequently mentioned stressors before addressing the resources. For a better overview, we summarized the most important results under the following categories: (1) work content and task, (2) social relations at work, (3) organization of work, (4) work environment and (5) individual stressors or resources. Tables 3, 4 provide specific exemplary quotes for the stressors and resources sorted by code. All verbatim quotes were translated from the original German by LG.

3.1. Stressors

3.1.1. Work content and task

Participants mainly discussed stressors related to emotional demands and ethical conflicts in this context. These stressors were mentioned more frequently by employees from the nursing service and the secretariats and in the second survey time point. Among these stressors we found psychological stress, increasing anxiety of patients, loneliness, physical distance and aggression/irritability also among patients' relatives. Communication and general contact were perceived as more difficult due to the use of masks. Participants also reported ethical conflicts, e.g., in dealing with the deceased or with dying persons (missing relatives, not dignified, triage).

3.1.2. Social relations at work

Disagreements and conflicts between colleagues, especially concerning distance and hygiene regulations, irritability, a lack of understanding and missing exchange or contact with colleagues were perceived as stressful. Employees also mentioned stressful conflicts with superiors (e.g., lack of support, more pressure, e.g., to renounce to certain aspects in the private environment for the sake of work). Participants also brought up stressors in the handling of patients and relatives (e.g., distance, limited interaction, discussions). The number of statements concerning stress caused by relations with colleagues and by contact with patients and relatives increased in the second survey period.

3.1.3. Organization of work

Overall, participants reported an increase in workload and in the amount of work and in this context also more stress, excessive demands, time and performance pressure due to additional tasks and also because of absent colleagues (e.g., more administrative tasks, implementation of guidelines, make up for canceled appointments). Work time-related stressors came up more frequently in the second survey stage. Other issues mentioned in this context were staffing shortages becoming especially apparent due to illness or quarantine absences, for example. Respondents described constantly changing guidelines, regulations and procedures (sometimes daily changes) as a major burden in the workflow. Some of the guidelines were perceived as contradictory or unclear, which seemed to have led to uncertainties. Overall, many employees lacked clear communication, reliable information and clarification, especially in the initial survey stage. Stress also seemed to result from additional cooperation and necessary arrangements. In relation to the general communicational exchange, employees described a lack of networking and less productive communication due to a lack of meetings or online conferences.

3.1.4. Work environment

Employees mentioned stress caused by wearing protective equipment (in some instances for a long time), especially mouth and nose protection (circulatory problems, breathing and skin problems, headaches), but also by poor quality, unsuitable protective clothing or the lack of protective equipment and tests. According to the employees, protective equipment sometimes had to be organized by themselves or one-time material had to be re-used. For the participants, an additional burden was present in the context of the perceived risk of infection (e.g., bad screening, lack of control, inconsequent implementation of protective measures, missing uniform procedures). Statements on stress caused by the work environment increased in the second survey stage.

3.1.5. Individual stressors

Individual stressors covered fear of infection (fear of infecting family members, patients or fear of being infected) and a general uncertainty regarding the pandemic (e.g., uncertain future, unpredictable course of the pandemic, possible lockdowns and restrictions). Additionally, participants described individual pressure or stress (e.g., tension, high mental burden) and stressors such as panic, isolation or distrust. Some participants said they were more cautious and more distanced while others rather experienced this behavior from other people. According to the participants, further stressors emerged from the pressure of not wanting to make mistakes or trying to act as a role model and

TABLE 1 Code system.

Codes and sub-codes	Definitions/rules of application	Examples from the material
1 Work content and task		
1.1 Scope of action	Influence on work content, workload, work methods/procedures, sequence of the tasks	"No free choice of patients possible anymore." (T1, 64, Pos. 1) under changes
1.2 Variability/rich variety	Variety of requirements in terms of work equipment/objects and actions	"New remits." (T2, 91, Pos. 5) under improvements
1.3 Responsibility	Competencies and responsibilities that are not related to changing guidelines, rules or work processes	"Transfer of responsibility in competence areas." (T1, 105, Pos. 4) under unexpected developments; "Always consultation with doctor, not always clear decisions." (T2, 151, Pos. 2) under stressors
1.4 Qualification	Changed qualification requirements of employees; new instruction/initial training, changed possibilities for further training	"More and more employees do not feel up to their task or are not sufficiently supported." (T2, 144, Pos. 4) under unexpected developments; "Knowledge growth strongly increased." (T1, 37, Pos. 1) under changes
1.5 Emotional demands	Experiencing emotionally touching events; clear reference to emotions and own needs. Emotion regulation required or not. Emotional demands in relation to work activities, in contact with patients or relatives. Not in relation to colleagues/supervisors -> social relations, supervisors, colleagues	"Patients are more aggressive overall due to waiting times at the door or also because facial expression is covered." (T1, 15, Pos. 1) under changes; "More anxious and psychologically impaired patients." (T2, 163, Pos. 2) under stressors
2 Organization of work		
2.1 Work time	Change in work time, other shifts or night work, change in overtime, breaks and in work on call	"As a result, many overtime hours could be reduced." (T1, 110, Pos. 5) under improvements
2.2 Amount of work	Change in time pressure/work intensity, disturbances/interruptions, changed clocking	"Due to the COVID-19 pandemic workload was lower." (T1, 63, Pos. 1) under changes; "A lot of delay due to the very strict hygiene regulation." (T2, 23, Pos. 1) under changes; "Balancing act between patient care and the large number of organizational tasks." (T1, 74, Pos. 2) under stressors
2.3 Work process	New, changed work processes, clear or unclear rules and/or guidelines	"Clear structures and requirements from hygiene and senior management." (T1, 1, Pos. 3) under resources; "Clear rules from the employer." (T2, 159, Pos. 3) under resources; "Frequent changing of procedures – feels like 1,000 e-mails per day." (T1, 15, Pos. 2) under stressors; "Confused and changing guidelines from the employer." (T2, 191, Pos. 2) under stressors
2.4 Information/communication	Change in the provision of information, changed processing/presentation of information, changing information	"Good information from the hygiene department, exchange with other employees." (T2, 66, Pos. 3) under resources; "Clear information about the current situation in the clinic." (T1, 23, Pos. 3) under resources; "No good possibility to get information anymore, no exchange." (T2, 60, Pos. 4) under unexpected developments; "Lack of communication about changed processes." (T1, 86, Pos. 2) under stressors
2.5 Cooperation	Changed commitment to the workplace, different opportunities for cooperation/support, different areas of responsibility	"Yes, support from areas that had reduced their workload." (T1, 32, Pos. 4) under unexpected developments; "Little contact to other wards and colleagues, no networking." (T2, 60, Pos. 1) under changes
2.6 Staff and work planning	Staffing, work planning including sick leave, vacation, quarantine, compensation for overtime	"Sufficient staff." (T1, 115, Pos. 3) under resources; "Quarantine of colleagues burdens the working schedule." (T2, 21, Pos. 1) under changes; "Staff shortage." (T1, 136, Pos. 2) under stressors
3 Social relations		
3.1 Supervisors	Reference to feedback, recognition, support or appreciation	"Ward manager took our concerns seriously." (T1, 56, Pos. 3) under resources
3.2 Colleagues	Reference to social contacts with colleagues, harmony, support and appreciation by colleagues	"Good support among each other." (T2, 32, Pos. 3) under resources; "Exchange with colleagues." (T1, 26, Pos. 3) under resources; "Mood of colleagues is generally worse, everyone is annoyed." (T2, 20, Pos. 2) under stressors; "Lack of understanding among some colleagues in relation to necessary measures, constant discussions on this topic." (T1, 183, Pos. 2) under stressors
3.3 Patients/relatives	Social interactions with patients and relatives, reference to recognition/appreciation	"Relatives are potentially more polite and more likely to agree with measures related to patients." (T2, 69, Pos. 4) under unexpected developments; "Distance to patients." (T1, 57, Pos. 2) under stressors

(Continued)

TABLE 1 (Continued)

Codes and sub-codes	Definitions/rules of application	Examples from the material
4 Work environment		
4.1 Physical and chemical factors	Reference to noise, lighting, hazardous substances, risk of infection, hygiene	"Hygiene measures." (T2, 11, Pos. 5) under improvements; "Working in unsuitable rooms without air exchange with FFP2 mask." (T2, 76, Pos. 1) under changes
4.2 Corporeal factors	Changed ergonomic design; different physical work, changed strain due to protective measures	"By wearing protective clothing. This is very stressful, especially physically." (T2, 3, Pos. 2) under stressors
4.3 Workplace and information design	Changed workspace/patient rooms; changed design of signals and notes, changed visiting regulations	"The visiting ban made the corridors and patient rooms significantly emptier. Life was more relaxed for patients because there were very strict visiting hours, which made resting phases possible. As a caregiver you felt less harassed and threatened." (T2, 21, Pos. 4) under unexpected developments
4.4 Work equipment	Reference to tools and work equipment; changed operation or setup of machines; use of software and protective clothing	"Not enough FFP2 masks, or very spare distribution of protective masks." (T2, 21, Pos. 2) under stressors
4.5 Work atmosphere	Reference to mood and atmosphere at work, sense of community or no sense of community, cohesion within the team. This category does not refer to single factors only (e.g., social relations), but covers the entire social dimension.	"Good work atmosphere, good team and new, nice colleagues." (T2, 77, Pos. 3) under resources
5 Individual changes/ stressors/resources/ strategies	Individual situation, approaches or private conditions	"Conversations with family and friends." (T1, 86, Pos. 3) under resources; "Leisure time, e.g., hiking, cycling." (T1, 97, Pos. 3) under resources; "Strain-bearing capacity is still exhausted." (T2, 14, Pos. 1) under changes
6 Other changes	Other changes, improvements or deteriorations (stressors, resources)	"Medicine is more paramount than purely economic considerations." (T1, 37, Pos. 5) under improvements; "It's all about COVID at moment, but there are enough other diseases that have priority but are neglected." (T2, 156, Pos. 2) under stressors
7 Question-oriented codes		
7.1 Changes	Concrete reference to changes according to the question	"More time-consuming patient handling due to corona tests and questioning." (T2, 5, Pos. 1) under changes
7.2 Stressors	Concrete reference to stressors according to the question	"Distance to fellow people, patients, colleagues. Changed processes with severe limitations. Both during work time and during breaks." (T2, 22, Pos. 2) under stressors
7.3 Resources	Concrete reference to resources according to the question	"Walks in the forest." (T2, 4, Pos. 3) under resources
7.4 Unexpected developments	Concrete reference to unexpected developments according to the question	"Yes, mental load is indeed very high for many, and the resulting dissatisfaction is getting higher and higher. Some of the employees start making each other look negative, and the potential for dispute increases." (T2, 38, Pos. 4) under unexpected developments
7.5 Improvements	Concrete reference to improvements according to the question	"It has become a bit more quiet (fewer patients, no visitors)." (T2, 8, Pos. 5) under improvements
7.6 Suggestions/wishes for future improvements	Concrete expression of wishes or suggestions. Improvements must not have been implemented yet.	"The appreciation of care staff has hopefully gotten better in the long run." (T1, 33, Pos. 5) under improvements

from social and economic changes (e.g., child care, extremization of society). This type of stress occurred more frequently in the first survey stage.

3.2. Resources

Table 5 illustrates resources that participants mentioned most frequently in relation to the pandemic. Only minor differences between the individual occupational groups occurred. Very few resources were described in the section of work content and task, which is why this part is omitted in the following.

3.2.1. Social relations at work

Employees said that a strong team spirit, exchange and good relations with colleagues were helpful. According to the participants, open communication among colleagues led to better cohesion. Cooperative exchange of opinions, feelings and expertise was described as useful in order to cope with stressors related to the COVID-19 pandemic. Overall, colleagues were the most frequently mentioned resource.

3.2.2. Organization of work

The reduced number of examinations and operations at the beginning of the pandemic was described as helpful. Due to the low number of patients, there seemed to be more time for individual

TABLE 2 Description of participants' sociodemographic characteristics (collected in the baseline survey for all study participants).

	Participated in T1 (*N* = 259)	Participated in T2 (*N* = 217)
Age groups in years		
< 21	0	0
21–30	36	29
31–40	49	41
41–50	59	48
> 50	96	81
No response	21	18
Gender		
Female	183	158
Male and divers	71	58
No response	5	1
Occupational group		
Medical service (medical service and medical-technical service)	63	50
Care service	113	97
Functional services (functional service, secretariats and others)	62	53
No response	21	17
Management responsibility		
With management responsibility	98	77
Without management responsibility	144	123
No response	17	17

patients. The fact that fewer relatives were in the hospital and hence fewer conversations were necessary was perceived as relieving. Employees said they were able to take care of many tasks that had been previously deferred due to time constraints. They also described having less time pressure and fewer meetings and expressed that better planning was possible. The quietness apparently also brought teams together, which indicates a connection between colleagues and the work atmosphere. Some participants described this aspect as an unexpected development. Participants perceived this relief especially in the first survey stage.

Participants valued a functioning information exchange and mentioned successful communication as helpful: Regular and timely information (e.g., concerning current regulations and policies for COVID-19 infections or contact with persons infected) provided transparency and certainty in dealing with the pandemic, according to our respondents. They also perceived clarity of information and rules as well as new ways and forms of communication, such as daily information meetings where relevant changes were communicated, as helpful in handling the pandemic situation. Similar aspects were mentioned with regard to the work process: Participants appreciated clear guidelines and procedures, quick and pragmatic decisions, little confusion as well as consistent and determined structures. Further helpful aspects in this context were calmer procedures, less hecticness, growing confidence and more routine. Cooperation, e.g., collaboration and support from other departments, areas and wards or a more profound coordination with the management, was also mentioned as helpful by participants, because this seemed to give them insights into other units. However, it has to be mentioned that when participants were requested to help out in other departments, this was sometimes considered as a burden.

3.2.3. Work environment

With regard to workplace and information design, participants particularly valued the adjusted visitor regulations, especially in the first survey stage. Access controls seemed to have led to more relief and safety among patients and employees. The reduction of visitor numbers was perceived as an improvement that seemed to have led to both fewer infections among patients and less stress among hospital staff. Several participants requested that these regulations should also be maintained after the pandemic.

The calmer and relaxed work atmosphere at the beginning of the pandemic was perceived as relieving. Respondents also described an improved work atmosphere with regard to collaboration in the team: Team spirit and teamwork were highlighted, and everyone seemed to be pulling in the same direction and master different tasks as a team. Some employees apparently also moved closer together. Support and consideration as well as cohesion and solidarity were described as helpful. Several respondents indicated that they had not expected these positive changes.

Improved hygiene standards and the acceptance of measures among colleagues, patients and relatives were often perceived as helpful in the context of dealing with stressors related to the pandemic. Additionally, caution, sufficient testing as well as wearing masks and protective equipment were addressed.

TABLE 3 Exemplary quotes concerning stressors (negative characteristics), sorted by codes.

Codes	Quotes
Work content and task	"That patients could not be visited, and doctors were not sensitive there." (T1, 56, Pos. 2)
	"The visiting ban for relatives makes care more difficult because it's a great burden for the psyche of patients and relatives." (T2, 21, Pos. 1)
	"Tension between COVID-rules and personal freedom of patients. Sometimes, rules that contradict therapeutic recommendations need to be advocated." (T2, 166, Pos. 2)
	"Patients are also insecure – they expect care staff to provide information." (T1, 161, Pos. 2)
	"Constantly reminding patients and visitors to adhere to protective measures." (T1, 220, Pos. 2)
	"Especially relatives/visitors insult care staff more severely." (T2, 55, Pos. 1)
	"It was humanly and ethically not okay to let people die alone without any relatives, or not to pray together." (T1, 154, Pos. 1)
	"Need for triage with regard to scarce surgery capacities." (T1, 62, Pos. 2)
Social relations	"For one thing, the ignorance of some colleagues, so that you had to justify why you wanted to keep minimum distances. You felt more like the odd one out if you wanted to adhere to the hygiene and infection control measures within the team as well." (T2, 21, Pos. 2)
	"Additional safety measures that colleagues and employees do not adhere to because they feel immune." (T1, 91, Pos. 2)
	"Less collaboration, hardly any joint social events possible, e.g., eating cake to celebrate birthdays, having coffee or lunch breaks together." (T2, 288, Pos. 2)
	"No personal support from supervisors, if communication takes place, it's only pressure." (T1, 50, Pos. 2)
	"Staff shortage exacerbates pressure on supervisors to keep the numbers up despite the pandemic." (T2, 232, Pos. 1)
	"Desire from the management level to renounce to a lot in your personal life to maintain work capacity." (T2, 256, Pos. 2)
	"Many discussions with patients concerning scheduling." (T1, 14, Pos. 1)
	"The personal contact to your patients -> has become more impersonal (mouthguard, gloves, protective gown...)." (T1, 165, Pos. 1)
Organization of work	"Too many changes that have to be implemented in a short period of time lead to more work and overtime." (T2, 155, Pos. 1)
	"Same number of persons, less time." (T1, 46, Pos. 1)
	"Usually no breaks possible." (T2, 172, Pos. 2)
	"After capacity had been booted up again, patients were significantly sicker + more labor-intensive." (T1, 251, Pos. 1)
	"Always available, boundary between work and private time becomes blurred." (T2, 281, Pos. 1)
	"Due to shortfall of personnel, number of staff is not sufficient to be able to adequately deal with the organization of tasks." (T2, 284, Pos. 2)
	"Disinformation from the employer about planned measures, processes. Lack of communication." (T1, 142, Pos. 2)
	"Dissatisfaction in the team due to changing orders." (T1, 155, Pos. 4)
Work environment	"Working with full protective equipment is very exhausting; talking, breathing is very burdensome and also sweating." (T2, 154, Pos. 2)
	"That protective material FFP2 masks + gowns were missing or should be re-used at times." (T1, 48, Pos. 2)
	"No consistent procedures for isolation measures. No swab tests were carried out for suspected COVID-cases." (T1, 29, Pos. 2)
	"No separate protection for employees and risk patients." (T2, 233, Pos. 2)
	"Small meeting rooms, few possibilities to keep minimum distances." (T2, 75, Pos. 2)
	"Potential risk of infection (for employees and oneself) due to poor screening (e.g., lack of tests in the emergency room)." (T2, 88, Pos. 2)
	"Higher burden to work in personal protective equipment and also to organize it." (T2, 32, Pos. 1)
	"The team in the corona ward is emotionally exhausted." (T2, 73, Pos. 4)
Individual stressors	"Fear of infecting myself and then especially my relatives." (T2, 129, Pos. 2)
	"Great insecurity and fear among employees." (T2, 57, Pos. 2)
	"Uncertain future." (T1, 80, Pos. 2)
	"Loneliness." (T1, 191, Pos. 2)
	"Furthermore, private compensation through positive activities is missing." (T2, 152, Pos. 2)
	"In the private surroundings, many have backed away because you are working at the hospital." (T1, 151, Pos. 2)
	"You always have to be a role model for everyone, more than usual because everyone is more observant." (T1, 64, Pos. 2)
	"The fear of not making the right decision." (T2, 239, Pos. 2)

3.2.4. Individual resources

According to our respondents, the private environment, especially joint conversations, distraction and support from partners, family and friends, e.g., with child care, often brought relief. Leisure activities, such as sports or time spent outside or in nature, were also mentioned as resources. Furthermore, participants described qualities or attitudes

TABLE 4 Exemplary quotes concerning resources (positive characteristics), sorted by codes.

Codes	Quotes
Social relations	"The good relation to my supervisor, the cohesion with my colleagues from my department." (T1, 14, Pos. 3)
	"[…] This open communication has had the effect that other colleagues have also admitted that they want to adhere to the distance regulation." (T1, 21, Pos. 3)
	"Exchange with colleagues, doctors and at team meetings." (T2, 17, Pos. 3)
	"We talk a lot with colleagues at work during breaks, respectively, the appreciation from supervisors has helped me. They motivated us and told us we would handle everything well. Sometimes, I was also proud that we had sticked together so well." (T1, 154, Pos. 3)
	"Great team -> everyone helps everyone -> very good cohesion." (T1, 279, Pos. 3)
	"More intensive cohesion among individual colleagues." (T2, 288, Pos. 3)
	"The caring way colleagues treated each other. The cohesion." (T2, 9, Pos. 3)
	"Conversations with colleagues, the exchange, their feelings/opinions." (T2, 185, Pos. 3)
Organization of work	"By reducing patient occupancy while increasing the number of staff, there is less stress and time pressure." (T1, 206, Pos. 1)
	"You have more time for the patients." (T2, 54, Pos. 5)
	"Deceleration has been noticeably good." (T1, 76, Pos. 3)
	"Fewer patients at times, thus relief, beneficial." (T2, 215, Pos. 1)
	"Newsletter, information, regular meetings where the next steps were worked out." (T1, 98, Pos. 3)
	"Timely information and clear process instructions." (T2, 78, Pos. 3)
	"Clear instructions, not something different every day, enough staff to relieve everyone." (T1, 160, Pos. 3)
	"Consultation with management and other departments affected, e.g., hygiene, purchasing." (T2, 155, Pos. 3)
Work environment	"In my opinion, there are less infects also among patients due to fewer visitors in the clinic/in the patient room. The clinic is calmer, work is therefore not so stressful. The noise level is lower." (T2, 221, Pos. 5)
	"The introduced visiting hours are pleasant. This should be kept." (T2, 220, Pos. 3)
	"Good collegial interaction throughout the hospital." (T1, 204, Pos. 3)
	"Mastering tasks together, good agreements. Team spirit is enhanced, because things only work together." (T1, 265, Pos. 3)
	"I mostly solved the problems myself with the help of the accessible (very good!!!) material and the support from our hygiene specialist. I felt challenged thus not burdened." (T1, 286, Pos. 3)
	"Wearing protective equipment because of the burden of the fear of infection." (T2, 124, Pos. 3)
	"Currently the availability of FFP2 masks, patients and accompanying persons are tested." (T2, 222, Pos. 3)
	"Increasing acceptance of the need for protective measures within the team, more protective equipment." (T1, 21, Pos. 3)
Individual resources	"Good and strengthened private 'environment' -> I'm always looking forward to coming 'home.'" (T1, 279, Pos. 3)
	"Activities in daily life. Doing something with friends and family." (T1, 185, Pos. 3)
	"Strong social environment both with family and team." (T1, 173, Pos. 3)
	"Outdoor sports, long walks." (T2, 107, Pos. 3)
	"Relaxing in nature." (T1, 283, Pos. 3)
	"I'm used to dealing with a lot of stress, I applied my compensation mechanism to the pandemic as well -> Hanging in there, showing optimism despite the difficult situation etc." (T2, 74, Pos. 3)
	"Serenity and hoping for improvement." (T2, 106, Pos. 3)
	"A positive way of thinking and a positive approach." (T2, 95, Pos. 3)

such as optimism, positive thinking, humor, serenity, resilience and concentration as helpful in dealing with the situation. Individual resources were important in both survey stages.

4. Discussion

In the present study, we examined what stressors hospital staff perceived during the pandemic and what resources were helpful for them in order to deal with stress. The answers of 303 hospital workers at two different time points in the development of the pandemic helped us identify aspects in four areas that could be reinforced for normal operation and further crises: (1) social relations at work, (2) organization of work, (3) work environment and (4) individual resources. To a large extent, our results show overlapping resources between the different occupational groups at the hospital workplace. This can be taken as an indication that there are starting points to introduce or deepen stress prevention measures in all hospital sections.

We have focused our discussion on resources that can be modified through organizational and work changes. Some resources mentioned

TABLE 5 Thematic summary of the resources (positive characteristics) in relation to the COVID-19 pandemic, the 10 most frequent codes.

Main codes	Sub-codes	Specific resources
Social relations	Colleagues	Cohesion and support: • Team spirit • Exchange and common handling • Team stability • Social backing Colleagues: • Good collaboration • Good relations • Open communication • Positive behavior
Organization of work	Amount of work	Patients, relatives and capacity: • Reduction of examinations, beds and operations • Fewer elective cases and emergencies • Fewer patients • More time for individual patients • Fewer relatives, fewer conversations needed Tasks and processes: • Fewer tasks • All tasks that had been left could be handled • Better planning in advance possible • Less time pressure • Fewer team meetings Workload: • Less work strain • Less workload • More calmness • Deceleration • Less stress
	Information/ communication	Information as a resource: • Newsletter • Good/improved flow of information • Exchange of information Exchange and communication in general: • Improvement in communication • Weekly meetings in the corona steering committee • Regular meetings to plan further actions • Daily information meetings • News ways of communication (e.g., improvement of digital communication, information on the internet, daily updates via e-mail, virtual conferences and trainings) • Communicative exchange • Addressing problems • Supervision • Clarification Clarity/Transparency: • More transparency and openness • Transparent leadership team Information on COVID-19 and rules: • Clear information on current situation • Updates on COVID-19 as short videos • Safety through education • Timely information about measures and changes • Media with new information • Clear instructions

(Continued)

TABLE 5 (Continued)

Main codes	Sub-codes	Specific resources
Organization of work	Work process	Structures and guidelines: • Clear structures and specifications (from the hygiene, senior management, in the department and at the hospital, precise guidelines from the management) • Fixed structures that were not constantly changed • Faster and more pragmatic decisions • Less confusion • Restructuring Processes in general: • Processes became slower and calmer • Hectic is avoided • Clear information about the current situation and processes • Clarity • Increasing routine • Discuss results and conduct initial interviews by phone/video • Confidence in own processes Planning and organization in general: • Good organization • Good considerations and rational division to avoid shortages • Better prepared tasks • Containment of the first phase by shutting down operations
	Cooperation	Collaboration: • Support of other departments • Helping out at other wards • More constructive collaboration with the administration/the executive level • Joint implementation strategies • More intensive coordination with the clinic management • Insights into other areas • Good interaction among colleagues • Formation of interprofessional teams • Establishment of communication structures Cohesion and understanding: • Better mutual understanding within and between departments • Good cohesion • Strong team to back each other up Exchange and support: • Exchange with other areas, wards • Solving problems with the help of the hygiene specialist • Exchange with colleagues, doctors and at team meetings • Support from hospital hygiene/hygiene officers • Making arrangements

(Continued)

TABLE 5 (Continued)

Main codes	Sub-codes	Specific resources
Work environment	Workplace and information design	Regulations for visitors/entrance: • Selecting patients at the gate and directing them to the appropriate department • Access controls • Fewer visitors • Regulated visiting hours • Relatives partly recognized as a stress factor • More calmness for patients and nursing • More security/less unauthorized persons in the hospital Patients: • Rooms with two beds • Telephone consultation • Fewer infections • Patients focus more on themselves in some cases Digital work: • More remote work possible • Virtual conferences • IT is getting better • Improved digital working Structure and organization: • Renovations • Own office as a retreat • Workplace is closer to the team, therefore more connection and shorter distances • New constructions under required safety measures
	Work atmosphere	Togetherness and Cohesion: • More conscious interaction and good behavior among each other • Sense of community and joint implementation strategies • Great willingness to help each other • High motivation on all sides to manage the crisis • Support and consideration • Openness and solidarity • Cohesion of the different wards • Team spirit/teamwork • Everyone is pulling together/mastering tasks together • Some employees move closer together • There is a lot of laughter • Everyone in the team is equally affected • Mental support • Similar opinions Calmer and more relaxed work atmosphere
	Physical and chemical factors	Hygiene and infection protection: • Improved hygiene standards • More attention to hygiene measures • Refrain from shaking hands • Disinfection • Increasing acceptance of the measures • Knowing that individual actions do not spread the disease • More routine in handling infected patients • Protective measures • Good infection protection • More caution in certain areas (protection of others and own protection) • More tests • Wearing mask and protective equipment Other aspects: • Air conditioning • Lower noise level

(Continued)

TABLE 5 (Continued)

Main codes	Sub-codes	Specific resources
Individual changes/ resources/strategies	Individual resources	Friends and family: • Spouse/partner • Support from family, e.g., with child care • Conversations • Strong and positive private environment provides recovery • Family as a retreat • Other people with similar attitudes • Understanding (in general)
		Leisure activities: • Leisure time/time off in general • Sports activities and relaxation (meditation, cycling, breathing exercises, outdoor sports, autogenic training) • Outdoor/nature activities (walks, fresh air, hiking, forest bathing)
		Individual attitude/qualities: • Confidence • Positive thinking • Staying calm • Humor/laughing/having fun • Religion/trust in God • Concentration/focus on yourself • Resilience • Inner strength • Pushing fear aside/not being afraid • Good mental hygiene • Many new experiences and challenges • Better assessment of situations due to medical knowledge • Research, dealing with the topic • Self-protection and setting boundaries
Other positive changes/ resources/strategies	Other resources	• Being allowed to go to work instead of sitting at home to work • Satisfaction with the situation at work • Felt safer in the hospital than outside • Distraction when working with patients • Appreciate working in palliative care • Being able to help others despite the pandemic • Recognition

by individual participants in our study which, to our knowledge, have not been recorded in previous studies in relation to the COVID-19 pandemic include interdisciplinary cooperation across different teams and departments as well as the gain of (medical) knowledge related to the disease. Participants in our study mentioned interdisciplinary work and cooperation among teams and departments not merely as a burden but sometimes as helpful. This stands in contrast to another study conducted in Germany where participants indicated their desire for fixed and stable teams in the first phase of the pandemic (7).

Many respondents already seemed to have great confidence in their colleagues. Our results show that the extraordinary situation of crisis brought teams and colleagues closer together, but caused conflicts as well, especially in the second survey stage. Social relations are considered one of the most important influence factors of health (35). It is already recognized that positive social relations are important for stress reduction at the hospital workplace (2, 36). Situations characterized by high stress require the mobilization of social support to prevent negative consequences of stress (20). Nevertheless, stressful situations can also erode social relations in the long run, especially when stressors are chronic (20). The increase in stressors related to social relations in the second wave of the pandemic could be an indication that this resource was already eroding.

Long working hours, time and work pressure as well as frequent overtime have been recognized as job-related stress factors (37). Temporarily lower workloads at the beginning of the pandemic, a good flow of information and successful communication and cooperation were perceived as especially helpful in a time when regulations and procedures were rapidly changing. These findings suggest that interventions to improve work organization and work environment could reduce stress of hospital staff. A rapid review on the prevention and management of psychosocial effects among healthcare workers during previous pandemics assessed clear communication and the adherence to hygiene and infection control measures as helpful strategies (38). Respondents in our study found

these aspects helpful during the first two waves of the COVID-19 pandemic, which is also consistent with a qualitative study from the United States (28).

Social relations in the private environment and further individual coping strategies such as attitudes and leisure activities also played an important role in dealing with pandemic-specific stressors. This finding empirically supports the expansion of the JD-R theory, which proposes that organizational, job, home and personal demands and resources interact with each other, such as that, for example resources from either domain can buffer demands of the same or other domains and that proactive regulatory strategies of the individual can boost the positive impact of resources from different domains (24). In a crisis context, family resources become "resistance resources" that can prevent change or disruptiveness (24). Thus, the well-being of employees in times of crisis may not only be influenced by the organization or the leader, but also by families and the individuals themselves (24). In the case of care professions, individual resources have been shown to have a protective effect on workload and the risk for burnout (39). Another study reported that psychosocial support from friends and family as well as leisure time were the most frequent resources among care staff and physicians during the pandemic (7). Participants in our study also mentioned leisure time and personal contacts as important resources. Since our study included all hospital staff with patient contact, our findings suggest that employees from the functional service and secretariats also benefit from positive personal contacts and leisure activities in times of crisis.

The decrease in workload reported by our respondents during the first wave of the COVID-19 pandemic stands in contrast to reports of increased workload in hospitals in Germany (12) as well as other European countries (29) and may be specific to hospital departments not attending COVID-19 patients. Due to the temporarily lower workload at the beginning of the pandemic, it became clear that relief in this area can be perceived as especially positive and beneficial. This stands in contrast with more frequent mentions of stressors in relation to emotional demands, social relations and workload in the second survey stage. This observation is in line with one assumption of the job-demands-resources-model, namely that without sufficient opportunities for recovery, permanent stressful work demands can become stressors that can deplete the resources of employees (21).

During a crisis, employees with high job demands and low job resources are less likely to adapt to the situation and maintain well-being and performance (24). A follow-up study among Canadian nurses indicated that exhaustion due to pandemic-related stressors had not subsided a year after the pandemic, and that some were considering leaving the profession or had already done so (40). Resources become especially important in times of crisis, but they are also essential during normal operation. According to occupational psychology studies, employees who have stronger reserves of resources can handle demands resulting from stressful working conditions more effectively (20). For employees without resource reserves, on the other hand, these stress-inducing conditions can become chronic (20). Further, it has been suggested that a "recovery paradox" ensues when the need to recover from job stressors is high, while at the same time the likelihood to actually recover under these circumstances is reduced (41). Periods of high workload–e.g., later during the pandemic when operations were ramped up again–cannot be completely avoided in clinical work routine. Therefore, it is important to provide hospital employees with resources by improving the organization of work.

4.1. Implications

Against the background of our results, the promotion of social support and communication seems to be a promising starting point to effectively improve working conditions. Trust in the team and in other colleagues can prevent anxiety and depression among hospital staff, which is why the promotion of mutual trust through teambuilding activities is recommended (5). Conversations with colleagues and superiors have already been recognized as an especially valuable resource for stress management among care staff (39). So-called "Schwartz Rounds", conversations among employees that focus on reflection, emotions and exchange (42), might be a helpful intervention that could be implemented even without significant structural changes. One study has shown that Schwartz Rounds can improve mutual understanding and can be beneficial for teamwork and a connection among staff (42). Yet, social relations cannot compensate stress-generating working conditions in the long run (20), which is why a parallel reduction of stress-generating demands in addition to promoting this resource is needed in order to sustainably prevent stress.

The relevance of individual resources next to organizational and job resources for hospital workers was an important result of our study. Individual resources such as leisure activities or family and friends could be strengthened by ensuring necessary regenerative breaks, e.g., through sufficient staffing and optimized duty planning. Avoiding long working hours could also protect this resource (7). The prevention of stressors becomes especially important in view of the "recovery paradox" (41), which suggests that people experiencing a high level of job stressors cannot fully profit from resources that promote recovery. At this point, the issue of staff shortage needs to be mentioned as well. The connection between difficult working conditions and staff shortages has already been examined, some studies reported that hospital managers considered high workloads a reason for absenteeism among hospital staff (36, 43). More staff in the hospital sector could possibly at least partially solve other problems described, such as additional work, compensation for absence of staff/quarantine of other employees or related dissatisfaction, which reinforce each other in a vicious circle. Improved staffing could also help ensure that employees take the necessary breaks for regeneration and thus prevent stress. However, this kind of intervention might require the involvement of further actors outside of the hospital context, as the problem of staff shortage is currently one of the big challenges in the German political landscape (44, 45).

4.2. Strengths and limitations

A strength of our study is that less frequently questioned occupational groups at the hospital (e.g., functional service and secretariats) also participated in the survey. Data were gathered at three different sites at two time points during the COVID-19 pandemic. An additional strength is the highly detailed coding process with multiple rounds and four researchers involved.

Nevertheless, limitations must be taken into account as well. The answers to the open-ended questions were usually in the form of bullet points and often lacked context. We had no additional data that could have been considered. The use of open-ended questions in surveys has been criticized as a qualitative method because of the difficulty to interpret short answers without further context information, making it difficult to produce robust insights (31). By using written surveys, it was not possible to answer potential questions or achieve thematic saturation. Therefore, we do not exactly know whether all relevant aspects have been covered. Free text fields may not have been completed by employees who were particularly stressed or who had too much time pressure. However, this method may have allowed us to capture responses of hospital staff who may not have had the time to participate in a more time-consuming interview or focus-group study, especially during the period characterized by high workload demands. Moreover, there are only 173 employees who participated in both surveys considered by us, and we did not conduct a dropout-analysis. Statements about the development over time are therefore difficult. Even though there were two survey stages, we analyzed the results altogether. A further limitation is that data from the functional service, the secretariats and others as well as the data from physicians and the medical-technical service were each compiled in two groups for data protection reasons. This meant that we were unable to make differentiated statements with regard to the individual occupational groups, but only for the respective group in total. Finally, only hospitals that had already been involved in the SEEGEN project participated. Thus, they might have already had more resources at hand than other hospitals.

5. Conclusion

The resources perceived by employees in large hospitals of different ownership indicate that communication and mutual social support significantly contribute to a better coping with everyday stress and special challenges in a time of crisis. Improving workplace and communication design and reducing the amount of work were also perceived as helpful. Strengthening and reinforcing existing resources is a useful and necessary starting point for the sustainable improvement of working conditions in normal operation and in order to prepare for possible further pandemics and crisis situations. Adequate staffing of the clinics must not be disregarded in the substantial promotion of these resources.

Data availability statement

The datasets presented in this article are not readily available because of data protection guidelines. Requests to access the datasets should be directed to KS, kira.schmidt.stiedenroth@hhu.de; LG, lisa.guthardt@hhu.de.

Ethics statement

The studies involving humans were approved by University of Ulm: 501/18, University of Heidelberg: S-602/2019, University of Düsseldorf: 6193R. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KS, LG, MG, PA, and AM: Conceptualization. KS, LG, MG, and MK: Formal analysis. FJ, IM, HG, PA, AM, and SEEGEN: Funding acquisition. KS, LG, MG, and MK: Methodology. SEEGEN: Project administration: MS, RE, SEEGEN, PA, and AM: Resources. AM and PA: Supervision. KS and LG: Visualization. KS and LG: Writing - original draft. KS, LG, MG, MK, MS, RE, FJ, IM, HG, PA, and AM: Writing - review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Physical discomforts, feeling of the high work intensity and the related risk factors of the frontline medical staff during COVID-19 epidemic: an early-outbreak, national survey in China

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Background: Facing the unknown virus, COVID-19 medical staff kept wearing thick personal protective equipment during their work in the early stage of the outbreak. The survey was designed to investigate the physical discomforts, the feeling of the work intensity and the related risk factors of the frontline medical staff during COVID-19 epidemic in the early outbreak.

Methods: An national survey was carried out in China from March 17th 2020 to March 20th 2020 by applying a standardized WeChat questionnaire survey. The doctors or nurses working in the wards for the confirmed COVID-19 patients on front-line were eligible to participate in the survey. Descriptive analysis and multivariate logistic regression analysis were used.

Results: A total number of 515 COVID-19 medical staff, including 190 physicians and 325 nurses participated in this survey. 375 medical staff (72.8%) experienced physical discomforts at work, mostly consist of dyspnea (45.8%), pain (41.0%), chest distress (24.1%), dizziness (18.8%), and weakness (17.5%), while wearing thick isolation clothes at work. The mean onset time and peak time of these symptoms were 2.4 h and 3.5 h after working, respectively. 337 medical staff (65.4%) suffered from sleep disorders. 51 medical staff (10%) were highly worried about being infected by COVID-19 even during their work breaks. 246 medical staffs (47.8%) felt high work intensity and the independent influential factors were the effective daily sleep time and anxiety levels at break time ($p = 0.04$).

Conclusion: The frontline medical staff during COVID-19 epidemic felt different physical discomforts when they wear thick isolation clothes at work in the early outbreak and they felt high work intensity. These precious data will help optimize the work management strategy to ensure the physical and mental health of medical staff in the face of similar outbreaks in future.

KEYWORDS

COVID-19, medical staff, physical discomforts, work intensity, risk factors

1. Introduction

Since the outbreak of 2019 novel coronavirus (COVID-19) in Wuhan, Hubei province, China in late December 2019 (1–5), COVID-19 cases are still being continuously confirmed all over the world (6). This disease was transmitting so fast that the health-care system had been facing a sudden crisis. Moreover, the mortality rate was considerable in critically ill patients, as high as 61·5% (7). It is no doubt a huge challenge for medical staff never met before.

Reports showed that many health-care workers had been infected by COVID-19, and some of them had died (8–11). The mental stress of the health-care workers increased significantly when they cared for a large number of anxious COVID-19 patients with high-intensity work (12, 13). Lai (14) reported that health-care workers experiencing psychological burden, directly engaged in the diagnosis, treatment, and care for patients with COVID-19. Therefore, the medical staff for COVID-19 patients wore thick personal protective equipment (PPE) to protect themselves not being infected in the early outbreak in China, including three layers of medical hats, two layers of medical masks (N95 and surgical mask), eye protection (goggles or face screens), two layers of waterproof isolation clothing (a long fluid-impermeable gown and an operating coat), two layers of gloves, and two layers of shoe covers (Figure 1). This combination of PPE may cause increased work of breathing, reduced field of vision, muffled speech, difficulty hearing, and heat stress (15). Also, the medical staff who care for patients infected with COVID-19 are at a high risk of pressure injuries that caused by protective equipment in the prevention process (16). A growing concern regarding skin problems has been identified among healthcare workers during the COVID-19 pandemic (17–19), and the PPE-related skin injury can be serious (20). Daye (21) reported that skin problems were found to be 90.2%, the most common were dryness, itching, cracking, burning, flaking, peeling and lichenification. Severity of skin reaction was found to be significantly related to "hours per day of PPE use," "consecutive days of PPE use," and "female sex" (22). In the study by Proietti et al., prolonged use of PPE was a significant risk factor for developing skin related adverse events considering all the PPE considered (23). These occupational dermatoses caused by PPE in the ongoing COVID-19 pandemic are emerging occupational health challenges (24).

Therefore, the frontline medical staff faced great work stress and physical challenges during COVID-19 epidemic in the early outbreak. However, their physical discomforts and the feeling of the work intensity were not detailed described in previous studies. The survey was to comprehensively investigate their physical discomforts, the feeling of the work intensity and the related risk factors. When people face similar outbreaks in the future, these precious data may be learned from by the medical workers.

FIGURE 1
The COVID-19 medical staff wore thick personal protective equipment (PPE).

2. Methods

2.1. Study design and data collection

An anonymous investigation was carried out in China from March 17th 2020 to March 20th 2020 by applying a standardized anonymous WeChat questionnaire and the details are provided in the Supplementary material. The medical staff directly taking care of the confirmed COVID-19 patients were eligible to participate in the survey. The questionnaire consists of three parts. The first part is to collect basic characteristics, including demographic information and general work history. The second part is to investigate the physical discomforts of the COVID-19 medical staff at work. Other work related information were also included, such as work location, personal protective status, work time. The third part of the questionnaire collects information about the feeling of the work intensity and other mental state. Visual Analogue Scale (VAS) was used to evaluate the feeling of the work intensity levels, the anxiety levels of being infected by COVID-19 both at work and break time, and the adaptability levels to the COVID-19 related work (Figure 2). The feeling of the work intensity levels were further categorized into two groups according to the VAS scores, low-moderate intensity (VAS score: zero-five) and high intensity (VAS score: six-ten). Sleep disorder and the psychological interventions during the COVID-19 work period were also investigated.

2.2. Statistical analysis

Statistical analyses were performed using SPSS 22.0 software (SPSS Inc., Chicago, IL, United States). Quantitative variables were reported as mean with standard deviation or median with interquartile spacing (IQR). Qualitative data were described as values or percentages. A $p < 0.05$ was considered statistically significant.

Potential influential factors for feeling of the work intensity were identified firstly by univariate logistic regression analysis. Those factors with $p < 0.05$ were further included in a stepwise multivariate logistic regression analysis. Results were reported as the odds ratio (*OR*) with 95% confidence interval (CI).

3. Results

3.1. Basic characteristics

A total number of 515 medical staff for COVID-19 [mean age, 34.5 (SD, 7.1) years; mean weight, 58.8 (SD, 18.0) kg; 190 (36.9%) physicians and 325 (63.1%) nurses], participated in this anonymous survey. As shown in Table 1, 389 medical staff (75.5%) came from Heilongjiang province, and 126 medical staff (24.5%) were from other provinces in China. 198 ICU medical staff accounted for 38.4% of all the participants in this survey. The rest of them were from respiratory department (63 medical staff, 12.2%), infectious disease department (15 medical staff, 2.9%), emergency department (11 medical staff, 2.1%), and other departments (228 medical staff, 44.3%). The medical staff mainly consisted of resident physicians and nurses (239 medical staff, 46.4%) and attending physicians and nurses (162 medical staff, 31.5%). Half of them had more than 10 years of work experience. The results showed that 39 medical staff (7.6%) had underlying physical diseases, such as hypertension or diabetes.

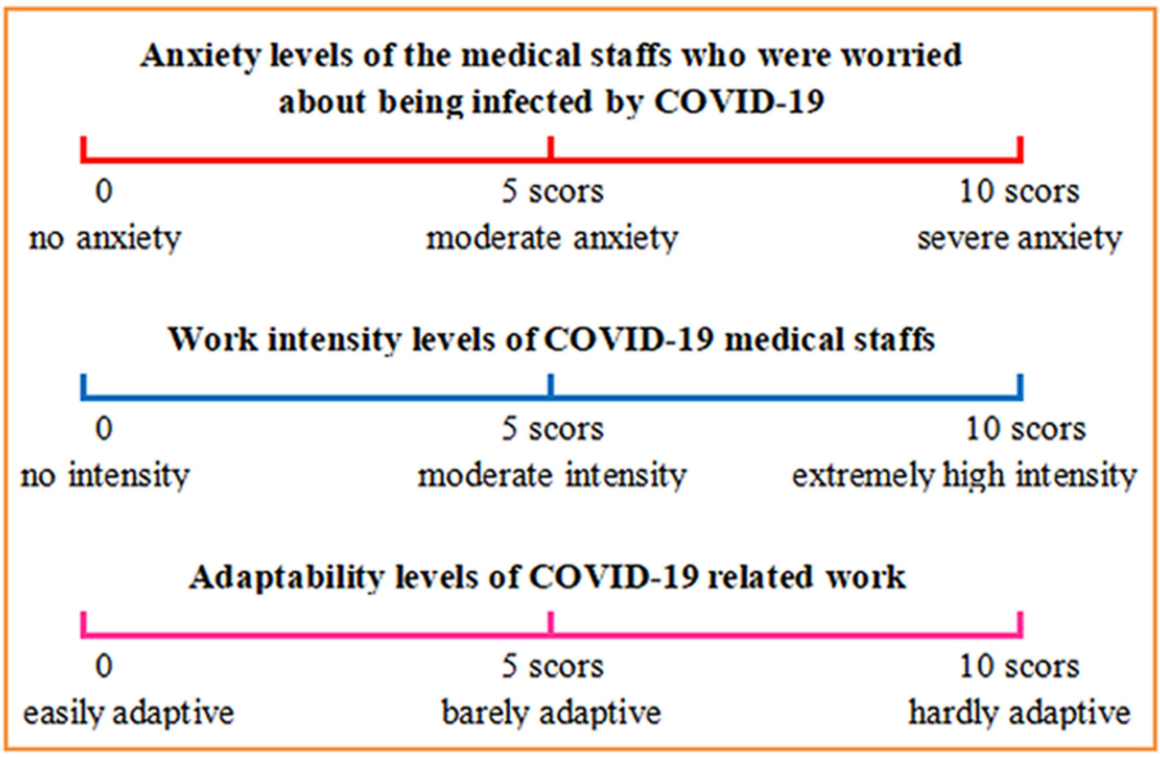

FIGURE 2
Visual Analogue Scale (VAS) used in the investigation.

TABLE 1 Basic characteristics of 515 COVID-19 medical staffs.

	Median	IQR	Mean ± SD	Number	%*N*
Age, years	33	9	34.5 ± 7.1		
Gender					
Male				168	32.6
Female				347	67.4
Weight, kg	60	15	58.8 ± 18.0		
Hometown					
Heilongjiang providence				389	75.5
Other providences				126	24.5
Disciplines					
Intensive care unit				198	38.4
Respiratory department				63	12.2
Infectious disease department				15	2.9
Emergency department				11	2.1
Other departments				228	44.3
Type of staff					
Doctors				190	36.9
Nurses				325	63.1
Professional titles					
Resident physicians and nurses				239	46.4
Attending physicians and nurses				162	31.5
Associate chief physicians and nurses				74	14.4
Chief physicians and nurses				40	7.8
Working years					
<5 years				81	15.7
5–10 years				174	33.8
>10 years				260	50.5
Physical disease				39	7.6
Hypertension				6	1.2
Diabetes				3	0.6
Other problems				30	5.8

COVID-19 = 2019 novel coronavirus.

3.2. Physical discomforts and other work related information

Table 2 shows the work related information of the medical staff for COVID-19. All of them worn thick PPE at work (Figure 1). Most of them worked in Heilongjiang province (257 medical staff, 49.9%) or Hubei province (227 medical staff, 44.1%). None of the medical staff in this study was infected with COVID-19. Upon the time of the survey, these medical staff had continued working for COVID-19 patients for mean 26.3 [SD, 13.4] days. Nearly half of the medical staff (229 medical staff, 44.5%) had finished their rescue work for COVID-19 patients at the time of data collection.

375 medical staff (72.8%) felt physical discomforts while wearing thick isolation clothes at work, mostly consist of dyspnea (236 medical staff, 45.8%), pain (211 medical staff, 41.0%), chest distress (124 medical staff, 24.1%), dizziness (97 medical staff, 18.8%), and weakness (90 medical staff, 17.5%). The onset time [mean (SD)] and peak time [mean (SD)] of these symptoms were 2.4 [1.5] hours and 3.5 [1.5] hours after working, respectively. 27.0% of the medical staff felt obvious discomforts in 1 h. 20.8% of the medical staff had been forced to leave the wards during the working time because of several reasons, including feeling physical discomforts (61 medical staff, 11.8%), changing the protective equipment (40 medical staff, 7.8%), going to the toilet (14 medical staff, 2.7%), or other reasons (5 medical staff, 1.0%). The effective working hours/per time of 459 medical staff (89.1%) was four to 6 h, and 369 medical staff (70.9%) expected the effective working hours/per time to be 4 h.

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TABLE 2 Work status of 515 COVID-19 medical staffs.

	Median	IQR	Mean ± SD	Number	%N
Work location					
Heilongjiang province				257	49.9
Hubei province				227	44.1
Other provinces				31	6
Working wards of COVID-19 patients					
Ward for mild patients				12	2.3
Ward for moderate patients				40	7.8
Ward for severe patients				162	31.5
ICU for critically ill patients				234	45.4
Ward for mixed patients				67	13
Effective working hours/per time					
<4 h				23	4.5
4–6 h				459	89.1
≧7 h				33	6.4
Expected effective working hours/per time					
≦3 h				67	13
4 h				365	70.9
5–8 h				83	16.1
Cumulative working days for COVID-19	26	19	26.3 ± 13.4		
Physical discomforts during work				375	72.8
Symptoms					
Pain				211	41
Chest distress				124	24.1
Dizziness				97	18.8
Dyspnea				236	45.8
Weakness				90	17.5
Cough				48	9.3
Faint				3	0.58
Others				55	10.7
Start time	2	2	2.4 ± 1.5		
0.5–1 h				139	27
2–4 h				317	61.6
>4 h				59	11.5
Peak time	3.5	1	3.5 ± 1.5		
0.5–1 h				49	9.5
2–4 h				340	66
>4 h				126	24.5
Interruption of work in the ward				107	20.8
Physical discomfort				61	11.8
Change the protective equipment				40	7.8
Go to the toilet				14	2.7

(Continued)

TABLE 2 (Continued)

	Median	IQR	Mean ± SD	Number	%N
High mental strain				1	0.2
Others				4	0.8
End of work for COVID-19				229	44.5
According to the work management				214	41.6
Physical discomfort				8	1.6
Others				7	1.4

COVID-19, 2019 novel coronavirus; IQR, interquartile spacing; ICU, intensive care unit.

TABLE 3 Mental state of 515 COVID-19 medical staffs.

	Median	IQR	Mean ± SD	Number	%N
Sleep disorder				337	65.4
Effective daily sleep time					
≦6 h				305	59.2
7–8 h				189	36.7
>8 h				21	4.1
Anxiety levels of medical staffs from worrying about being infected by COVID-19[#]					
Work time	3	3	3.8 ± 2.9		
0 score				81	15.7
1–5 scores				333	64.7
6–10 scores				101	19.6
Break time	2	4	2.6 ± 2.6		
0 score				131	25.4
1–5 scores				333	64.7
6–10 scores				51	10
Work intensity levels of COVID-19 medical staffs[#]	5	3	6.0 ± 2.2		
0 score				11	2.1
1–5 scores				258	50.1
6–10 scores				246	47.8
Adaptability levels of COVID-19 related work[#]	2	4	2.8 ± 2.4		
0 score				124	24.1
1–5 scores				340	66
6–10 scores				51	10
Psychological intervention				70	13.6

[#]Visual Analogue Scale (VAS) was used to evaluate as in Figure 2. COVID-19, 2019 novel coronavirus; IQR, interquartile spacing.

3.3. Feeling of the work intensity and other mental state

The mental state of the medical staff for COVID-19 was shown in Table 3. 337 medical staff (65.4%) suffered from sleep disorders, and more than half of them had 6 h or less effective sleep per day. The VAS scores [mean (SD)] of anxiety levels of the medical staff who were worried about being infected by COVID-19 were 3.8 [2.9] at work and 2.6 [2.6] during break time, respectively. Only 131 medical staff (25%) were not anxious about the COVID-19 infection during breaks, whereas 51 medical staff (10%) were highly worried about being infected by COVID-19 even during breaks. 70 medical staff (13.6%) received psychological interventions during the COVID-19 work period. The VAS score (mean [SD]) of their feeling of the work intensity levels was 6.0 [2.2] and 246 medical staff (47.8%) felt high work intensity (VAS score ≧ six). However, most of the medical staff could adapt to the COVID-19 related work with the VAS score [mean (SD)]: 2.8[2.4] (Table 3). The feeling of the work intensity were further

TABLE 4 Related factors for work intensity of COVID-19 medical staffs*.

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	*P*	*OR* (95% CI)	*P*
Age, years	1.005 (0.981–1.029)	0.70	NT	
Gender	1.064 (0.736–1.538)	0.74	NT	
Weight (kg)	1.003 (0.989–1.017)	0.66	NT	
Hometown	1.008 (0.674–1.507)	0.97	NT	
Disciplines			NT	
Intensive care unit	Reference	–		
Respiratory department	0.623 (0.348–1.118)	0.11		
Infectious disease department	1.239 (0.433–3.548)	0.69		
Emergency department	0.904 (0.267–3.058)	0.87		
Other departments	1.103 (0.754–1.615)	0.61		
Type of staff (doctors or nurses)	1.008 (0.705–1.443)	0.97	NT	
Professional titles	0.988 (0.822–1.186)	0.90	NT	
Working years	1.052 (0.831–1.330)	0.68	NT	
Physical disease	0.833 (0.432–1.609)	0.59	NT	
Work location			NT	
Hubei province	Reference	–		
Heilongjiang province	1.387 (0.969–1.985)	0.07		
Other provinces	1.065 (0.501–2.264)	0.87		
Working wards of COVID-19 patients			NT	
Ward for mild patients	Reference	–		
Ward for moderate patients	1.615 (0.375–6.951)	0.52		
Ward for severe patients	2.341 (0.611–8.966)	0.22		
ICU for critically ill patients	3.500 (0.924–13.256)	0.07		
ward for mixed patients	2.743 (0.682–11.032)	0.16		
Effective working hours/per time	1.461 (0.857–2.492)	0.16	NT	
Cumulative working days	1.007 (0.994–1.020)	0.32	NT	
Sleep disorder	1.687 (1.166–2.439)	0.00		
Effective daily sleep time	0.727 (0.535–0.987)	0.04	0.718 (0.526–0.981)	0.04
Anxiety levels of medical staffs from worrying about being infected by COVID-19*				
Work time	1.168 (1.097–1.244)	0.00		
0 score	Reference	–		
1–5 scores	1.552 (0.935–2.574)	0.09		
6–10 scores	3.900 (2.101–7.240)	0.00		
Break time	1.179 (1.098–1.266)	0.00		
0 score	Reference	–	Reference	–
1–5 scores	1.877 (1.234–2.856)	0.00	1.652 (0.952–2.867)	0.07
6–10 scores	4.587 (2.273–9.255)	0.00	2.503 (1.039–6.027)	0.04

*Visual Analogue Scale (VAS) was used as in Figure 2, and the work intensity were categorized into low-moderate intensity (VAS score:0–5) and high intensity (VAS score:6–10); COVID-19, 2019 novel coronavirus; NT, not tested; *OR*, odds ratio; CI, confidence interval.

categorized into low-moderate intensity (VAS score: zero-five) and high intensity (VAS score: six-ten). Univariate and stepwise multivariate logistic regression analyses were performed to identify potential factors that were related to the work intensity. Comparisons were made between reference category and each of the remaining groups per characteristic.

In Table 4, the results from univariate logistic regression analysis show that none of the basic characteristics of medical staff significantly affected their feeling of the work intensity. Work location, working wards for patients with different disease severity, effective working hours/per time, effective break time, and cumulative working days were also not associated with work intensity. In contrast, sleep disorder,

effective daily sleep time, and anxiety levels of being infected by COVID-19 both at work time and break time were correlated with COVID-19 work intensity ($p < 0.05$). However, after adjusting for potential confounding factors through multivariate analysis, only effective daily sleep time and anxiety levels at break time were independent related factors for work intensity ($p < 0.05$). More specifically, the medical staff who were worried about being infected by COVID-19 with a VAS score of ≥six at break time felt a significantly higher work intensity than did those with a VAS score of zero ($p = 0.04$).

4. Discussion

As the continue increases of the confirmed COVID-19 cases worldwide, health-care systems globally could be operating at more than maximum capacity then and the health-care workers were every country's most valuable resource (25). The medical staff were under great pressure in the early outbreak. In a district general hospital in south London, 128 (39%) of doctors experienced at least one sickness episode (26). However, there is no detailed description of the physical discomforts of the medical staff for COVID-19 during the early outbreak. Facing the unknown virus, COVID-19 medical staff kept wearing thick PPE during their work in the early stage of the outbreak. The survey showed that COVID-19 medical staff had different physical discomforts and they felt high work intensity.

The incidence of the physical discomforts related to PPE (such as dyspnea, pain, chest distress,etc.) was high in our survey and these effects were really inevitable. They are not caused by individual weakness; they are normal and expected reactions that any person will have when exposed to an unusual environment (15). Sahebi A also found that the prevalence of PPE-associated headache was relatively high, and the prevalence after and before the use of PPE was 48.27 and 30.47%, respectively (27). Adverse effects of PPE were associated with longer shift durations (28). In our study, PPE was worn for 4–6 h in 89.1% of the participants. Since the mean peak time of these physical discomforts was 3.5 h in our study, it indicates that the ideal working hours for the COVID-19 medical staff should be around 4 h every time. Also, 70.9% of them expected the effective working hours/per time to be 4 h. If PPE and human resources became sufficient, medical staff should take reasonable shifts to ensure physical health, otherwise the efficiency and quality of their work might decrease. However, due to the limitations of PPE or human resources, some of them had to work continuously for more than 6 h, which might easily cause distractions from their work. If working hours/per time cannot be shorten, some other work strategies should be applied.

Most of the medical staffs involved in the study worked for severe and critically ill patients, 162 medical staffs (31.5%) and 234 medical staffs (45.4%), respectively. When wearing thick isolate clothes, it is more difficult to perform procedures for COVID-19 patients, particularly for critically ill COVID-19 cases requiring complicated invasive procedures, such as tracheal intubation and arterial puncture/venipuncture. High frequency of performing these procedures would significantly increase the workload of the medical staffs and shorten their peak time of physical discomforts. Some measures might be beneficial for performing centralized treatments, and saving human resources, such as setting up a specialized procedure team, classifying patients being according to their severity. More work is needed to summarize and share the reasonable COVID-19 patient management.

The COVID-19 medical staff may experience considerable psychological distress due to providing direct patient care, vicarious trauma, quarantine, or self isolation (29, 30). Sleep disorders, in particular insomnia, have been commonly reported in frontline medical workers (31, 32). A meta-analysis, which included 98,533 medical staff from 71 studies, found the prevalence of insomnia among Chinese medical staff during the COVID-19 outbreak was generally high, especially for first-line workers (33). Our result showed that more than half of the medical staffs suffered from sleep disorders, and the effective daily sleep time was an independent influential factor for work intensity. These workers who had shorter effective daily sleep time during the COVID-19 work period felt higher work intensity. The medical staff were under high pressure even in the break time, which might be a major reason that lead to sleep disorder. The results indicated that only about 25% of medical staffs were not anxious about being infected by COVID-19, whereas 10% of them were highly worried about being infected by COVID-19 even during breaks. Moreover, anxiety levels of medical staffs at break time was an independent related factor for work intensity, and medical staffs with a VAS score of ≥six at break time felt a significantly higher work intensity than did those with a VAS score of zero. During the early phase of the pandemic in the Philippines, one-fourth of respondents reported moderate-to-severe anxiety and one-sixth reported moderate-to-severe depression and psychological impact (34). Besides, the workload of taking care of COVID-19 patients is very overwhelming, which challenges physical and mental limitations of medical staff all the time. Many other factors, such as change of living habit, food and environment in the isolation regions, would affect their effective sleep time, which in turn reduce the quality and productivity of their work. The risk of psychological effects from the COVID-19 pandemic is significant and manifests as stress, anxiety, depression, sleeplessness, and, in some cases, suicide (35). Therefore, it is of great importance to monitor the mental and psychological state of COVID-19 medical staffs, and provide professional psychological interventions as needed.

The psychological issues may induce healthcare workers experienced burnout during the pandemic. Ibar C found that 12% of the studied population showed burnout (52% doctors and residents, 19% nurses, 19% administrative personnel) and healthcare workers are subjected to increased levels of stress and burnout (36). Other than poor sleep, long working hours was a risk factor regarding an increase in personal burnout, work-related burnout levels and depression among health care professionals (37). The medical staff in China have been working for COVID-19 treatments in isolated areas for about 3 years. The mean continuous working days of medical staffs was 26.3 days during our survey time. However, health-care workers, unlike ventilators or wards, cannot run at 100% occupancy for long periods (25). Training workers about appropriate coping styles to adopt may be essential to enact prevention strategies to reduce burnout incidence in workers (38). Also, it is crucial to design an appropriate work schedule for medical staff, otherwise their health would be under risk and the work quality might also decrease.

Furthermore, Vancappel (39) reported that post-traumatic symptoms were also highly prevalent among French healthcare workers at the beginning of the COVID-19 crisis and they found a significant effect of the level of exposure to COVID-19 on affective symptoms. In the study by Oliver TL, the results implied that the COVID-19 pandemic had immediate effects on the eating patterns, weight changes, PA, and psychological factors of healthcare workers

(40). In a large-scale survey during the COVID-19 pandemic, the results indicated that nurses who identified as women, working in ICUs, COVID-19 designated hospitals, and departments involved with treating COVID-19 patients had higher scores in mental health outcomes (41). Leaders within the hospital should investigate the working conditions and personal habits of all medical staff regularly and systematically during the COVID-19 pandemic and take any necessary preventive measures, such as improving resilience for nursing staff, in order to best care for their employees (37).

4.1. Study limitations

This study has several limitations. First, our investigation was carried out in the early stage of the outbreak of COVID-19 in China. The physical and mental state of the medical staff might be different in the later stage. Second, VAS score was first applied to evaluate the feeling of the work intensity of COVID-19 medical staff in this study. It was subjective and easy to implement, but further research is needed to confirm its effectiveness. Third, the details of the sleep disorders or the psychological intervention of the medical staff were not included in the questionnaire. In addition, this study fails to include the health-care workers who worked for fever clinics and who were in charge of infection surveillance. Their result of the data may be different.

5. Conclusion

The frontline medical staff for COVID-19 felt different physical discomforts when they wear thick isolation clothes at work in the early outbreak and they felt high work intensity. These precious data will help optimize the work management strategy to ensure the physical and mental health of medical staff in the face of similar outbreaks in future.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

This study was deemed non-human-subjects research by the institutional Review Board (IRB) of the Harbin Medical University. As a result, ethical approval and written informed consent to participate in this study were not required for the study.

Author contributions

LJ: Data curation, Formal analysis, Writing – original draft, Writing – review & editing. MY: Data curation, Writing – review & editing. HoW: Data curation, Writing – review & editing. HuW: Data curation, Formal analysis, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1270366/full#supplementary-material

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Public school teachers' occupational stress across different school types: a nationwide survey during the prolonged COVID-19 pandemic in Japan

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Objectives: School teaching is regarded as one of the most stressful professions worldwide. To maintain schoolteachers' mental health, the factors influencing occupational stress among schoolteachers must be clarified. This study aimed to investigate public school teachers' work-related stress considering the differences in school types using data from a large-scale nationwide survey conducted during the prolonged coronavirus disease 2019 (COVID-19) pandemic in Japan.

Methods: Data from a nationwide survey of public school teachers performed between June 2019 and December 2022 were analyzed. The dataset consisted of repeated cross-sectional data. The total number of participants was 270,777 in 2019, 296,599 in 2020, 299,237 in 2021, and 307,866 in 2022. Information on working hours, job demands, workplace support, stress response, and perceived main stressors were assessed for each type of public school.

Results: Regardless of school type, quantitative workload and long working hours were the most significant factors affecting teachers' stress responses. However, stress-related factors among teachers varied significantly between school types. The percentage of junior high school teachers who perceived "extra-curricular club activities" as their main stressor was the highest among all school types. The highest proportion of elementary school teachers perceived "dealing with difficult students" as their main stressor. Meanwhile, interpersonal conflict scores were the highest among special needs school teachers. Teachers' workload and stress levels significantly increased in the third year of the COVID-19 pandemic (2022) compared to the pre-pandemic year (2019) in all school types despite the marginally small score differences.

Conclusions: This study highlighted the importance of reducing teachers' workload for their mental health regardless of school types. Meanwhile, perceived work-related stress among teachers differed significantly between school types. Given the possible prolonged impacts of the pandemic on teachers' occupational stress, teachers' stress levels must be monitored throughout and after the pandemic. The results suggest that increasing the number of schoolteachers and support staff and providing adequate organizational support are necessary to prevent teachers' sick leave due to mental disorders. In addition, taking comprehensive countermeasures against teachers' occupational stress, considering the differences in school types, is crucial for safeguarding schoolteachers' mental health.

KEYWORDS

COVID-19 pandemic, interpersonal conflicts, public schools, school types, stressors, stress responses, teachers, working hours

1. Introduction

Teaching is one of the most stressful professions worldwide (1, 2). A high prevalence of mental disorders, such as depression and anxiety, have been identified among schoolteachers (3, 4). Consequently, teachers exhibit relatively high levels of stress-related symptoms and low levels of mental wellbeing compared with other occupations (5, 6). Burnout significantly contributes to teacher attrition (7). School teaching is one of the professions with the highest burnout rate (8). Teachers' work-related stress is associated with decreased job performance and increased burnout, which eventually affects their professional accomplishments (9). High levels of occupational stress among schoolteachers negatively affect individuals and society (10).

Schoolteachers are exposed to various sources of work-related stress. One of the major stressors among teachers is students' misbehavior (11). Moreover, interpersonal conflicts among co-workers are positively related to burnout rates among teachers (12, 13). In addition, long working hours among schoolteachers is a major social issue globally (14, 15) and is significantly associated with stress-related disorders among teachers (15, 16). In addition to teaching duties, teachers are burdened with multiple administrative and clerical tasks (17). According to the Teaching and Learning International Survey performed in 2018 (TALIS, 2018), teachers experience higher levels of stress in their school management duties or administrative work than in their classroom teaching tasks (18).

Schoolteachers' occupational stress varies depending on the school setting. Some studies indicate that primary school teachers experience greater stress and burnout than high school teachers (19–21). Timms et al. (19) indicated that a gender ratio imbalance and high job stress among female teachers could be the main reasons for the increased stress levels of primary school teachers (19). Generally, primary school students require more support because of their immaturity (22). Accordingly, teachers may be devoting more time and effort to primary school students, which may explain elevated stress levels among primary school teachers (23). Conversely, other studies have demonstrated that secondary school teachers are more stressed than primary school teachers (24, 25). Kavita et al. (24) analyzed seven stress factors: relationship with parents and co-workers, workload, time pressure, student attitude, workplace support, and lack of resources. Regarding all these stress factors, secondary school teachers experienced more stress than primary school teachers (24). Kongcharoen et al. (25) reported that secondary school teachers experienced higher overall stress than primary school teachers due to financial challenges and various work obligations (25). Studies on stress among special education teachers (teachers who work with students with learning or cognitive difficulties) unveiled that they experienced substantial work-related stress (26–28). Special education teachers struggled with inadequate training opportunities (27), lack of support from the organization and administration (26), and the perception that students are not excelling academically despite their efforts (28). Thus, considerable differences in schoolteachers' stress structures may exist between different school types.

In Japan, leaves of absence among schoolteachers due to mental health problems have become an urgent social concern. The percentage of schoolteachers on leave due to mental disorders has increased by approximately sixfold from 0.11% in 1992 to 0.64% in 2021 (29). In addition to their essential teaching tasks, teachers in Japan are tasked with various duties, such as related clerical work, school management, parent-teacher association activities, and extra-curricular club activities. The TALIS 2018 demonstrated that the working hours of schoolteachers in Japan were the longest among the OECD participating countries (18).

Public education has played a vital role in Japanese society. Public schools account for 96% of all primary and lower secondary schools in Japan (30). Mainly, Japan has four types of public school (excluding higher education institutions) according to education levels and the presence of students with physical or learning disabilities: elementary schools, junior high schools, high schools, and special needs schools. Elementary schools comprise 6-year education programs in which children's school attendance typically starts at the age of six. After graduating from elementary schools, students enroll in junior high schools which comprise 3-year lower secondary education programs. Compulsory education begins with 6 years of elementary school and ends with 3 years of junior high school. After completing a 9-year compulsory education, most students proceed to high schools which are normally attended for 3 years between the ages of 15 and 18 years. Special needs schools, which are divided into four educational levels (kindergarten, elementary, lower, and upper secondary), are for children with comparatively severe physical or learning disabilities. Students with mild disabilities attending regular elementary and junior high schools also receive special needs education.

Junior high school teachers in Japan tend to work extremely long hours (18). In junior high schools in Japan, extra-curricular club activities are enthusiastically pursued, with many teachers serving as advisors or coordinators (31). Junior high school teachers spend an average of 7.6 h a week on extra-curricular club activities, whereas elementary school teachers only spend 0.6 h a week (32). These activities and related club tournaments generally occur after school or on weekends, compelling teachers to extend their working hours or report to work on weekends and holidays. According to a survey conducted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the working hours of junior high school teachers were the longest among the three types of public schools in Japan (elementary, junior high, and high schools) (32). Approximately 60% of junior high school teachers worked 60 h a week or more (32). Thus, many engage in overtime work of over 80 h a month, which is considered a criterion for sudden death from overwork due to the increased risk of cardiovascular disease (33).

In Japan, special needs school teachers experience marked occupational stress due to the discrepancies between teachers' needs and national educational policies (34), similar to the conditions among special education teachers in other nations (26, 27). They also face inadequate organizational support for their particular working conditions (34). Conflicts among co-workers have also been linked to teachers' burnout, which is directly associated with sick leave due to mental illness (12). Team teaching, commonly employed in special needs schools in Japan, has been associated with teachers' stress reactions, mainly because teachers with different teaching philosophies are compelled to collaborate (34). For these various reasons, a survey conducted by MEXT in 2021 indicated that the percentage of teachers leaving a job due to mental

health problems was the highest in special needs schools among all types of public schools in Japan (29).

It is clear then that teachers' stress levels and related factors vary by school setting. To take comprehensive countermeasures against increased sick leave among teachers due to mental illness, the factors contributing to teachers' work-related stress, considering the differences in school types, must be clarified. However, the influence of school type on teachers' stress has not been adequately considered in a national survey with a sufficiently high participation from the target population.

In Japan, the government implemented the Stress Check Program in 2015, to mitigate workers' sick leave due to mental disorders (35). The program must be executed once a year in workplaces with 50 or more employees (35). In this program, workers' job stressors, and stress levels are examined. Every year, a significant number of public school teachers across Japan have participated in this program.

This study sought to examine schoolteachers' occupational stress and clarify the stress factors by considering the differences in school type using large-scale nationwide survey data. Finally, the study aimed to offer a useful proposal for protecting teachers' mental health. Data from the Stress Check Program, which is conducted on numerous public school teachers across Japan, were analyzed.

Based on the context described above, we present the following research hypotheses:

Hypothesis 1: Regardless of school type, quantitative workload and long working hours are the most significant factors affecting teachers' stress responses.

Hypothesis 2: Stress response scores among teachers in junior high and special needs schools are the highest among all types of public schools.

Hypothesis 3: Interpersonal conflict scores among teachers in special needs schools are higher than those in any other type of public school.

The COVID-19 pandemic has caused significant global challenges for schoolteachers worldwide (36). During the pandemic, a substantial prevalence of anxiety and depression among teachers has been observed (36, 37). Teachers experience high levels of stress as a result of workloads involving unfamiliar online instruction and the implementation of countermeasures against the spread of infection while performing routine school duties (36). In Japan, mild lockdowns have been intermittently implemented because the pandemic has showed a repeated pattern of expansion and contraction. The government maintained the classification level of COVID-19 as Category II under the Infectious Disease Control Law until May 2023, which required people to take strict countermeasures against the spread of infection for a total of 3 years (38). This situation holds true for school workplaces, where strict infection control measures have been implemented for a considerably long period. Teachers' stress levels are expected to increase significantly during this prolonged pandemic period. Thus, we propose the fourth hypothesis:

Hypothesis 4: Teachers' (quantitative and qualitative) workloads and stress levels have significantly increased during the prolonged COVID-19 pandemic.

2. Materials and methods

2.1. Sample and data collection procedure

We used data from the Stress Check Program performed by the Mutual Aid Association of Public School Teachers for public school (primary, secondary, and special needs schools) employees in participating educational institutions across Japan. The number of eligible public school employees for this program was approximately 350,000 per year. The survey is conducted yearly between June and December through an online questionnaire. The survey did not include questions specifically regarding the impact of the COVID-19 pandemic on schoolteachers' stress; nonetheless, it did include various questions concerning teachers' work-related stress, such as job workload, stress responses, working hours, and perceived main stressors. The total numbers of public school employees completing this questionnaire were 270,777 in 2019, 296,599 in 2020, 299,237 in 2021, and 307,866 in 2022, which comprised 80.0%, 81.1%, 82.9%, and 82.3% of all eligible employees, respectively. We could not acquire precise information relating to the proportion of public school teachers who underwent this "Stress Check" examination in all 4 years from 2019 to 2022. However, considering the program's high response rate (80.0–82.9%), a substantial number of public school teachers are most likely to have completed the examination in all 4 years.

The inclusion criteria for participating were as follows: (1) a full-time public school teacher (working at elementary, junior high, high, and special needs schools). The exclusion criteria were as follows: (1) a part-time teacher, (2) a teacher with administrative positions (a school principal and a vice-principal), (3) a nursing teacher (responsible for offering first aid to sick or injured school children), (4) a nutrition teacher (responsible for providing a nutrition education program), and (5) a clerical worker. No participants had missing data. The total number of eligible participants was 205,255 in 2019, 224,347 in 2020, 226,506 in 2021, and 232,577 in 2022. Table 1 exhibits the demographic characteristics of the participants.

2.2. Measurements

2.2.1. Working hours

We collected data on working hours per day with seven answer options as follows: (1) <8 h, (2) 8 to 9 h, (3) 9 to 10 h, (4) 10 to 11 h, (5) 11 to 12 h, (6) 12 to 13 h, and (7) 13 h or more. The data on working hours in the survey were based on self-reported information, including the time spent on various school duties other than educational tasks. These included school management duties, clerical work, extracurricular club activities, and parental contact.

2.2.2. Brief job stress questionnaire

In this study, the Brief Job Stress Questionnaire (BJSQ) was used to assess schoolteachers' work-related stress. Several language versions of the BJSQ are available (39). The BJSQ is an established stress scale used to identify high-stress workers, and is broadly used in occupational health in Japan (40, 41). The BJSQ was developed

TABLE 1 Participants' demographics.

		2019		2020		2021		2022	
		n	%	*n*	%	*n*	%	*n*	%
Elementary school	Men	34,569	37.0%	38,388	37.0%	39,296	37.2%	41,077	37.2%
	Women	58,984	63.0%	65,341	63.0%	66,262	62.8%	69,228	62.8%
	Total	93,553	100.0%	103,729	100.0%	105,558	100.0%	110,305	100.0%
	Age								
	≤29	22,018	23.5%	24,081	23.2%	24,226	23.0%	25,212	22.9%
	30–39	21,224	22.7%	23,688	22.8%	24,661	23.4%	26,102	23.7%
	40–49	19,967	21.3%	22,080	21.3%	22,481	21.3%	23,465	21.3%
	50–59	23,491	25.1%	25,122	24.2%	24,714	23.4%	24,737	22.4%
	≥60	6,853	7.3%	8,758	8.4%	9,476	9.0%	10,789	9.8%
Junior high school	Men	30,110	57.2%	33,725	57.0%	34,143	56.8%	35,347	56.6%
	Women	22,574	42.8%	25,479	43.0%	25,981	43.2%	27,112	43.4%
	Total	52,684	100.0%	59,204	100.0%	60,124	100.0%	62,459	100.0%
	Age								
	≤29	11,403	21.6%	12,612	21.3%	12,881	21.4%	13,204	21.1%
	30-39	13,442	25.5%	15,318	25.9%	15,660	26.0%	16,754	26.8%
	40-49	11,729	22.3%	12,961	21.9%	12,889	21.4%	13,024	20.9%
	50-59	12,548	23.8%	13,591	23.0%	13,286	22.1%	13,303	21.3%
	≥60	3,562	6.8%	4,722	8.0%	5,408	9.0%	6,174	9.9%
High school	Men	27,040	66.7%	28,067	66.2%	27,480	65.9%	26,880	65.8%
	Women	13,768	33.7%	14,353	33.8%	14,249	34.1%	13,963	34.2%
	Total	40,808	100.0%	42,420	100.0%	41,729	100.0%	40,843	100.0%
	Age								
	≤29	5,221	12.8%	5,430	12.8%	5,191	12.4%	5,165	12.6%
	30-39	8,306	20.4%	8,672	20.4%	8,634	20.7%	8,624	21.1%
	40-49	11,394	27.9%	11,489	27.1%	10,831	26.0%	10,123	24.8%
	50-59	12,334	30.2%	12,612	29.7%	12,287	29.4%	11,678	28.6%
	≥60	3,553	8.7%	4,217	9.9%	4,786	11.5%	5,253	12.9%
Special needs school	Men	7,023	38.6%	7,350	38.7%	7,300	38.2%	7,165	37.8%
	Women	11,187	61.4%	11,644	61.3%	11,795	61.8%	11,805	62.2%
	Total	18,210	100.0%	18,994	100.0%	19,095	100.0%	18,970	100.0%
	Age								
	≤29	3,267	17.9%	3,301	17.4%	3,172	16.6%	3,058	16.1%
	30-39	3,994	21.9%	4,247	22.4%	4,417	23.1%	4,492	23.7%
	40-49	5,098	28.0%	5,132	27.0%	5,065	26.5%	4,920	25.9%
	50-59	4,885	26.8%	5,132	27.0%	5,081	26.6%	5,002	26.4%
	≥60	966	5.3%	1,182	6.2%	1,360	7.1%	1,498	7.9%

in reference to the Generic Job Stress Questionnaire designed by the United States of America National Institute for Occupational Safety and Health (42). The BJSQ was also formulated based on the Job Demand-Control-Support model, the central hypothesis of which is that combinations of job demand, job control, and social support are associated with workers' stress levels (43). The scale comprises 57-items and assesses three aspects of work-related stressors: job demands (17 items), stress responses (29 items), and social support factors (11 items). Among job demands, the BJSQ includes quantitative workload (three items; e.g., "I have an extremely large amount of work to do"), qualitative workload (three items; e.g., "I have to pay very careful attention"), physical demands (one item; "My job requires a lot of physical work"), job control (three items; e.g., "I can work at my own pace"), skill utilization (one item; "My knowledge and skills are used at work"), interpersonal conflict (three items; e.g., "There are differences

of opinion within my department"), poor physical environment [one item; "My working environment is poor (e.g. noise, lighting, temperature, ventilation")], suitable jobs (one item; "This job suits me well"), and meaningfulness of work (one item; "My job is worth doing"). Stress responses include vigor (three items; e.g., "I have been very active"), anger-irritability (three items; e.g., "I have felt angry"), fatigue (three items; e.g., "I have felt exhausted"), anxiety (three items; e.g., "I have felt restless"), depression (six items; e.g., "I have felt gloomy"), and physical symptoms (11 items; e.g., "I have experienced headaches"). Social support factors include support from supervisors (three items; e.g., "How freely can you talk with your supervisors?"), co-workers (three items), and family and friends (three items). Each item was rated on a four-point Likert scale (1 = almost never, 2 = sometimes, 3 = often, and 4 = almost always). The stress response scores range from 29 to 116, with higher scores meaning higher stress levels. The scores on the three-item scale range from 3 to 12 (the scores on the one-item scale range from one to four). Higher scores indicate higher levels of stress for quantitative and qualitative workloads, physical demands, interpersonal conflict, and poor physical environment. Higher scores indicate better work conditions for job control, skill utilization, suitable jobs, and meaningfulness of work. Regarding the social support factors, higher scores indicate higher levels of social support.

The reliability and validity of this questionnaire are well established (44). All BJSQ scales presented acceptable alpha coefficients (e.g., quantitative workload, 0.82; qualitative workload, 0.73; job control, 0.76; stress responses, 0.90) (44, 45). Stress response scores measured using the BJSQ successfully predict the occurrence of depression among employees (45). The BJSQ has been used to evaluate work-related stressors and stress levels in various professions, such as schoolteachers, healthcare professionals, and firefighters (46–49).

2.2.3. Perceived main stressors of teachers

Participants were asked to select their main stressors out of the following 12 items (up to two items can be selected): (1) responsibility for students' learning, (2) school management duties, (3) providing a demonstration lesson, (4) managing extra-curricular club activities (5) dealing with difficult students, (6) dealing with challenging parents, (7) workload of clerical tasks, (8) relationship with co-workers, (9) relationship with supervisors, (10) unfamiliar work environment (due to a transfer), (11) long commuting time, and (12) personal problems. The survey items on schoolteachers' main stressors were chosen by the Mutual Aid Association of Public School Teachers based on the opinions of mental health professionals such as psychiatrists and psychologists in affiliated organizations. This study investigated the main stressors experienced by teachers in each type of public school.

2.3. Statistical analysis

Continuous variables are presented as means (*M*) with standard deviation (*SD*), and categorical variables presented as the number of cases with percentages. Differences in continuous variables were compared using Welch's one-way ANOVA, and a *post-hoc* analysis was performed using the Games–Howell test. Eta-squared (η^2) was calculated as the effect size for ANOVA using 0.01, 0.06, and 0.14 considered small, medium, and large effect sizes (50). Accordingly, we interpreted the eta-squared value of 0.01 as the minimum threshold of practical significance.

A multiple linear regression analysis was performed to assess the relationship between each scale of the BJSQ and stress responses after adjusting for gender and years of experience as a teacher for each school type. We also examined whether the size of each regression coefficient differed statistically between different school types. This procedure was performed by adding the interaction term between school type (after creating dummy variables) and each predictor variable to the regression equation, as well as examining its statistical significance (51).

To assess the multicollinearity between variables, we first examined the correlation coefficients for each pair of predictor variables. If the correlation coefficients for two variables were 0.8 or above, only one was used in the analysis. Multicollinearity was evaluated using variance inflation factors (VIF). We regarded a VIF exceeding 5.0 as indicating the presence of multicollinearity. We did not examine the interactions between the predictor variables in this study.

Cross-tabulated frequencies and percentages were calculated for the statistical analysis of categorical variables. A chi-squared test was performed to assess the association between categorical valuables. Cramer's V was used to calculate the effect size of the test. Conventionally, Cramer's V values of < 0.1 was considered negligible; 0.1, a small effect; 0.3, a medium effect; and 0.5, a large effect (33). Accordingly, we regarded the effect size value of 0.1 as the minimum threshold of practical significance. All the statistical analyses were conducted using SPSS version 28 (IBM Corp., Armonk, NY, USA). The level of significance for each test was set at $p < 0.05$.

2.4. Ethical considerations

The study was performed in accordance with the latest version of the Declaration of Helsinki, and was approved by the Institutional Review Board of Tokai Central Hospital (Reference no. 2022082601). This study used existing data, which were already completely anonymized and untraceable. The ethics committee of the hospital confirmed that all procedures were conducted appropriately and concluded that informed consent was not necessary for this study.

3. Results

3.1. Participants' characteristics

Participants' demographics are presented in Table 1. The largest number of teachers were elementary school teachers (N = 93,553–110,305 per year), followed by junior high school teachers (N = 52,684–62,459 per year). For elementary and special needs schools,

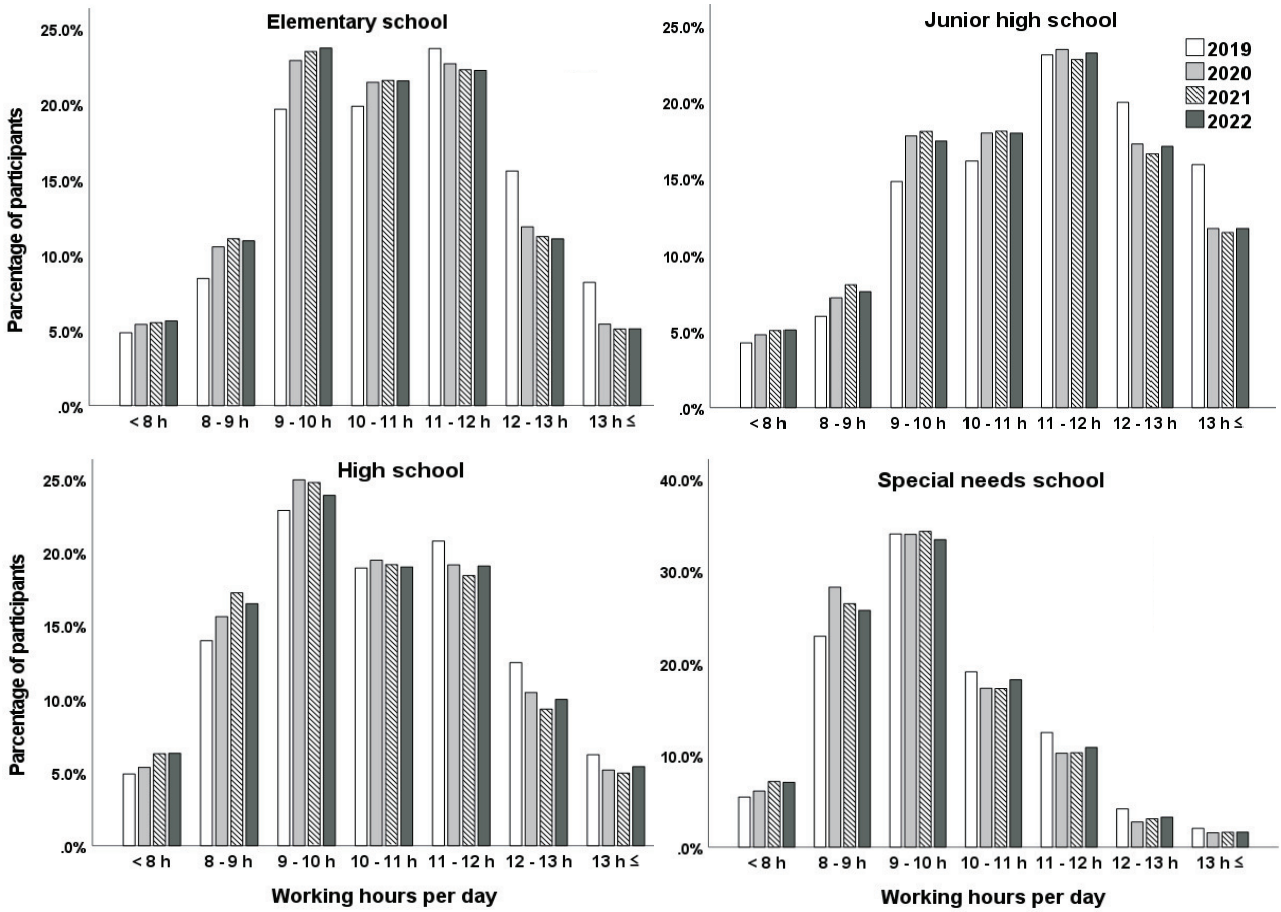

FIGURE 1
Comparisons of school teachers' working hours per day from 2019 to 2022 by school types.

the proportion of women was higher than that of men (62.8–63.0% and 61.3–62.2%, respectively).

3.2. Comparisons of working hours by school types

Figure 1 exhibits teachers' working hours per day for each school type. In the longest working-hour groups (11–12 h, 12–13 h, ≥13 h), the percentages of junior high school teachers were the highest (50.8–59.0%), followed by elementary school teachers (38.3–47.3%). Meanwhile, in the shortest working hour groups (< 8 h, 8–9 h 9–10 h), the percentage of special needs school teachers was the highest (62.3–68.2%). In all school types, the percentages of the longest working-hour groups (≥11 h) were the highest in 2019, and teachers' working hours significantly decreased after the pandemic began (2020–2022). The results of the chi-squared test demonstrated that the association between working hours and years was statistically significant ($p < 0.001$) in all school types; however, the effect sizes were marginally small (Cramer's V = 0.038–0.051).

3.3. Stress response scores in each working hour category from 2019 to 2022 by school types

Figure 2 presents box plots of the stress response scores in each working hour category from 2019 to 2022 according to school type. The results revealed that stress response scores significantly increased as working hours per day increased in all school types. Welch's ANOVA showed a significant difference in stress response scores between different working hour categories in all school types ($p < 0.001$, $\eta^2 = 0.027$–0.043). In the same working hour category, stress response scores in 2022 were the highest in all school types, followed by those in 2021.

3.4. Participants' BJSQ scores from 2019 to 2022 by school types

Table 2 presents participants' BJSQ scores by school types between 2019 and 2022. Welch's ANOVA demonstrated a significant difference between school types in qualitative workload

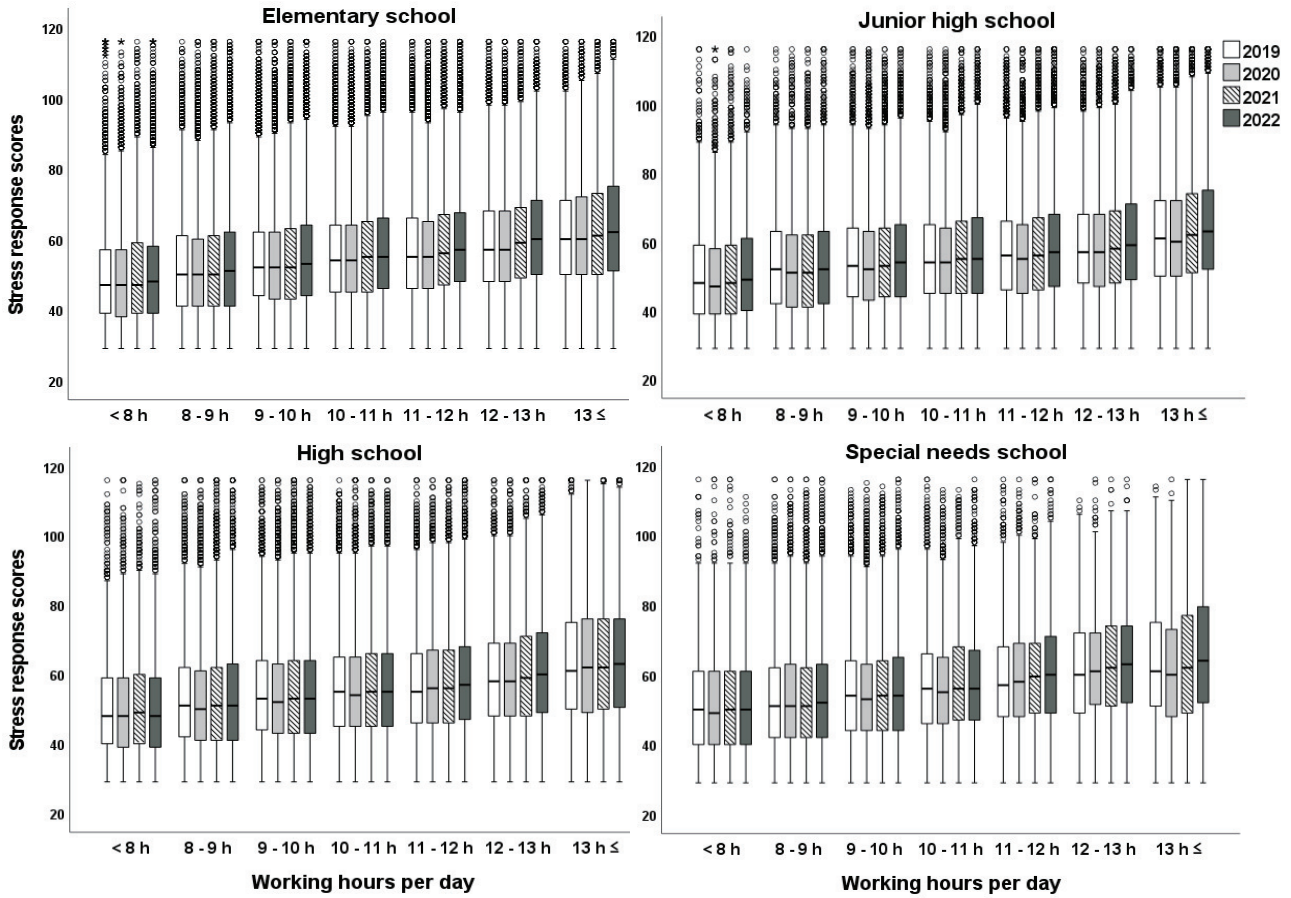

FIGURE 2
Stress response scores in each working hours category from 2019 to 2022 by school types.

(η^2 = 0.015–0.022), qualitative workload (η^2 = 0.018–0.020), physical demands (η^2 = 0.051–0.056), interpersonal conflict (η^2 = 0.015–0.016), poor physical environment (η^2 = 0.015–0.021), supervisor support (η^2 = 0.014–0.018), and co-worker support (η^2 = 0.014–0.017) in all four years ($p < 0.001$ for all the scales). The scores of quantitative and qualitative workloads were the highest among elementary school teachers, followed by those among junior high school teachers in all four years. The scores of interpersonal conflicts were the highest among special needs school teachers. The scores of supervisor and co-worker support were the highest among elementary school teachers, followed by those among junior high school teachers.

The stress response scores of junior high school teachers were the highest, followed by those of elementary school teachers. Special needs school teachers' scores were the lowest among all school types. However, the difference in stress response scores between school types was negligibly small in all four years (η^2 = 0.001–0.002).

Welch's ANOVA showed a significant difference in almost all the scales between 2019, 2020, 2021, and 2022 ($p < 0.05$); nevertheless, the effect size of the difference between years was marginally small for all the scales ($\eta^2 < 0.01$). The scores for workloads (quantitative and qualitative) and stress response decreased from 2019 to 2020 and increased from 2020 to 2022 in a consistent pattern in all school types although the changes in scores were minimal.

3.5. Relationship between the BJSQ job stress scales and stress response scores among public school teachers by each school type in the third year of the pandemic (2022)

Table 3 displays the results of the multiple regression analysis assessing the association between the BJSQ job stress scales and stress response scores after adjusting for the effects of gender and years of experience as a teacher. First, we examined the correlation coefficients for each pair of predictor variables, none of which was 0.8 or above. In addition, all VIFs were below 5.0; therefore, multicollinearity was ruled out.

All regression coefficients were statistically significant ($p <$ 0.001) except for years of experience among teachers in special needs schools. Gender (being a woman) was positively associated with stress response scores in all school types. The association

TABLE 2 Comparison of the BJSQ job stress and stress response scores among public school teachers between different school types.

		2019	2020	2021	2022	
		M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	p^a
Quantitative workload	Elementary school	9.69 (1.91)	9.52 (1.94)	9.59 (1.94)	9.65 (1.94)	< 0.001
	Junior high school	9.59 (1.95)	9.43 (1.97)	9.54 (1.99)	9.62 (2.00)	< 0.001
	High school	9.07 (2.04)	8.96 (2.06)	9.03 (2.08)	9.11 (2.11)	< 0.001
	Special needs school	8.94 (1.94)	8.80 (1.94)	8.91 (1.98)	9.01 (1.99)	< 0.001
	Effect size[b]	0.022	0.017	0.017	0.015	
Qualitative workload	Elementary school	9.35 (1.72)	9.30 (1.74)	9.35 (1.73)	9.41 (1.73)	< 0.001
	Junior high school	9.06 (7.79)	9.01 (1.78)	9.06 (1.80)	9.14 (1.80)	< 0.001
	High school	8.68 (1.81)	8.67 (1.83)	8.69 (1.84)	8.73 (1.86)	< 0.001
	Special needs school	9.03 (1.74)	9.04 (1.75)	9.09 (1.76)	9.09 (1.76)	< 0.001
	Effect size[b]	0.020	0.018	0.018	0.019	
Physical demands	Elementary school	2.99 (0.75)	2.98 (0.75)	2.99 (0.75)	3.03 (0.75)	< 0.001
	Junior high school	2.80 (0.80)	2.80 (0.80)	2.80 (0.80)	2.84 (0.80)	< 0.001
	High school	2.49 (0.80)	2.50 (0.80)	2.51 (0.81)	2.53 (0.82)	< 0.001
	Special needs school	2.94 (0.78)	2.96 (0.78)	2.98 (0.79)	2.99 (0.78)	< 0.001
	Effect size[b]	0.056	0.051	0.052	0.053	
Interpersonal conflict	Elementary school	5.61 (1.82)	5.59 (1.83)	5.59 (1.82)	5.62 (1.82)	< 0.001
	Junior high school	6.08 (1.91)	6.06 (1.92)	6.06 (1.92)	6.11 (1.93)	< 0.001
	High school	6.06 (1.86)	5.99 (1.87)	6.01 (1.87)	6.01 (1.89)	< 0.001
	Special needs school	6.15 (1.76)	6.11 (1.77)	6.10 (1.77)	6.13 (1.77)	0.018
	Effect size[b]	0.016	0.015	0.015	0.016	
Poor physical environment	Elementary school	1.97 (0.84)	1.91 (0.81)	1.88 (0.80)	1.89 (0.80)	< 0.001
	Junior high school	2.07 (0.88)	2.02 (0.86)	2.00 (0.84)	2.02 (0.86)	< 0.001
	High school	2.23 (0.89)	2.18 (0.88)	2.17 (0.88)	2.18 (0.89)	< 0.001
	Special needs school	2.18 (0.86)	2.14 (0.85)	2.17 (0.86)	2.19 (0.87)	< 0.001
	Effect size[b]	0.015	0.016	0.021	0.020	
Job control	Elementary school	7.96 (1.80)	8.05 (1.78)	8.02 (1.80)	7.99 (1.81)	< 0.001
	Junior high school	7.84 (1.90)	7.91 (1.88)	7.86 (1.90)	7.81 (1.93)	< 0.001
	High school	8.03 (1.85)	8.10 (1.86)	8.06 (1.88)	8.05 (1.91)	< 0.001
	Special needs school	7.69 (1.81)	7.76 (1.81)	7.73 (1.83)	7.73 (1.83)	0.005
	Effect size[b]	0.003	0.003	0.003	0.003	
Skill utilization	Elementary school	3.20 (0.67)	3.22 (0.66)	3.21 (0.66)	3.20 (0.67)	< 0.001
	Junior high school	3.23 (0.70)	3.25 (0.70)	3.23 (0.70)	3.21 (0.71)	< 0.001
	High school	3.16 (0.72)	3.19 (0.72)	3.17 (0.72)	3.16 (0.72)	< 0.001
	Special needs school	3.03 (0.69)	3.06 (0.68)	3.05 (0.68)	3.04 (0.68)	0.002
	Effect size[b]	0.006	0.006	0.005	0.004	
Suitable jobs	Elementary school	3.03 (0.67)	3.05 (0.66)	3.02 (0.67)	3.01 (0.67)	< 0.001
	Junior high school	3.00 (0.70)	3.03 (0.68)	3.01 (0.70)	2.98 (0.70)	< 0.001
	High school	2.98 (0.69)	3.02 (0.69)	2.99 (0.69)	2.97 (0.70)	< 0.001
	Special needs school	2.99 (0.68)	3.01 (0.67)	2.99 (0.67)	2.98 (0.67)	< 0.001
	Effect size[b]	0.001	0.000	0.000	0.000	

(Continued)

TABLE 2 (Continued)

		2019	2020	2021	2022	
		M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*p*[a]
Meaningfulness of work	Elementary school	3.36 (0.65)	3.36 (0.65)	3.32 (0.65)	3.28 (0.67)	< 0.001
	Junior high school	3.31 (0.68)	3.32 (0.67)	3.28 (0.69)	3.23 (0.70)	< 0.001
	High school	3.17 (0.71)	3.20 (0.70)	3.16 (0.71)	3.13 (0.72)	< 0.001
	Special needs school	3.27 (0.67)	3.29 (0.66)	3.25 (0.67)	3.23 (0.68)	< 0.001
	Effect size[b]	0.012	0.008	0.008	0.006	
Supervisor support	Elementary school	8.46 (2.21)	8.48 (2.22)	8.49 (2.24)	8.49 (2.25)	< 0.001
	Junior high school	8.32 (2.28)	8.34 (2.29)	8.31 (2.31)	8.28 (2.33)	< 0.001
	High school	7.78 (2.27)	7.83 (2.30)	7.84 (2.32)	7.89 (2.34)	< 0.001
	Special needs school	7.66 (2.21)	7.72 (2.23)	7.72 (2.24)	7.74 (2.25)	0.006
	Effect size[b]	0.018	0.016	0.016	0.014	
Co-worker support	Elementary school	9.11 (2.02)	9.10 (2.04)	9.10 (2.05)	9.08 (2.07)	0.004
	Junior high school	8.79 (2.10)	8.81 (2.12)	8.76 (2.14)	8.72 (2.16)	< 0.001
	High school	8.44 (2.09)	8.49 (2.12)	8.48 (2.14)	8.45 (2.16)	0.006
	Special needs school	8.54 (2.03)	8.56 (2.07)	8.55 (2.08)	8.51 (2.09)	0.194
	Effect size[b]	0.017	0.014	0.015	0.015	
Support from family and friends	Elementary school	10.14 (1.99)	10.18 (2.00)	10.18 (2.01)	10.18 (2.02)	< 0.001
	Junior high school	9.82 (2.17)	9.86 (2.18)	9.85 (2.20)	9.83 (2.21)	0.045
	High school	9.65 (2.22)	9.69 (2.24)	9.68 (2.27)	9.67 (2.29)	0.167
	Special needs school	9.66 (2.22)	9.71 (2.20)	9.72 (2.21)	9.72 (2.22)	0.027
	Effect size[b]	0.010	0.010	0.010	0.010	
Stress responses	Elementary school	55.98 (14.6)	55.25 (14.6)	56.00 (15.0)	56.70 (15.3)	< 0.001
	Junior high school	57.39 (15.4)	56.32 (15.3)	57.19 (15.8)	58.13 (16.1)	< 0.001
	High school	56.28 (15.4)	55.63 (15.5)	56.10 (15.8)	56.58 (16.1)	< 0.001
	Special needs school	55.87 (15.1)	55.39 (15.2)	56.02 (15.5)	56.31 (15.6)	< 0.001
	Effect size[b]	0.002	0.001	0.001	0.002	

BJSQ, Brief Job Stress Questionnaires; M, mean; SD, standard deviation. [a]Welch's one-way ANOVA was performed to examine the difference of scores between the yeas for each school type. Effect sizes [eta-squared value (η^2)] was calculated as the effect size for one-way ANOVA] were negligible ($\eta^2 < 0.01$) for all scales. [b]Welch's one-way ANOVA was performed to examine the difference of scores between different school types for each year. P-values were less than 0.001 for all scales. Eta-squared value was calculated as the effect size for one-way ANOVA. Higher scores indicate higher stress levels for the quantitative and qualitative workloads, interpersonal conflict (scores range between 3.0 and 12.0, respectively), physical demands, and poor physical environment (scores range between 1.0 and 4.0, respectively). Higher scores indicate better work situation for job control (scores range between 3.0 and 12.0), skill utilization, suitable jobs, and meaningfulness of work (scores range between 1.0 and 4.0, respectively). Regarding buffering factors, higher scores indicate higher levels of social support (scores range between 3.0 and 12.0).

between gender and stress response scores was significantly stronger among junior high and high school teachers (β = 0.075–0.076) than those among elementary and special needs school teachers (β = 0.051–0.059).

Quantitative workload was the most significant positive predictor of stress responses among schoolteachers regardless of school type (β = 0.178–0.193), followed by qualitative workload (β = 0.129–0.155). In special needs schools, interpersonal conflict among teachers was the second salient factor leading to stress responses (β = 0.172). The association between interpersonal conflict and stress responses among teachers in special needs schools was significantly stronger than among teachers in other school types. Job control was the most buffering factor for teachers' stress responses in all school types (β = −0.145– −0.125).

3.6. Public school teachers' perceived main stressors by school types in the third year of the pandemic (2022)

Table 4 exhibits public school teachers' primary sources of stress in 2022 by school type. The highest percentage of teachers indicated a "workload of clerical tasks" as their main stressor regardless of school type (18.7–21.4%). The association between teachers' main stressor categories and school types was practically significant in "dealing with difficult students," "dealing with challenging parents," and "extra-curricular club activity" (Cramer's V = 0.103–0.305).

The percentage of elementary school teachers who indicated "dealing with difficult students" as their main stressor was the highest (26.3%) among all school types, followed by junior high

TABLE 3 Multiple regression analysis which examined the relationship between the BJSQ job stress scales and stress response scores among public school teachers in the third year of the pandemic (2022), adjusting for gender and years of experience as a teacher.

Scales	Elementary school	Junior high school	High school	Special needs school	Significantly different βs[a]
Years of experience	−0.028	−0.037	−0.038	−0.008[†]	E–J, E–H, E–S, J–S, H–S
Gender (reference: Men)	0.051	0.075	0.076	0.059	E–J, E–H, J–S, H–S
Quantitative workload	0.187	0.178	0.185	0.193	
Qualitative workload	0.146	0.155	0.151	0.129	E–J, E–S, J–S, H–S
Physical demands	0.058	0.054	0.039	0.053	E–H, J–H, H–S
Interpersonal conflict	0.141	0.145	0.139	0.172	E–S, J–S, H–S
Poor physical environment	0.076	0.075	0.073	0.065	E–S, J–S
Job control	−0.133	−0.145	−0.142	−0.125	E–J, J–S
Suitable jobs	−0.021	0.017	−0.016	−0.020	
Skill utilization	−0.139	−0.132	−0.124	−0.118	E–H, E–S
Meaningfulness of work	−0.116	−0.115	−0.127	−0.105	H–S
Supervisor support	−0.022	−0.020	−0.031	−0.029	
Co-worker support	−0.037	−0.046	−0.038	−0.048	
Support from family and friends	−0.096	−0.097	−0.086	−0.104	E–H, J–H, H–S
R^2	0.445	0.485	0.500	0.461	

BJSQ, Brief Job Stress Questionnaires; E, Elementary school; J, Junior high school; H, High school; S, Special needs school; R^2, Adjusted R square. Standardized regression coefficient (β) is shown in each category. All regression coefficients were statistically significant ($p < 0.001$) except years of experience among special needs school teachers. [†]β was not statistically significant ($p = 0.125$). [a]The difference in regression coefficients between school types was statistically significant [e.g., "E–J" means the difference in regression coefficients between elementary (E) and junior high school (J) was statistically significant ($p < 0.05$)].

school teachers (18.6%). Similarly, the percentage of elementary school teachers who indicated "dealing with challenging parents" as their main stressor was the highest (14.8%), followed by junior high school teachers (12.3%). Meanwhile, the percentage of junior high school teachers who perceived "extra-curricular club activities" as their main stressor was the highest (19.3%), followed by high school teachers (14.1%). The highest percentage of special needs school teachers indicated "relationship with co-workers" as their main stressor (18.0%) even though the effect size of its association with school types was negligible (Cramer's V = 0.076).

4. Discussion

This study aimed to assess public school teachers' occupational stress and clarify stress factors considering the differences in school types during the prolonged pandemic period. The results revealed that, regardless of school type, quantitative workload was the most significant factor for teachers' stress responses. Moreover, the results unveiled significant differences in the impact of each stress factor on teachers' stress responses between school types. To the best of our knowledge, this is the first study to investigate schoolteachers' work-related stress by school type using a large-scale nationwide survey data with an adequately high participation rate of the target population in Japan.

The results indicated that stress response scores among teachers increased significantly as working hours increased regardless of school type. In addition, multiple regression analysis demonstrated that quantitative workload was the most significant positive predictor of stress responses among teachers in all school types, thus supporting Hypothesis 1. These findings are consistent with those of previous studies (15, 52); quantitative workload and long working hours are significantly associated with psychological stress reactions among schoolteachers (15, 16).

The association between teachers' work overload and their mental health problems have been indicated worldwide (9, 53). A study in German revealed that teachers who worked more than 45 h per week suffered more often from unrecoverable fatigue than teachers who worked <40 h per week (53). A study in Philippine demonstrated that excessive workload among schoolteachers significantly increased their burnout rate (9). According to the Teacher Workload Survey 2019 (conducted in England), approximately 70% of primary school teachers and 90% of secondary school teachers reported that their workload was a serious problem (54). Thus, the present study further highlighted the importance of addressing teachers' excessive workload, which has been a serious social concern globally, for safeguarding teachers' mental health.

Previous studies have shown that teachers are burdened with a substantial amount of administrative and clerical tasks in addition to teaching duties (17, 18). Even in this study, the highest percentage of teachers indicated a "workload of clerical tasks" and "school management duties" as a main stressor regardless of school type. Paperwork related to educational and other peripheral tasks are perceived as considerably stressful for schoolteachers globally (54, 55). A survey in England demonstrated that most primary

TABLE 4 Public school teachers' main stressors in the third year of the pandemic (2022) by school types.

Main stressor		Elementary school ($N = 110,305$)	Junior high school ($N = 62,459$)	High school ($N = 40,843$)	Special needs school ($N = 18,970$)	Cramer's V
Dealing with difficult students	Count	29,015	11,639	5,672	2,418	
	% (within the school)	26.3%	18.6%	13.9%	12.7%	**0.133**
	Adjusted residual	60.2	−16.7	−38.7	−29.0	
Workload of clerical tasks	Count	22,635	13,295	8,726	3,544	
	% (within the school)	20.5%	21.3%	21.4%	18.7%	0.018
	Adjusted residual	−2.3	4.0	3.5	−7.2	
Dealing with challenging parents	Count	16,300	7,670	2,450	1,538	
	% (within the school)	14.8%	12.3%	6.0%	8.1%	**0.103**
	Adjusted residual	38.8	2.3	−41.2	−17.3	
School management duties	Count	16,074	9,859	7,380	3,295	
	% (within the school)	14.6%	15.8%	18.1%	17.4%	0.037
	Adjusted residual	−14.7	0.4	14.2	6.4	
Responsibility for students' learning	Count	12,024	4,688	4,487	1,757	
	% (within the school)	10.9%	7.5%	11.0%	9.3%	0.050
	Adjusted residual	15.8	−23.2	8.3	−2.9	
Extra-curricular club activities	Count	968	12,076	5,744	106	
	% (within the school)	0.9%	19.3%	14.1%	0.6%	**0.305**
	Adjusted residual	−121.5	119.9	48.4	−39.8	
Demonstration lessons	Count	8,909	3,570	1,034	964	
	% (within the school)	8.1%	5.7%	2.5%	5.1%	0.085
	Adjusted residual	35.1	−6.2	−34.0	−6.8	
Relationship with co-workers	Count	10,080	6,667	4,373	3,419	
	% (within the school)	9.1%	10.7%	10.7%	18.0%	0.076
	Adjusted residual	−21.1	1.2	1.1	35.0	
Relationship with supervisors	Count	6,102	3,800	1,707	1,049	
	% (within the school)	5.5%	6.1%	4.2%	5.5%	0.028
	Adjusted residual	1.8	8.3	−12.4	0.6	
Unfamiliar work environment	Count	5,832	3,248	2,038	1,269	
	% (within the school)	5.3%	5.2%	5.0%	6.7%	0.019
	Adjusted residual	−0.8	−1.6	−3.3	8.7	
Long commuting time	Count	4,037	2,847	2,888	1,145	
	% (within the school)	3.7%	4.6%	7.1%	6.0%	0.061
	Adjusted residual	−22.4	−1.9	25.0	9.1	
Personal problems	Count	11,186	5,384	4,016	2,418	
	% (within the school)	10.1%	8.6%	9.8%	12.7%	0.036
	Adjusted residual	3.8	−12.4	−0.4	13.7	

The number of cases is shown with their percentage in each category. A chi-squared test showed that the association between main stressors and school types was statistically significant in all stressor categories ($p < 0.001$). Values in bold indicate the absolute value of Cramer's V is more than 0.1.

and secondary school teachers recognized their spending "too much" time on administrative work and related clerical tasks (54). Moreover, teaching-related paperwork significantly contributed to schoolteachers' occupational stress (55). This situation is particularly true for the school workplace in Japan. The time spent on clerical and other related tasks was approximately 5.6 h work per week among teachers in Japan, more than double the average for all investigated countries (18). Our previous study demonstrated that teachers working overtime to conduct core educational work and peripheral tasks (e.g., clerical tasks) exhibited significantly higher stress responses than those engaging only in core educational work (52). To reduce teachers' occupational stress, more support staff members who can help with teachers' peripheral tasks must be employed. In addition, policymakers should re-examine the necessity of paperwork duties imposed on teachers and take effective measures to reduce this burden.

We hypothesized that junior high school teachers would experience the highest levels of stress, is similar to the special needs of school teachers. However, the results did not demonstrate a significant difference in schoolteachers' stress levels between different school types despite those in junior high schools having the highest levels. Therefore, Hypothesis 2 is not supported.

As expected, the working hours of junior high school teachers were the longest, followed by those of elementary school teachers, consistent with previous studies (18, 32). Furthermore, the highest percentage of junior high school teachers perceived "extra-curricular club activities" as their main stressor. Globally, extra-curricular club activities are considered as an integral component of school life, especially for secondary school students (56, 57). Extra-curricular activities have positive impacts on students' academic performance, regular class attendance, and favorable self-image among peers (56). Meanwhile, these activities place considerable burden on teachers involved (57). Extra-curricular club activities are conducted fervently in Japanese junior high schools, and many teachers serve in these activities as supervisors (31). Average hours spent on engaging in extra-curricular activities are extremely long (7.6 h per week) among junior high school teachers (elementary school teachers spend only 0.6 h per week) (32). According to international organizations such as the OECD, one of the strengths of Japan's public school system is that it provides students with holistic educational opportunities through various extra-curricular activities, including school trips, clubs, and school festivals (58). However, this situation imposes a substantial burden on public school teachers in Japan (58). To reduce teachers' excessive workloads, MEXT instructed local governments to gradually transfer the administration of weekend club activities to private sports clubs in local communities over several years starting from 2023 (59). However, there are numerous issues that must be addressed in transferring these club activities to local communities. The availability of personnel and facilities for managing these activities is inadequate depending on the region. In addition, outsourcing school activities to private clubs imposes new expenses on parents (59). The financial problems associated with extra-curricular activities, especially for low-income households, have also been identified in other countries (60, 61). Therefore, the government and policymakers should secure a sufficient budget to support the collaborating private clubs and low-income households to establish a sustainable model for these club activities.

The results revealed that quantitative and qualitative workloads of elementary school teachers were the largest among all school types. Moreover, the highest percentage of elementary school teachers perceived "dealing with difficult students" as their main stressor. In the Japanese educational system, elementary school teachers generally teach almost all subjects, from math and science to art class, while engaging in various extra duties. These duties include attending to students who are absent from school, providing guidance regarding their daily lives, and communicating with parents or guardians (52). Furthermore, the Japanese government has established an inclusive education system (one that encourages students with and without disabilities to learn together as much as possible) to meet the requirements of Article 24 of the Convention on the Rights of Persons with Disabilities. Based on these requirements, an increasing number of students with special needs are enrolled in regular public schools (62). This trend is particularly noticeable in elementary schools in Japan. According to a government report, the percentage of students with learning difficulties or behavioral problems taught in regular class settings was significantly higher in elementary schools (10.4%) than in secondary schools (5.6% in junior high schools and 2.2% in high schools) (63). Addressing students with special needs is creating additional challenges for primary school teachers already overloaded with various school duties. Schoolteachers' stress related to the implementation of inclusive education has also been reported in surveys from other nations (64, 65). A study in Ireland revealed that more than 80% of primary school teachers perceived educating children with behavior difficulties as increasingly challenging and stressful (64).

Despite challenging working conditions, the class size in Japanese schools remains relatively large, and the student-teacher ratio is considerably high in Japan compared with other OECD participating countries (66). The lack of an adequate number of schoolteachers compared to the number of students negatively affects the quality of education and teachers' work-related stress. Considering these conditions, increasing the number of schoolteachers and support staff is crucial to safeguard teachers' mental health. In addition, given the global trend of accepting students' individual needs, providing all teachers with opportunities to acquire basic special needs education skills and sufficient mental support is imperative.

The results demonstrated that the scores for interpersonal conflict among teachers were the highest among special needs schools. In addition, multiple regression analysis showed that interpersonal conflict was the second most important factor leading to stress responses among teachers in special needs schools. Furthermore, the percentage of teachers who perceived "relationship with co-workers" as their main stressor was the highest among special needs schools. Therefore, Hypothesis 3 is fully supported.

Conflicts among co-workers have been linked to teachers' burnout, which is directly associated with teachers going on sick leave due to mental disorders (12, 13). Team teaching is an instructional strategy in which two or more teachers collaborate

to teach the same group of students (67). This strategy is commonly employed in many special needs schools in Japan. If effectively used, collaborative exchanges between teachers can enhance their professional work and reduce their workload (68). Moreover, students instructed through collaborative teaching achieve higher academic outcomes and support from teaching staff (68). Considering its promising potential, team teaching has received increased attention globally (67). Meanwhile, teachers' stress levels may increase if teachers with different teaching style preferences are forced to collaborate (34). Muehlbacher et al. demonstrated that team teaching is an educational practice requiring teachers to have increased emotion regulation (69). Team teachers frequently use emotion regulation techniques, such as attentional deployment and reappraisal, to minimize experiencing negative emotions. Additionally, a positive discussion with a partner teacher after class is regularly used to address disagreements among team teachers (69). Taniguchi et al. demonstrated that a postponed-solution coping strategy reduced schoolteachers' stress caused by interpersonal problems with co-workers (70). Assertiveness, a social communication skill that openly expresses oneself while being concerned with others, can increase teachers' wellbeing at work (71). In this context, a stress coping program that focuses on relationship problems among colleagues would be significantly useful in reducing schoolteachers' work-related stress, especially for teachers involved in team teaching. Therefore, acquiring effective communication skills between colleagues is crucial for managing teachers' occupational stress.

In this study, the scores of teachers' workloads (quantitative and qualitative) and stress responses were the highest in 2022 (the third year of the pandemic) in all school types, although the effect size of the difference between the years was marginal. Moreover, in the same working hours category, the stress response scores in 2022 were the highest, regardless of school type. The results indicated that schoolteachers experienced significant work-related stress during the prolonged pandemic. Therefore, Hypothesis 4 is partially supported.

The scores for teachers' stress responses and workloads temporarily dropped in 2020 (the first year of the pandemic) in all school types, possibly due to the cancelation of various school events or activities and a decrease in schoolteacher related tasks (72). However, many school events and activities that were canceled in 2020 were reinstated in 2021 at Japanese public schools. In 2021 and 2022, COVID-19 variants continued to spread throughout Japan. Infection control measures, such as social distancing, were implemented to prevent infection, while many school activities and events were reinstituted (72). Additionally, online teaching has been implemented in place of traditional in-person learning since the COVID-19 outbreak (73). Teachers experienced elevated stress levels as a result of the unfamiliar workload entailed by online education methods (74). These difficult situations may have contributed to an increase in schoolteachers' stress levels during the prolonged pandemic. Furthermore, a study in China revealed that schoolteachers remain under considerable pressure even after the end of COVID-19 restrictions (75). Many offline school activities were arranged in the short period of time after the restrictions were lifted, imposing a substantial workload on teachers (75). The pandemic also caused severe psychological trauma among schoolteachers (75). Considering the possible prolonged impacts of the pandemic on teachers' mental health, their stress levels must be monitored throughout and after the pandemic.

The COVID-19 pandemic has severely affected the global economy (76), including the Japanese economy (77). However, public spending on primary, secondary, and tertiary education in 2019 was 7.8% of the total government expenditure in Japan, which was relatively low compared with other OECD countries (the OECD average was 10.6%) (66). Thus, the government should supplement public spending on school resources, such as by increasing the number of schoolteachers and support staff, and by providing teachers with opportunities to learn effective stress coping skills.

Although this study offers several important insights, it has some limitations. This study comprises four cross-sectional studies, executing a comparative analysis between years based on these survey data. The dataset consisted of repeated cross-sectional data that precluded the examination of individual-level changes prior to and after the onset of the pandemic. Longitudinal studies based on solid panel data obtained before and during the pandemic are required to identify the effects of the pandemic on teachers' occupational stress accurately. Nonetheless, considering the high participation rate in the "Stress Check" survey, it is plausible that a significant number of public school teachers completed the surveys in all four years. This study investigated occupational stress among public school teachers, including elementary, junior high, high, and special needs school teachers. The results may differ in other school settings, such as private schools, colleges, and universities. The pandemic-related stress may have differed among schoolteachers with administrative positions and clerical staff. Stress structures among schoolteachers may also differ in other cultures and countries. Planning cohort studies investigating cross-cultural differences in teachers' occupational stress should be valuable for this field of research. Further well-designed studies including these variables are necessary to counteract these possible biases. Despite these limitations, we believe that this study will provide useful proposals in this field of research.

5. Conclusion

The present study investigated public school teachers' work-related stress, considering the differences in school types. Regardless of school setting, quantitative workload and long work hours were the most significant factors for teachers' stress responses. This study further highlighted the importance of reducing teachers' workload for addressing their occupational stress. Meanwhile, stress factors among teachers significantly varied between school types. The highest percentage of junior school teachers perceived "extra-curricular club activities" as their main stressor. The scores for teachers' job workload were the highest in elementary schools, and the highest percentage of elementary school teachers perceived "dealing with difficult students" as their main stressor. Moreover, teachers' interpersonal conflict scores

were higher in special needs schools than in any other school type. Considering the global attention on team teaching in educational institutions, acquiring effective communication skills between colleagues is crucial for managing teachers' occupational stress. Finally, teachers' workload and stress levels significantly increased in the third year of the pandemic (2022) compared to the pre-pandemic year (2019), although the difference were minimal. Given the possible prolonged impacts of the pandemic on teachers' stress, teachers' stress levels must be monitored throughout and after the pandemic. These findings suggest that increasing the number of schoolteachers and support staff as well as providing adequate organizational support are critical to prevent teachers' sick leave due to mental disorders. Additionally, taking comprehensive countermeasures against teachers' occupational stress, considering the differences in school types, is crucial for safeguarding teachers' mental health.

Data availability statement

The datasets presented in this article are not readily available because we cannot publicly present individual data due to a data provider's regulations. Qualifying researchers may apply to access a minimal dataset on reasonable request by contacting the corresponding author. Requests to access the datasets should be directed to KT, tubonok@tokaihp.jp.

Ethics statement

The studies involving humans were approved by the Institutional Review Board of Tokai Central Hospital. The studies were conducted in accordance with the local legislation and institutional requirements. The Ethics Committee/Institutional Review Board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because This study used existing data for the study, and these data were already completely anonymized and untraceable.

Author contributions

KT: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing—original draft, Writing—review and editing. SM: Supervision, Writing—review and editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Associations of burnout with job demands/resources during the pandemic in health workers from Southeast European countries

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Introduction: Despite several studies assessing job demands and burnout in countries from the Southeast European (SEE) region, there is still a lack of data about the psychological impact of the pandemic on health workers (HWs).

Aims: The present study aimed to demonstrate and compare levels of burnout dimensions in HWs from SEE countries and to reveal the burnout–job demands/resources relationships in these workers during the pandemic.

Materials and methods: During the autumn of 2020, this online multicentric cross-sectional survey studied a large group ($N = 4.621$) of HWs working in SEE countries. The Maslach Burnout Inventory was used for the measurement of burnout dimensions. We analyzed the job demands by using the Hospital Experience Scale. Remuneration and relationships with superiors were measured using the Questionnaire sur les Ressources et Contraintes Professionnelles (English version).

Results: A series of ANOVA comparisons of means revealed the countries in which respondents showed higher mean values of emotional exhaustion (Bosnia and Herzegovina, Bulgaria, Croatia, Moldova, Montenegro, and North Macedonia) and the countries in which respondents showed lower mean values of this burnout dimension (Israel and Romania) (Welch $F = 17.98$, $p < 0.001$). We also found differences among HWs from different countries in job demands and job resources. The testing of hierarchical regression models, which have been controlled for certain confounding factors, clearly revealed that emotional exhaustion was predicted by job demands ($R^2 = 0.37$) and job resources ($R^2 = 0.16$).

Conclusion: Preventive measures for the improvement of mental health in HWs during the pandemic and beyond have to take into account the differences between countries regarding the country context and current scientific

knowledge. A modified stress test should be implemented in hospitals regarding future shocks that might include new pandemics, terrorism, catastrophes, or border conflicts.

KEYWORDS

health workers, pandemic, occupational health, burnout, job demands

1. Introduction

Health workers (HWs) are key stakeholders in delivering healthcare to patients that must be safe, timely, patient-centered, equitable, and effective. Long working hours, working under pressure with patients with coronavirus disease 2019 (COVID-19) infection, and having reduced rest periods during the COVID-19 pandemic put HWs at the front of the battle and thus at an increased risk of infection, resulting in psychological reactions such as chronic fatigue, anxiety, desolation, feelings of helplessness, and depression, among others (British Medical Association, 2020). Additionally, there has been significant disruption to usual practices, with many HWs being sent out of their usual workplaces and reassigned to work in more risky frontline positions.

Furthermore, the constant presence of fear of spreading the disease and the feeling of 'no one is safe', the concern over the availability of adequate personal protective equipment (PPE), discomfort caused by PPE usage, frequent changes of regulations, stigmatization in the community, and anger and aggression from patients and their families may result in chronic psychological distress, thus affecting the mental health of HWs. Therefore, the workplace environment that is rapidly changing during the ongoing emergency significantly increases the occupational risk to HWs (Cheng et al., 2020; De Kock et al., 2021; Sun et al., 2021).

Studies of the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) outbreaks reported that HWs more frequently suffer from psychological distress (including anxiety, depression, and stigmatization) and also long-lasting mental health consequences that can develop even years after the beginning of an outbreak (Mousavi et al., 2021). Moreover, during these outbreaks, an estimated one-third of HWs were found to suffer from burnout syndrome (Magnavita et al., 2021).

Burnout relates to "exhaustion due to prolonged exposure to work-related problems" (Guseva Canu et al., 2021; Shoman et al., 2021). Maslach defines emotional exhaustion (an unbearable exhaustion of physical and emotional strengths and feelings of overload caused by workplace stressors or job demands), depersonalization (an indifferent and cynical behavior toward the job), and reduced personal accomplishment (when the worker feels incompetence and has low performance at the workplace) as three basic components of the syndrome (Maslach and Jackson, 1981; Maslach and Leiter, 1997; Maslach et al., 2001). In HWs, chronic emotional and interpersonal workplace stressors, together with exposure to additional workplace hazards, could result in the development of burnout symptoms.

Apart from the everyday workload and individual traits, such as perfectionism and difficulty coping with stress, the context of the pandemic, especially working with infected patients, and lack of resources, such as lack of training or good organizational rules, put additional strain on HWs (Preti et al., 2020; Meira-Silva et al., 2022). On the other hand, cooperative teamwork and good organizational support can increase job satisfaction and the delivery of safe and efficient patient care (Mijakoski et al., 2015a).

All these psychological changes and effects among HWs during the pandemic support the theoretical model that was proposed by Demerouti et al. (2001) (job demands–resources model), according to which burnout syndrome and its development in healthcare settings are caused by the presence of high job demands (all prolonged physical and/or psychological efforts of work), which cause overburdening and emotional exhaustion, and the lack of job resources, at both the organizational and interpersonal level, causing withdrawal behavior and disengagement (Mijakoski et al., 2015b).

Job satisfaction and working conditions directly influence the quality of care HWs provide to patients. Sufficient job resources are required, even in conditions in which job demands are high (such as during a pandemic); hence, the motivation and engagement for work among HWs could be sustained and burnout levels reduced (Gómez-Salgado et al., 2019; Thapa et al., 2022). Many studies have indicated that supervisor support and remuneration could influence career commitment in HWs, leading to improved work engagement and well-being, so they should not be neglected (Bertone and Witter, 2015; Hämmig, 2017; Xu et al., 2021; Heyns et al., 2022).

In the latest report from the World Innovation Summit for Health (WISH), supported by the WHO, around 40% of HWs were found to develop anxiety and depression, while the occurrence of burnout symptoms and their manifestations has outlined that younger HWs face higher mental health risks during times of pandemic. The psychological burden and rise of negative mental health impacts caused by this global health emergency have caused the so-called 'pandemic within a pandemic' (World Health Organization, 2022).

Previous studies that determine work demands and burnout dimensions in countries from the Southeast European (SEE) region exist. Differences in burnout between nurses and doctors working in hospital settings have been assessed (Mijakoski et al., 2015c), but there is a lack of data assessing HWs and the psychological impact that the pandemic had on them. Therefore, the present study aimed to demonstrate and compare levels of burnout dimensions among HWs from SEE countries and to reveal the burnout and job demands/resources relationships among these workers during the pandemic.

2. Materials and methods

2.1. Procedure

This study is a part of an online Survey titled "Job Stress in Health Workers during COVID-19 Pandemic," conducted in SEE countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Israel, Moldova,

Montenegro, North Macedonia, Romania, Serbia, and Turkey) during the autumn of 2020 by the SEE Network on Workers' Health (SEENWH) with the SEE Health Network (Mijakoski et al., 2022). The coordinator of the activities was the Institute of Occupational Health of RN Macedonia, WHO CC in Skopje, North Macedonia. This multicentric cross-sectional survey studied a large group ($N = 4.621$) of HWs working in SEE countries. The majority of participants were female (78.4%). Their average age was 43.7 ± 10.7 years. The mean tenure was 18.8 ± 11.4 years. Participants were invited via e-mail, and links to the online questionnaires were available on the websites of the Medical and Nursing Chambers (for each of the participating countries) and through Microsoft Forms and LinkedIn. The participation was online, anonymous, and voluntary.

2.2. Survey instruments

The Maslach Burnout Inventory (MBI), as one of the most popular and validated burnout questionnaires, was applied for the measurement of burnout dimensions (Maslach et al., 2001). The MBI demonstrated high reliability for emotional exhaustion ($\alpha = 0.92$) and depersonalization ($\alpha = 0.78$). Nine items for emotional exhaustion and five items for depersonalization were scored using a 7-point Likert scale (0 = never to 6 = every day). Low emotional resources, reduced energy, feelings of unbearable exhaustion, and feelings of being used up were described as emotional exhaustion. Detached responses to other people, feelings of frustration, and cynicism defined the interpersonal dimension of burnout - depersonalization. The score for each dimension was calculated by adding responses, and each participant had separate scores for the two burnout components (Maslach et al., 2001).

The Hospital Experience Scale (HES) was applied for the evaluation of job demands. The HES was developed within the FP7 ORCAB Project by using qualitative thematic analysis (Montgomery et al., 2015; European Commission, 2022). Aimed at understanding workplace stressors in HWs, focus groups were organized with doctors, nurses, residents, and interns. The focus groups' data were evaluated by thematic analysis, which revealed workplace stressors among HWs. Furthermore, these stressors were used for the development of HES items, which were additionally categorized into four subscales: physical (seven items, $\alpha = 0.73$), organizational (six items, $\alpha = 0.79$), emotional (six items, $\alpha = 0.75$), and cognitive (five items, $\alpha = 0.69$) job demands. More comprehensive data about the validation of the HES could be obtained upon request. HWs marked their level of agreement with the items using a 5-point Likert scale (1 = never to 5 = always). For different job demand subscales, a mean score was calculated (Montgomery et al., 2015).

Remuneration and Relationship with superior were analyzed using the Questionnaire sur les Ressources et Contraintes Professionnelles (QRCP) (English version). This instrument is developed based on the Questionnaire on the Experience and Assessment of Work (QEAW) (Lequeurre et al., 2013). Remuneration evaluates the approach workers reflect on their salary (Demerouti et al., 2001; Lequeurre et al., 2013). Relationship with superior demonstrates the relationships of workers with their superiors and the social support that employees could obtain from them (Bakker et al., 2008; Lequeurre et al., 2013). Remuneration consists of five items ($\alpha = 0.82$), and Relationship with superior ($\alpha = 0.92$) consists of 9 items. A 7-point Likert scale (from 1 = never to 7 = always) was used for the ratings on the Relationship with superior items, while Remuneration ranged from 1 = strongly disagree to 7 = strongly agree (Lequeurre et al., 2013). The MBI and HEs have translated and back-translated to every language of the SEE countries, validated for Croatian and Macedonian use. For the other languages, validation is ongoing.

2.3. Ethical permission

The SEENWH and Ethical Boards of the Institute of Occupational Health of RN Macedonia, the coordinator of the Project, approved the ethical issues of the study. Participants' consent was requested and received.

2.4. Statistical analysis

The answers from all questionnaires were entered into an electronic database together with a check of the completeness of the data. Before other statistical analyzes, normality tests (reviewing histograms, skewness, kurtosis, box plot, and P–P Plot) were conducted. Where appropriate and necessary, a square root transformation of the data was applied. Taking into account the differences in sample sizes, Hochberg's GT2 *post hoc* procedure was applied within ANOVA comparisons of means between several samples. We evaluated the correlation coefficients for each pair of predictor variables to check the possible multicollinearity between variables. We took into account that if the correlation coefficient was 0.8 or above, only one of the variables should have been used in the regression analysis. Multicollinearity was assessed using variance inflation factors (VIFs). We considered a VIF exceeding 5.0 as an indicator of multicollinearity. None of the VIF values for the predictor variables in this study were greater than 5, which showed that multicollinearity was not an issue in the regression models. Initially, bivariate analyzes were used to analyze the relationships of burnout dimensions with job demands, and job resources. Furthermore, the role of job demands and job resources for burnout dimensions was assessed by testing separate hierarchical multiple regression models for each burnout dimension. The models were controlled for sex, age, tenure, working hours per week, night-shift work, and contact with COVID-19 patients. In the first step, we entered age, tenure, working hours per week, night-shift work, and contact with COVID-19 patients, while in the second step, we entered job demands (or job resources).

3. Results

3.1. Participants

Completed surveys were returned by 4.621 HWs working in the countries of the SEE region (Albania 0.6%, Bosnia and Herzegovina 3.5%, Bulgaria 2.6%, Croatia 6.5%, Israel 0.5%, Moldova 5.2%, Montenegro 3.2%, North Macedonia 17.4%, Romania 55.2%, Serbia 1.6%, Turkey 3.4%, and other countries 0.4%). The majority of the participants were female (78.4%). This sex distribution was similar in the respective countries included in the survey. Their mean age was

10.3389/fpsyg.2023.1258226

43.7 ± 10.7 years, and they had worked for an average of 18.8 ± 11.4 years. Due to the small number of participants from Albania ($n = 26$), Israel ($n = 24$), and other countries ($n = 20$), the findings for these countries were analyzed with certain caution. The most frequent education level of the respondents was a university degree (4 years or more; $n = 2.445$, 52.9%), followed by a master's/PhD ($n = 1.076$, 23.3%), bachelor's (3 years; $n = 786$, 17%), and high school ($n = 308$, 6.7%) degree. The frequency distribution of the participants showed that they were specialist medical doctors ($n = 1.779$, 38.5%), nurses/technicians ($n = 1.095$, 23.7%), medical doctors ($n = 904$, 19.6%), nurses/technicians with bachelor's degrees ($n = 571$, 12.4%), dentists ($n = 111$, 2.4%), and pharmacists ($n = 32$, 0.7%). They had worked in a public ($n = 3.633$, 78.6%) or private ($n = 988$, 21.4%) healthcare institution.

Of all the respondents, 2.184 (47.3%) reported night-shift work. Less than half ($n = 2.009$, 43.5%) of the participants answered that they had not had any occupational contact with self-isolated patients or patients who were positive for COVID-19, while 2.835 (61.4%) reported that HWs suffered a stigma as someone who could transmit the COVID-19 infection. The distribution of participants according to their overall satisfaction with the work in their institution was (ranging from 1 as the lowest level of job satisfaction to 5 as the highest level of job satisfaction) 1–191 (4.1%), 2–445 (9.6%), 3–1.467 (31.7%), 4–1.737 (37.6%), and 5–781 (16.9%).

3.2. Differences between see countries according to analyzed variables

A series of ANOVA comparisons of means revealed the countries in which respondents showed higher mean values of emotional exhaustion (Bosnia and Herzegovina, Bulgaria, Croatia, Moldova, Montenegro, and North Macedonia) and countries in which respondents showed lower mean values of this burnout dimension (Israel and Romania; Welch $F = 17.98$, $p < 0.001$). Analyzes also demonstrated the countries whose respondents showed higher mean values of depersonalization (Bosnia and Herzegovina, Moldova, North Macedonia, Croatia, and Turkey) and countries whose respondents showed lower mean values of this burnout dimension (Israel, Serbia, and Romania; Welch $F = 16.54$, $p < 0.001$; see Table 1).

TABLE 1 Descriptive statistics of burnout dimensions and differences between SEE countries.

	Country	Mean	SD	SE	Welch F (p)
Burnout–Emotional Exhaustion	Albania	21.7	14.8	2.9	17.98 (<0.001)
	Bosnia and Herzegovina	21.9	12.4	0.9	
	Bulgaria	23.8	13.5	1.2	
	Croatia	23.7	12.2	0.7	
	Israel	13	10.9	2.2	
	Moldova	22.9	13.2	0.9	
	Montenegro	22.4	13.3	1.1	
	North Macedonia	24.1	12.8	0.5	
	Romania	18.2	12.6	0.2	
	Serbia	20.1	13.9	1.6	
	Turkey	20.4	15.02	1.2	
	Other countries	15.8	11.9	2.7	
Burnout–Depersonalization	Albania	4.3	6.2	1.2	16.54 (<0.001)
	Bosnia and Herzegovina	5.9	5.6	0.4	
	Bulgaria	5.5	5.7	0.5	
	Croatia	6.8	6	0.3	
	Israel	2.7	2.4	0.5	
	Moldova	6.6	6.9	0.4	
	Montenegro	5.7	6.8	0.6	
	North Macedonia	6.2	5.9	0.2	
	Romania	4.1	4.9	0.1	
	Serbia	3.6	5.8	0.7	
	Turkey	6.8	7.4	0.6	
	Other countries	5	6	1.3	

Since there are no standards or criteria for the categorization of samples into high-, medium-, or low-demand groups, for this study we have used the findings of ANOVA comparisons between groups for categorizing countries into different levels of analyzed variables. Three groups of countries were detected according to the mean values of physical job demands: countries in which respondents showed higher mean values of physical job demands (Bosnia and Herzegovina and Croatia), countries with medium mean values of physical job demands (Albania, Bulgaria, Moldova, Montenegro, North Macedonia, Romania, and Serbia), and countries with lower mean values of physical job demands (Israel and Turkey; Welch $F = 30.6$, $p < 0.001$). Three groups of countries were also detected according to the mean values of organizational job demands: countries with higher mean values (Bosnia and Herzegovina and Croatia), countries with medium mean values (Albania, Bulgaria, Israel, Moldova, Montenegro, North Macedonia, Romania, Serbia, and Turkey), and countries with lower mean values of organizational job demands (other countries; Welch $F = 12.09$, $p < 0.001$). According to the mean values of emotional job demands, these three groups of countries were detected: countries with higher mean values (Bosnia and Herzegovina and Croatia), countries with medium mean values (Albania, Bulgaria, Moldova, Montenegro, North Macedonia, Romania, Serbia, and Turkey), and countries with lower mean values of emotional job demands (Israel and other countries; Welch $F = 12.5$, $p < 0.001$). According to the mean values of cognitive job demands, three groups of countries were detected: countries with higher mean values (Albania, Bosnia and Herzegovina, and Croatia), countries with medium mean values (Montenegro, North Macedonia, and Serbia), and countries with lower mean values of cognitive job demands (Bulgaria, Israel, Moldova, Romania, Turkey, and other countries; Welch $F = 21.65$, $p < 0.001$; see Table 2).

Three groups of countries were detected according to the mean values of the job resource Remuneration: countries in which respondents showed higher mean values of Remuneration (Romania and other countries), countries with medium mean values of

10.3389/fpsyg.2023.1258226

TABLE 2 Descriptive statistics of job demands and differences between SEE countries.

	Country	Mean	SD	SE	Welch F (p)
Physical Job Demands	Albania	3.3	0.9	0.2	30.6 (<0.001)
	Bosnia and Herzegovina	3.8	0.7	0.1	
	Bulgaria	3.6	0.6	0.1	
	Croatia	3.9	0.6	0.04	
	Israel	2.7	0.9	0.2	
	Moldova	3.6	0.7	0.04	
	Montenegro	3.6	0.7	0.1	
	North Macedonia	3.5	0.7	0.03	
	Romania	3.4	0.7	0.01	
	Serbia	3.4	0.8	0.1	
	Turkey	2.7	0.8	0.1	
	Other countries	3.1	0.7	0.2	
Organizational Job Demands	Albania	2.6	1.2	0.2	12.09 (<0.001)
	Bosnia and Herzegovina	3.2	0.8	0.1	
	Bulgaria	2.7	0.8	0.1	
	Croatia	3.2	0.8	0.05	
	Israel	2.6	0.9	0.2	
	Moldova	2.7	0.8	0.1	
	Montenegro	2.9	0.8	0.1	
	North Macedonia	2.8	0.9	0.03	
	Romania	2.9	0.8	0.02	
	Serbia	2.7	0.8	0.1	
	Turkey	2.6	1.1	0.1	
	Other countries	2.3	0.8	0.2	
Emotional Job Demands	Albania	2.4	0.9	0.2	12.5 (<0.001)
	Bosnia and Herzegovina	2.7	0.7	0.1	
	Bulgaria	2.4	0.7	0.1	
	Croatia	2.7	0.7	0.04	
	Israel	2.1	0.6	0.1	
	Moldova	2.6	0.7	0.05	
	Montenegro	2.5	0.7	0.1	
	North Macedonia	2.6	0.7	0.02	
	Romania	2.4	0.7	0.01	
	Serbia	2.4	0.8	0.1	
	Turkey	2.5	0.9	0.1	
	Other countries	2.3	0.7	0.2	
Cognitive Job Demands	Albania	2.9	1.1	0.2	21.65 (<0.001)
	Bosnia and Herzegovina	2.9	0.8	0.1	
	Bulgaria	2.6	0.8	0.1	
	Croatia	3.1	0.7	0.04	
	Israel	2.5	0.7	0.1	
	Moldova	2.6	0.8	0.05	
	Montenegro	2.7	0.8	0.1	
	North Macedonia	2.8	0.8	0.03	
	Romania	2.5	0.8	0.02	
	Serbia	2.7	0.9	0.1	
	Turkey	2.5	0.9	0.1	
	Other countries	2.5	0.6	0.1	

Remuneration (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, N Macedonia, Serbia, and Turkey), and countries with lower mean values of Remuneration (Israel, Moldova, and Montenegro; Welch $F = 49.23$, $p < 0.001$). Three groups of countries were also detected according to the mean values of the job resource Supervisor support: countries with higher mean values (Albania, Bulgaria, Israel, Moldova,

10.3389/fpsyg.2023.1258226

TABLE 3 Descriptive statistics of job resources and differences between SEE countries.

	Country	Mean	SD	SE	Welch *F* (*p*)
Remuneration	Albania	2.7	1.1	0.2	49.23 (<0.001)
	Bosnia and Herzegovina	2.8	1	0.1	
	Bulgaria	2.6	1.1	0.1	
	Croatia	2.6	1	0.1	
	Israel	2.4	1.1	0.2	
	Moldova	2.4	0.9	0.1	
	Montenegro	2.2	1	0.1	
	North Macedonia	2.6	1.1	0.04	
	Romania	3.2	1	0.02	
	Serbia	2.5	0.9	0.1	
	Turkey	2.7	1.2	0.1	
	Other countries	3.8	0.8	0.2	
Supervisor support	Albania	3.9	0.9	0.2	10.15 (<0.001)
	Bosnia and Herzegovina	3.5	0.9	0.1	
	Bulgaria	4	1	0.1	
	Croatia	3.4	1	0.1	
	Israel	4	0.8	0.2	
	Moldova	4	0.7	0.04	
	Montenegro	3.6	0.9	0.1	
	North Macedonia	3.7	1	0.04	
	Romania	3.7	0.9	0.02	
	Serbia	3.4	1	0.1	
	Turkey	3.4	1.1	0.1	
	Other countries	4.1	0.8	0.2	

and other countries), countries with medium mean values (Bosnia and Herzegovina, Montenegro, North Macedonia, and Romania), and countries with lower mean values (Croatia, Serbia, and Turkey; Welch $F = 10.15$, $p < 0.001$; see Table 3).

3.3. Independent predictors of burnout dimensions in the study sample

The bivariate analysis has shown a significant positive correlation between emotional exhaustion and depersonalization with physical, organizational, emotional, and cognitive job demands in study participants. We found that both burnout dimensions were negatively correlated with Remuneration and Supervisor support. Job resources were also negatively correlated with physical, organizational, emotional, and cognitive job demands (see Table 4).

The standardized beta coefficients for the independent predictors (including job demands) of emotional exhaustion are presented in Table 5. We found that physical ($\beta = 0.18$, $p < 0.01$), organizational ($\beta = 0.09$, $p < 0.01$), emotional ($\beta = 0.31$, $p < 0.01$), and cognitive ($\beta = 0.15$, $p < 0.01$) job demands, working hours per week ($\beta = 0.06$, $p < 0.05$), and contact with patients with COVID-19 ($\beta = 0.03$, $p < 0.05$) were significant positive predictors of emotional exhaustion, whereas male sex ($\beta = -0.03$, $p < 0.05$) and working night shifts ($\beta = -0.1$, $p < 0.01$) negatively predicted emotional exhaustion (R^2 for the model = 0.371).

The standardized beta coefficients for the independent predictors (including job resources) of emotional exhaustion are shown in Table 6. We demonstrated that remuneration ($\beta = -0.2$, $p < 0.01$), supervisor support ($\beta = -0.24$, $p < 0.01$), male sex ($\beta = -0.07$, $p < 0.01$), and working night shifts ($\beta = -0.06$, $p < 0.01$) negatively predicted emotional exhaustion, while the number of working hours per week ($\beta = 0.1$, $p < 0.01$) and contact with patients with COVID-19 ($\beta = 0.11$, $p < 0.01$) were significant positive predictors of emotional exhaustion (R^2 for the model = 0.161).

Within Table 7 we have presented the standardized beta coefficients for the independent predictors (including job demands) of depersonalization. The obtained data demonstrated that physical ($\beta = 0.05$, $p < 0.01$), organizational ($\beta = 0.07$, $p < 0.01$), emotional ($\beta = 0.31$, $p < 0.01$), and cognitive ($\beta = 0.14$, $p < 0.01$) job demands, male

TABLE 4 Correlations of analyzed variables.

	1	2	3	4	5	6	7	8
1. Emotional Exhaustion	0.92							
2. Depersonalization	0.636*	0.779						
3. Physical job demands	0.446*	0.298*	0.739					
4. Organizational job demands	0.444*	0.357*	0.547*	0.762				
5. Emotional job demands	0.541*	0.465*	0.448*	0.555*	0.678			
6. Cognitive job demands	0.478*	0.393*	0.507*	0.539*	0.583*	0.69		
7. Remuneration	−0.283*	−0.175*	−0.281*	−0.251*	−0.211*	−0.214*	0.905	
8. Supervisor support	−0.307*	−0.23*	−0.257*	−0.459*	−0.331*	−0.313*	0.299*	0.948

*Correlation is significant at the < 0.01 level (two-tailed). Cronbach's alpha on the diagonal.

10.3389/fpsyg.2023.1258226

TABLE 5 Hierarchical multiple regression model for emotional exhaustion including job demands.

Emotional Exhaustion		B	SE	95% CI for B		Beta	R^2
				Lower	Upper		
Step 1	Sex	−2.27	0.47	−3.19	−1.36	−0.07**	0.036
	Age	−0.03	0.05	−0.12	0.07	−0.02	
	Tenure	−0.04	0.04	−0.13	0.05	−0.04	
	Working hours per week	0.15	0.02	0.11	0.19	0.12**	
	Night-shift work	−1.93	0.42	−2.74	−1.11	−0.07**	
	Contact with COVID-19 patients	3.5	0.4	2.73	4.28	0.13**	
	Constant	14.94	1.6	11.8	18.09		
Step 2	Sex	−0.91	0.38	−1.65	−1.17	−0.03*	0.371
	Age	0.03	0.04	−0.05	0.1	0.02	
	Tenure	−0.05	0.04	−0.11	0.02	−0.04	
	Working hours per week	0.07	0.02	0.04	0.11	0.06**	
	Night-shift work	−2.66	0.34	−3.33	−2.01	−0.1**	
	Contact with COVID-19 patients	0.86	0.33	0.22	1.49	0.03**	
	Physical Job Demands	3.05	0.26	2.54	3.57	0.18**	
	Organizational Job Demands	1.46	0.25	0.97	1.94	0.09**	
	Emotional Job Demands	5.61	0.28	5.06	6.17	0.31**	
	Cognitive Job Demands	2.51	0.26	2.01	3.01	0.15**	
	Constant	−17.56	1.49	−20.48	−14.65		

$R^2 = 0.036$ for Step 1; $\Delta R^2 = 0.335$ for Step 2 ($p < 0.001$). *$p < 0.05$, **$p < 0.01$.

TABLE 6 Hierarchical multiple regression model for emotional exhaustion including job resources.

Emotional Exhaustion		B	SE	95% CI for B		Beta	R^2
				Lower	Upper		
Step 1	Sex	−2.27	0.47	−3.19	−1.36	−0.07*	0.036
	Age	−0.03	0.05	−0.12	0.07	−0.02	
	Tenure	−0.04	0.04	−0.13	0.05	−0.04	
	Working hours per week	0.15	0.02	0.11	0.19	0.12*	
	Night-shift work	−1.93	0.42	−2.74	−1.11	−0.07*	
	Contact with COVID-19 patients	3.5	0.4	2.73	4.28	0.13*	
	Constant	14.94	1.6	11.8	18.09		
Step 2	Sex	−2.11	0.43	−2.96	−1.26	−0.07*	0.161
	Age	0.001	0.04	−0.08	0.09	0.001	
	Tenure	−0.07	0.04	−0.15	0.01	−0.06	
	Working hours per week	0.13	0.02	0.09	0.16	0.1*	
	Night-shift work	−1.62	0.39	−2.38	−0.86	−0.06*	
	Contact with COVID-19 patients	2.77	0.37	2.04	3.5	0.11*	
	Remuneration	−2.52	0.18	−2.86	−2.17	−0.2*	
	Supervisor support	−3.24	0.2	−3.62	−2.85	−0.24*	
	Constant	34.94	1.7	31.6	38.27		

$R^2 = 0.036$ for Step 1; $\Delta R^2 = 0.125$ for Step 2 ($p < 0.001$). *$p < 0.01$.

TABLE 7 Hierarchical multiple regression model for depersonalization including job demands.

Depersonalization		B	SE	95% CI for B		Beta	R^2
				Lower	Upper		
Step 1	Sex	0.84	0.2	0.45	1.23	0.06**	0.046
	Age	−0.04	0.02	−0.08	0	−0.08*	
	Tenure	−0.02	0.02	−0.06	0.01	−0.05	
	Working hours per week	0.04	0.01	0.02	0.05	0.06**	
	Night-shift work	−0.41	0.18	−0.76	−0.06	−0.04*	
	Contact with COVID-19 patients	1.74	0.17	1.40	2.07	0.15**	
	Constant	4.58	0.69	3.22	5.93		
Step 2	Sex	1.22	0.18	0.87	1.56	0.09**	0.263
	Age	−0.03	0.02	−0.06	0.01	−0.05	
	Tenure	−0.02	0.02	−0.05	0.01	−0.04	
	Working hours per week	0.01	0.01	−0.01	0.03	0.02	
	Night-shift work	−0.58	0.16	−0.89	−0.27	−0.05**	
	Contact with COVID-19 patients	0.91	0.15	0.61	1.21	0.08**	
	Physical Job Demands	0.34	0.12	0.1	0.58	0.05**	
	Organizational Job Demands	0.5	0.12	0.27	0.73	0.07**	
	Emotional Job Demands	2.4	0.13	2.14	2.66	0.31**	
	Cognitive Job Demands	0.98	0.12	0.74	1.21	0.14**	
	Constant	−5.63	0.7	−7	−4.27		

$R^2 = 0.046$ for Step 1; $\Delta R^2 = 0.216$ for Step 2 ($p < 0.001$). *$p < 0.05$, **$p < 0.01$.

sex ($\beta = 0.09$, $p < 0.01$), and contact with patients with COVID-19 ($\beta = 0.08$, $p < 0.01$) were significant positive predictors of depersonalization, whereas working night shifts ($\beta = -0.05$, $p < 0.01$) was detected as a significant negative predictor of depersonalization (R^2 for the model = 0.263).

The standardized beta coefficients for the independent predictors (including job resources) of depersonalization are presented in Table 8. We found that remuneration ($\beta = -0.11$, $p < 0.01$), supervisor support ($\beta = -0.19$, $p < 0.01$), and working night shifts ($\beta = -0.03$, $p < 0.05$) negatively predicted depersonalization, while male sex ($\beta = 0.06$, $p < 0.01$), number of working hours per week ($\beta = 0.05$, $p < 0.01$), and contact with patients with COVID-19 ($\beta = 0.13$, $p < 0.01$) were significant positive predictors of depersonalization (R^2 for the model = 0.161).

4. Discussion

4.1. Burnout

Throughout the course of the COVID-19 pandemic, a significant number of healthcare workers (HWs) have experienced burnout, prompting numerous studies to investigate this phenomenon. According to the World Health Organization (WHO), there has been an estimated range of 80,000 to 180,000 HWs who have lost their lives globally as a result of the COVID-19 pandemic (Arbar, 2021). The majority of individuals in question were medical professionals, specifically doctors and nurses. Based on the findings of Orrù et al. (2021), it has been observed that a significant number of HWs lost their lives due to various factors related to psychological stress. These factors include but are not limited to uncertainties surrounding the progression of the disease, both in terms of short-term and long-term effects, and concerns about the efficacy of available treatments. Additionally, the lack of personal protective equipment (PPE) poses a significant challenge, further exacerbating the psychological burden on HWs. Physical exhaustion resulting from excessive workloads also contributes to the overall stress levels experienced by these individuals. Moreover, the fear of direct exposure to COVID-19 in the workplace adds to the psychological strain faced by HWs (Britt et al., 2021; Ferry et al., 2021).

In a study conducted by Ulfa et al. (2022), it was found that in a total of 48 countries, numerous publications have made significant contributions to the advancement of research on the burnout status of HWs. The geographical distribution of these countries encompasses the United States, Spain, China, Italy, Taiwan, France, Canada, Malaysia, South Korea, and the United Kingdom. This distribution sheds light on the scientific production exhibited by each respective country. According to the data collected, it has been observed that the United States (US) has emerged as the most productive country, with a total count of 26. Following closely behind is Spain, with a count of 20, and China, with a count of 17. These findings suggest that these

TABLE 8 Hierarchical multiple regression model for depersonalization including job resources.

Depersonalization		B	SE	95% CI for B		Beta	R^2
				Lower	Upper		
Step 1	Sex	0.84	0.2	0.45	1.23	0.06**	0.046
	Age	−0.04	0.02	−0.08	0	−0.08*	
	Tenure	−0.02	0.2	−0.06	0.01	−0.05	
	Working hours per week	0.04	0.01	0.02	0.05	0.06**	
	Night-shift work	−0.41	0.18	−0.76	−0.06	−0.04*	
	Contact with COVID-19 patients	1.74	0.17	1.4	2.07	0.15**	
	Constant	4.58	0.69	3.22	5.93		
Step 2	Sex	0.88	0.19	0.5	1.26	0.06**	0.106
	Age	−0.04	0.02	−0.07	0.003	−0.07	
	Tenure	−0.03	0.02	−0.07	0.01	−0.06	
	Working hours per week	0.03	0.01	0.01	0.05	0.05**	
	Night-shift work	−0.35	0.17	−0.69	−0.01	−0.03*	
	Contact with COVID-19 patients	1.52	0.17	1.2	1.85	0.13**	
	Remuneration	−0.6	0.08	−0.75	−0.44	−0.11**	
	Supervisor support	−1.12	0.09	−1.29	−0.94	−0.19**	
	Constant	10.77	0.76	9.28	12.26		

$R^2 = 0.046$ for Step 1; $\Delta R^2 = 0.06$ for Step 2 ($p < 0.001$). *$p < 0.05$, **$p < 0.01$.

three countries have demonstrated a significant level of productivity in the given context.

4.2. Sociodemographic data

In the current study, we obtained results from SEE countries (Albania 0.6%, Bosnia and Herzegovina 3.5%, Bulgaria 2.6%, Croatia 6.5%, Israel 0.5%, Moldova 5.2%, Montenegro 3.2%, North Macedonia 17.4%, Romania 55.2%, Serbia 1.6%, Turkey 3.4%, and other countries 0.4%). Due to the small number of participants from Albania ($n = 26$), Israel ($n = 24$), and other countries ($n = 20$), the findings for these countries were analyzed with certain caution.

The present study consisted of a predominantly female sample, accounting for over half of the participants (78.4%). The average age of the participants was 43.7 years, with a standard deviation of 10.7 years. Additionally, the average tenure of the participants was 18.8 years, with a standard deviation of 11.4 years. The findings of this study align with previous research, which has consistently shown that female workers make up the predominant proportion of the health workforce (Asamani et al., 2019; Dubale et al., 2019; Suleiman et al., 2020; Afulani et al., 2021).

4.3. Job demands

HWs who are actively engaged in the frontline management of patients diagnosed with COVID-19 face the potential risk of experiencing stigmatization. Among the participants in our study ($n = 2{,}009$), a minority of individuals (43.5%) indicated that they had not engaged in any occupational interactions with patients who were either self-isolated or tested positive for COVID-19. Conversely, a majority of respondents (61.4%) reported that healthcare professionals experienced stigmatization as potential transmitters of infection during the COVID-19 pandemic. There is an increasing body of evidence indicating that the stigma surrounding COVID-19 has emerged as a significant contributor to the mental distress experienced by frontline HWs and affected individuals. This distress manifests in various forms, including stress, anxiety, and depression, and has profound implications for their overall well-being (Bao et al., 2020; Gunnell et al., 2020; Peprah, 2020). The phenomenon of COVID-19-induced stigma has been observed to have a significant impact on individuals, particularly HWs, leading to feelings of isolation and diminished self-worth. This is primarily attributed to their perceived inability to make meaningful contributions to the ongoing battle against the pandemic (Bao et al., 2020; Holmes et al., 2020).

Among the entirety of the participants, it was observed that a total of 2.184 individuals, accounting for approximately 47.3% of the sample, indicated their engagement in night-shift employment. The night-shift workers in question are compelled to engage in work and rest patterns that are incongruous with their natural circadian rhythm. Accordingly, it has been postulated that disruptions to the circadian rhythm and sleep patterns may serve as plausible catalysts for the adverse consequences associated with night-shift employment, including the development of cardiovascular ailments and type 2 diabetes mellitus (Knutsson, 2003; Puttonen et al., 2010; Moreno et al.,

2019). The potential relationship between sleep disrupted by circadian rhythm disturbances and the impact on the immune system has garnered significant attention among researchers. In light of this, there has been a growing interest in investigating the potential link between night-shift work and an increased vulnerability to infections (Almeida and Malheiro, 2016). Previous research has indicated a positive correlation between night-shift work and heightened incidences of common infections (Mohren et al., 2002; Prather and Carroll, 2021). Moreover, our research revealed that in a meticulously designed study, there was a notable disparity in the incidence of respiratory infections among healthcare workers engaged in night-shift work compared to their counterparts involved in day-shift work. Specifically, the former group exhibited a 20% higher incidence of respiratory infections (Loef et al., 2019). Nevertheless, the extent to which comparable outcomes can be anticipated beyond the realm of healthcare and concerning particular infection categories remains uncertain.

4.4. Job satisfaction

The present research has revealed a notable decline in the level of satisfaction experienced by healthcare workers (HWs) concerning their professional work. This decline can be attributed to the challenges and demands imposed on them as a result of their work during the COVID-19 pandemic. The data reveal the distribution of participants based on their overall satisfaction with their institution's work. The satisfaction levels were measured on a scale of 1 to 5, with 1 representing the lowest level of satisfaction and 5 representing the highest level of satisfaction. The breakdown of participants across these satisfaction levels was as follows: 191 participants (4.1%) reported a satisfaction level of 1, 445 participants (9.6%) reported a satisfaction level of 2, 1,467 participants (31.7%) reported a satisfaction level of 3, 1,737 participants (37.6%) reported a satisfaction level of 4, and 781 participants (16.9%) reported a satisfaction level of 5. The research conducted by Abd-Ellatif et al. (2021) revealed that a significant proportion of participants, specifically 41.2%, reported experiencing a low level of job satisfaction. This decline in job satisfaction was primarily attributed to the fear of contracting infections amidst the ongoing pandemic (Abd-Ellatif et al., 2021). Based on the findings of another study, it was observed that among a group of nurses working on wards where care for individuals afflicted with COVID-19 is not provided, approximately 10% of respondents expressed a serious contemplation of transitioning to a different profession. Conversely, in wards where patients suffering from COVID-19 were being treated, a significantly higher proportion of nurses, specifically 24.8%, indicated their inclination toward changing their current occupation (Said and El-Shafei, 2021). Labrague and De Los Santos (2020) have highlighted the significance of the circumstances surrounding the necessity to operate under increasingly challenging conditions, which has resulted in a notable decline in job satisfaction among nursing personnel. Consequently, this has effectively influenced their inclination to pursue alternative professional paths (Labrague and De Los Santos, 2020; De Los Santos and Labrague, 2021). In order to determine the primary factor contributing to the decrease in job satisfaction among nursing personnel, Soto-Rubio et al. (2020) conducted a study examining the relationship between a pandemic and the prevalence of psychosocial risks. Their findings indicate a positive correlation between the two, specifically in terms of increased risk of accidents at work, low work commitment, and mental illness (Soto-Rubio et al., 2020). The adverse effects of diminished job satisfaction on the organizational commitment of healthcare workers (HWs) have been well documented. This phenomenon has been observed to potentially exacerbate staff shortages within healthcare organizations, and it is widely recognized as a primary driver behind the high turnover rates among medical professionals. Research has shown that employees who experience a high level of job satisfaction tend to exhibit greater levels of creativity, dedication, and engagement in their work. This positive relationship between employee satisfaction and these desirable work outcomes has been observed in various organizational contexts. Furthermore, the research that was conducted has revealed a clear and direct correlation between the level of satisfaction experienced by HWs and the level of satisfaction reported by patients concerning the care they received during their hospital stay (Akinwale and George, 2020). Research has shown that there is a positive correlation between employee satisfaction and workplace performance. Specifically, individuals who report higher levels of job satisfaction tend to exhibit higher levels of productivity in their respective work environments. This suggests that employee satisfaction plays a crucial role in fostering a more productive workforce. Hospital management must prioritize the cultivation of a high level of job satisfaction among their employees. By doing so, they can enhance work efficiency, ultimately leading to improved patient care (Karem et al., 2019).

4.5. Country-specific results, challenges during the pandemic, and remuneration

The majority of the participating SEE countries followed the WHO recommendations at the time this research was conducted, and similar events took place: (1) In the healthcare sector, triage stations at healthcare facility entrances and COVID departments were opened, protective infection measures were undertaken, and information on treatment and prevention was provided for HWs, following the recommendations of the WHO. In the autumn of 2020, HWs were provided with adequate high-quality personal protective equipment. Additionally, the health sector was temporary restructured by establishing COVID hospitals and by reorganizing the provision of medical services to the chronically ill; (2) along with the increase of patients, in 2020, many HWs were infected, which led to a further decrease of the staff and consequently an increase of the workload and working hours; (3) additional stressors during the pandemic were the high risk of being infected and/or transmitting the virus, fear of exposing family members, losing patients, emergency patients, high number of patients, high workload, time pressure, long working hours, need to practice outside of the area of expertise, treating co-workers, or personal and lifestyle stressors; (4) a period of negotiations and correspondence using digitized "socio-professional vehicles" (such as e-mails, media messages, and social networks) was established; (5) the disjunction between the "pandemic" and "working conditions" was manifested both in economic terms and legislatively until the harmonization of European laws (with SARS-COV-2 being included in the risk group 3 and COVID-19 included in the List of occupational diseases for HWs), the provision of appropriate protective equipment for interventions in outbreaks, and the approval

of the vaccine; (6) the HWs were reimbursed for their work during the pandemic, receiving additional payment, but the reimbursement started later, after the survey was carried out; (7) the visibility of HWs faced with the uncertainty of the pandemic phenomenon made them either the target of admiration "heroes" or the target of stigma-related violence, harassment, and aggression generated by the frustration resulting from the isolation and quarantine measures and the limitations to mobility or work; and (8) working hours during the pandemic changed significantly from working 2 weeks (and resting the next 2 – the possible incubation period) to working 12-, 24-, or 48- h shifts.

The findings of a prior study conducted in Bosnia and Herzegovina revealed that a significant proportion, specifically 77%, of HWs in the country reported experiencing various manifestations of burnout amidst the ongoing pandemic. The findings of this study indicate that a significant proportion, specifically 32%, of the participants have experienced all three manifestations of burnout (Mijić Marić et al., 2022). The data collected from the respondents indicated a notable disparity between the levels of personal and work-related burnout when compared to the level of burnout specifically related to patient care. Healthcare workers have been subjected to stigmatization amidst the ongoing COVID-19 pandemic. The social stigma surrounding these individuals, characterized by fear and avoidance, has emerged as a prevalent and acknowledged issue across countries in Southeastern Europe (SEE) during this public health crisis. Bosnia and Herzegovina has demonstrated the highest degree of stigmatization, reaching a notable level of 82%. The study conducted in Bosnia and Herzegovina found a significant association between the perception of stigma among HWs and the perception of depersonalization ($p = 0.002$; Pranjic, 2021).

There are data on the widespread job stress and burnout among HWs before the pandemic in Bulgaria (Peev, 2017; Vangelova et al., 2019, 2021; Asenova et al., 2021). The study findings of higher mean values of emotional exhaustion within the sample of HWs from Bulgaria are consistent with our previous findings in a survey from 2018 showing high emotional exhaustion of hospital HWs, determined by time pressure, uncertainty, high strain, frustration, and lack of autonomy (Vangelova et al., 2019, 2021). Moreover, the long working hours were not a significant predictor of emotional exhaustion in our previous study; emotional exhaustion increased with the increase of night work and long working hours every week. Overtime and multiple workplaces are common in Bulgaria both for physicians and nurses, contributing to long weekly working hours (>41 h weekly for 80% of the studied physicians and 65.4% of the nurses, including >61 h weekly for 13.7% of the physicians and 13.4% nurses) (Vangelova et al., 2019, 2021). The medium mean values of physical job demands, organizational job demands, and emotional job demands are most probably due to the time the survey was conducted, in the autumn of 2020, which was a period with a comparatively low number of COVID cases. The medium mean values of remuneration with Bulgarian HCWs are well justified, taking into account the results of the previous study showing that a great deal of the studied physicians and nurses considered their payment unsatisfactory (Vangelova et al., 2019, 2021). In our previous studies (Vangelova et al., 2019, 2021), more than 70% of the physicians and 40% of the nurses had autonomy in their work, about 70% of both groups rated good opportunities for professional development, and about 40% considered there was justice in the distribution of work between the staff. The higher mean values for supervisor support are consistent with previous data from a study from 2018 conducted among hospital HWs (Vangelova et al., 2019, 2021).

From the onset of the pandemic, the Croatian Ministry of Health decided that all HWs were entitled to financial compensation while they were in isolation or at home (some HWs worked 2 weeks and had 2 weeks off afterward) and to compensation or days off work for working overtime (Ministry of Health, 2020). Shortly after this research took place, the government decided to increase the wages of HWs by 10% (Government of Republic of Croatia, 2020; Ministry of Health, 2020). High job demands were brought about by different changes in work organizations. The changes were frequent, following every new guideline that was brought by the government and the Croatian Institute of Public Health on a monthly or even weekly basis (Tokić et al., 2021). Emotional demands and burnout were associated with high job demands in our research and other Croatian research (Tokić et al., 2021). Some authors have reported changes in interpersonal relationships due to the pandemic and pandemic measures, which might contribute to emotional demands and burnout or working as a HW during the pandemic in general (Tokić et al., 2021; Šego, 2022).

In February 2020, North Macedonia officially reported its first-ever case of SARS-CoV-2, the causative agent of the ongoing coronavirus disease (COVID-19) pandemic. In late January, a series of initial national measures were implemented in response to the potential outbreak and treatment of a particular infectious disease. These measures included the installation of thermal cameras at the national airport and the provision of personal protective equipment and reagents for the detection of the virus. A sequence of public health measures and recommendations was adhered to. The escalating incidence of novel cases necessitated the implementation of enhanced and robust measures to effectively curb the propagation of the virus. The implementation of a comprehensive closure of educational institutions, ranging from kindergartens to universities, was initiated on March 10. On March 18, an official declaration of a state of emergency was made, signifying a critical situation requiring immediate action. Subsequently, on March 23, the first set of movement restrictions was implemented at the national level, aiming to regulate and limit the mobility of individuals within the affected area. The implementation of a curfew between the hours of 9 pm and 5 am on weekdays, along with specific measures targeting the elderly and individuals under the age of 18, was proven inadequate in effectively mitigating the transmission of the virus. Consequently, more stringent measures pertaining to the limitation of movement were implemented on April 8. These measures included a prohibition on movement between the hours of 4 pm and 5 am the following day and a complete ban on movement during weekends, commencing at 4 pm on Friday and concluding at 5 am on Monday. During the religious holidays in the country, namely, Orthodox Easter (17–21 April 2020) and Eid al-Fitr (24–26 May 2020), a comprehensive lockdown was implemented. This measure aimed to curtail the transmission of the virus, which was exacerbated by the customary practice of family gatherings during these occasions. Additionally, the lockdown was also enforced during the International Labor Day period, spanning from 1 May to 4 May 2020 (Government of Republic of Macedonia, 2020). The research conducted on personal protective equipment (PPE) among healthcare workers (HWs) revealed noteworthy findings. A significant proportion of participants,

approximately 61.2%, reported the absence of isolation zones within their workplace. Additionally, a considerable number of HWs, around 33.4%, indicated that their workplace lacked a triage system for patients at the entrance. Furthermore, a substantial majority of HWs, approximately 72%, reported not having attended any training courses on the proper usage of PPE. This lack of training raises concerns about the potential for inadequate PPE utilization among healthcare workers. Moreover, a notable percentage of participants, approximately 25.7%, expressed uncertainty regarding the appropriate course of action following unwanted contact with blood or other secretions from a COVID-19 patient. This finding highlights the need for improved knowledge and guidance on post-exposure protocols among HWs. Overall, these findings shed light on several areas of concern regarding PPE practices among healthcare workers, including the absence of isolation zones, inadequate triage systems, insufficient training, and uncertainties surrounding post-exposure procedures. Addressing these issues is crucial to ensuring the safety and well-being of HWs in their efforts to combat COVID-19. It is worth mentioning that within the scope of this study, during the initial stages of the COVID-19 pandemic, a higher proportion of healthcare workers expressed dissatisfaction regarding the accessibility and adequacy of personal protective equipment (PPE) within their respective work environments (Mijakoski et al., 2020). The official List of Occupational Diseases (ODs) underwent a modification as of 07.05.2020, as documented in the Official Gazette, No 118/2020. The Ministry of Labor and Social Policy has recently made an important update to the List of occupational diseases. Specifically, they have included a new entry pertaining to infectious diseases caused by the coronavirus, specifically COVID-19. This inclusion applies to individuals who are engaged in various activities such as prevention, healthcare, home visits, or any other similar tasks that carry a proven risk of infection. To receive compensation for each of the occupational diseases (ODs) listed, the employee must possess the necessary "Expertise for the verification of occupational disease" issued by the Institute of Occupational Health of the Republic of North Macedonia. This document serves as a requirement for the verification process and subsequent compensation. Thus far, it has been observed that this optical device (OD) provides comprehensive coverage and compensation for all hardware components. The cases have the potential to be retrospectively confirmed as overdose incidents as the declaration of the COVID-19 pandemic by the World Health Organization (WHO) serves as a reference point (Rulebook on the List of Occupational Diseases, 2020). Compensation of health workers is as follows: The Institute of Occupational Health of R. North Macedonia verifies the occupational disease, the Commission for Work Ability Assessment (Medical Commission within the Pension Insurance Fund) confirms the verified occupational disease, and, finally, the Pension Insurance Fund compensates the affected health worker. In case of temporary work disability, the compensation is made by the Health Insurance Fund through their commission. Compensation mechanisms include treatment, rehabilitation, fully paid long-term sick leave, potential disability pension, and pension to surviving family members.

The results obtained for the Romanian sample of HWs (high participation rate, high degree of satisfaction with remuneration, and low levels of burnout dimensions) reflect the period of study realization (autumn of 2020) and the study subjects (high frequency of HWs with higher education and doctors), with a deep vocation allowing for the utilization of knowledge and experience accumulated in the profession, and their dedication, revealing the way of identification with the task of caring for patients with an agent etiologically less known than SARS-COV-2 was. The time chosen for the distribution of the questionnaire, in the autumn of 2020, was important because the study, as a method of development, behaved like a "mobilization campaign" of professionals in the health sector, counterbalancing the tendencies of "victimization" or direct "rewarding" through the financial compensatory mechanism. The approach offered by this study was supported, being perceived as a benefit by the HWs who were actively involved both in the care of COVID-19 patients (in COVID hospitals) and especially in the constant education of the population for protection, prevention, discipline, vaccination, and a healthy way of living and working. At the national policy level, the National Emergency Committee decided to maintain the disjunction between the management of the pandemic and the assessment of the specific working conditions in the health sector generated by that high level of uncertainty. At the beginning of 2020, through the establishment of the National Emergency Committee for the correct management of the pandemic, the medical body was used directly for the specific medical intervention for the patients but without holding the decision-making power at the macroeconomic level. This aspect had direct consequences on the professionals involved, especially as the visibility of the HWs to the public was increased by the media and the surveillance institutions. We note that at that moment, HWs were caught without protective equipment appropriate to the level of exposure risk (De Kock et al., 2021) and with a poor organization of the security and protection systems (OHS). The visibility of the health system professionals faced with the uncertainty of the pandemic phenomenon made them either the target of admiration "heroes" or the target of the violence, harassment, and aggression generated by the frustration due to the isolation and quarantine measures and the limitations to mobility or work. As a general conclusion, the results of the statistical processing of the data and information provided by the subjects involved (statistically significant for the predictors of burnout) mathematically support the strategic solutions for managing the pandemic, as described above. The behavior of the predictors of burnout in the "medium" or "low" level (without any "high" level) for the Romanian health sector supports the need to continue interventions to improve working conditions and promote "the health of the health workers," as the 2021 conference and dissemination of the occupational health and safety guide issued by the WHO did (National Conference on Occupational Medicine, 2023).

HWs in Serbia, as an ambitious group, like challenges, and this had a significant impact on the Serbian results. It should be mentioned that most Serbian patients needed oxygen therapy and that Serbia does not have a central distribution of oxygen, so providing oxygen therapy was a physically demanding job (e.g., manual transport and distribution of oxygen cylinders). Therefore, this means that the most severe cases were not hospitalized at the Institute of Occupational Health (most respondents worked at the Institute) and that there were only a few fatal cases until the survey period. Since the respondents dealt mostly with patients who were successfully treated and released from the hospital in good condition, this also had an impact on the prevention of job burnout since invested efforts in the treatment of

patients had a positive effect. Furthermore, it should be mentioned that HWs for the first time in the past 30–40 years were recognized as an important part of society and that there were several "positive" articles in the media during this period. For example, taxi drivers offered free rides to HWs. Most healthcare institutions responsible for the treatment of COVID-19 patients had 12 h shifts and work organized in a 12–24–12-48 regime. The other healthcare institutions reduced activity and from time to time sent their staff to COVID hospitals. A significant number of HWs were not fully engaged. HWs who were engaged in COVID institutions received around 30% increased salaries.

The pandemic demonstrated that the healthcare systems were not prepared to cope with the stress or unexpected situations. Therefore, it is essential to develop and adapt stress test models, similar to stress tests for banks. Stress tests for banks are a crucial supervision tool used to evaluate the resilience of the banking system to adverse, but plausible, future shocks. These tests can not only lead to regulatory changes but also influence the strategic decisions of the banks themselves. Stress tests have become a key part of banking supervision after the global financial crisis in 2008 (European Banking Authority, 2023; European Central Bank, 2023). This crisis exposed weaknesses in the abilities of banks to assess and manage risks, especially in stressful conditions, and our results showed that the pandemic imposed on the healthcare system even bigger crises, resulting in sometimes debilitating outcomes for the human capital in healthcare and, thus, in burnouts and psychiatric diseases. Similarly to way that the 2008 financial crisis resulted in the introduction of stress tests necessary for banks, we find that a modified stress test should be implemented in hospitals regarding future shocks that might include new pandemics, terrorism, catastrophes, or border conflicts.

The strength of this study is the large number of participating health workers. The participants are from 12 SEE countries. The survey was conducted in autumn 2020, after the first wave and during the second wave of the pandemic. This enabled us to receive data from an ongoing pandemic experience.

One of the limitations of the study is that it was impossible to assess the response rate. Since the questionnaire was sent via e-mail, links to the online questionnaires were available on the websites of the Medical and Nursing Chambers (for each of the participating countries) and through Microsoft Forms and LinkedIn, meaning it is impossible to assess how many health workers the invitation reached.

Another limitation is that the questionnaires used were self-administered questionnaires, which might have introduced recall bias. An unequal number of participants from each of the participating countries was another limitation. One more limitation is that the majority of the participants were female. This sex distribution was similar in the respective countries included in the survey. The age of the participants approximated the average age of the target population.

5. Conclusion

The current situation necessitates the prompt implementation of country-specific preventive measures aimed at mitigating burnout and enhancing work ability among healthcare workers (HWs) both during the ongoing pandemic and in the post-pandemic period. Preventive measures for psychosocial risks should be developed and applied, specifically for health workers. A modified stress test should be implemented in hospitals regarding future shocks that might include new pandemics, terrorism, catastrophes, or border conflicts.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by SEENWH and Ethical Boards of Institute of Occupational Health of RN Macedonia. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

DM: Conceptualization, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. AA: Investigation, Validation, Writing – original draft, Writing – review & editing. DB: Investigation, Software, Validation, Writing – original draft, Writing – review & editing. HB: Formal analysis, Investigation, Validation, Writing – original draft, Writing – review & editing. OB: Formal analysis, Investigation, Validation, Writing – original draft, Writing – review & editing. LCK: Investigation, Validation, Writing – review & editing. MM: Formal analysis, Investigation, Validation, Writing – review & editing. JM: Data curation, Investigation, Validation, Writing – review & editing. BÖ: Investigation, Validation, Writing – review & editing. NP: Investigation, Validation, Writing – review & editing. LR: Investigation, Validation, Writing – review & editing. SS: Data curation, Investigation, Validation, Writing – review & editing. KV: Investigation, Validation, Writing – review & editing. RŽ: Investigation, Validation, Writing – review & editing. PB: Investigation, Validation, Writing – review & editing. AM: Investigation, Validation, Writing – review & editing. JK-B: Investigation, Validation, Writing – review & editing, Conceptualization, Methodology, Supervision.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Associations of working from home with job satisfaction, work-life balance, and working-model preferences

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Introduction: The COVID-19 pandemic forced many businesses to shift towards remote and hybrid working models. This study explored the association of the work-from-home model with employee satisfaction, work-life balance, and work-model preferences within MPlus Group, a leader in telework within the business process and technology outsourcing (BPTO) industry.

Methods: We analyzed survey responses of 4,554 employees of MPlus Group across seven countries to assess the associations of working from home with job satisfaction, work-life balance, and preference regarding continuing to work from home.

Results: Employees working within all models, and both women and men, reported high levels of job satisfaction and work-life balance, and most employees working from home expressed a desire to continue doing so.

Discussion: Our findings suggest working from home does not lead to lower job satisfaction or work-life balance in the BPTO and similar industries. The study provides insights for organizations and policymakers navigating post-pandemic work dynamics. However, further research is needed to examine the long-term implications of remote work across diverse industries.

KEYWORDS

work from home, job satisfaction, work-life balance, COVID-19, gender

1 Introduction

In a period of transformation in work dynamics, organizations are increasingly concerned with the viability and sustainability of remote work arrangements. While remote work models have been around for many years, they have recently gained prominence as a method of organizing the workforce, especially due to the far-reaching impact of the COVID-19 pandemic. The prevalence of remote work has captured global headlines in addition to the business press, reporting on cases of significant migration resulting from remote work opportunities (Badger et al., 2023). Limited available academic research in this nascent field presents a broad range of findings.

While there is a lack of consensus regarding the appropriate term, 'remote work,' 'telework,' and 'work from home,' researchers have been exploring working outside the regular office space for decades before the COVID-19 pandemic. Since IBM sent five employees home and provided them with gigantic terminals, 'telework' has expanded to refer to a broader range of work locations, including the home, satellite offices, and other remote settings (e.g., Di Martino and Wirth, 1990). Similarly, 'remote work' as a term encompasses various work settings, such as working from home, co-working spaces, or other remote locations (e.g., Olson, 1983).

However, work from home implies that the employee's primary workspace is within their own home, utilizing technology and digital tools to connect with colleagues and perform tasks remotely (e.g., Shamir and Salomon, 1985), potentially creating additional challenges for employee motivation and effectiveness.

Working from home some (here: hybrid) or all the time (here: simply working from home) can provide benefits such as enhanced autonomy, flexibility, and reduced commuting time, thereby improving job satisfaction, work-life balance as well as productivity, and reducing attrition. These positive effects were found in a study of engineers, marketing, and finance employees of a technology firm volunteering to enter a hybrid model randomized controlled trial (Bloom et al., 2022) and of customer service agents volunteering to enter a working-from-home randomized trial (Bloom et al., 2015). In contrast, some observational studies have found working from home to be associated with lower satisfaction and increased stress (Xiao et al., 2021; Lange and Kayser, 2022; Makridis and Schloetzer, 2022; Niebuhr et al., 2022). Bollestad et al. (2022) reported a reduction in employee exposure to bullying but also a rise in perceived loneliness, which was negatively associated with work engagement (Bollestad et al., 2022). Furthermore, Stanton and Tiwari (2021) considered the effect of remote workers' need to occupy more space at home on housing consumption, thus cutting into savings and expanding the housing footprint. Higher utility bills are also a factor to consider.

An area of particular significance in equity and long-term human capital development are the potential implications of remote work for individuals with various family roles and responsibilities. Several studies accentuated adverse labor outcomes for women due to the requirement to work from home amid the COVID-19 pandemic, including reduced hours and regression of gender roles towards those of traditional models (Singh et al., 2022). Another study found that mothers of little children working from home spent 49 more minutes per day on housework than fathers with the same working model (Lyttelton et al., 2020). Kumaresan et al. (2022) assessed self-reported burnout among IT professionals working from home, finding that women, on average, reported higher burnout rates than men (Kumaresan et al., 2022).

Like employees, organizations have had to weigh the benefits and costs of the work-from-home model. Having employees at home can cut office space and resources expenses, which for some organizations make it the most cost-effective work organization model (e.g., Bloom et al., 2022). However, many company leaders are concerned about productivity and the possible erosion of corporate culture due to remote working arrangements and are wary of the challenges involved in hiring and onboarding remote workers (Ferreira et al., 2021).

The COVID-19 pandemic forced many businesses to move towards remote work models and accelerated the digital transformation of work — changes which partially persisted even in the absence of pandemic circumstances (Nagel, 2020; Ng et al., 2021). Before the pandemic, only 5.4% of individuals worked exclusively from home in the EU-27 (Milasi et al., 2021), nearly identical to the 5% rate among US employees (Coate, 2021). A working paper on the evolution of work from home by Barrero et al. (2023) reports that 10% of the observed US workforce is now working fully remotely. The existing literature does not comprehensively address the effects of remote work as necessitated by the COVID-19 pandemic (Waizenegger et al., 2020; Singh et al., 2022). This gap, which our inquiry aims to address, is crucial for organizations aiming to optimize remote work arrangements as a matter of company policy rather than self-selection into remote work.

In contrast to Bloom et al.'s (2022) study on the hybrid model and Bloom et al.'s (2015) study of remote work arrangements, both of which explored effects among a subset of volunteers among the employees of the studied companies, our study is based on a survey of the employees of a company that has, in response to external pressures, strategically shifted the majority of its employees to having to work exclusively from home. This working context requires additional consideration as qualitatively different from that of a volunteer-based self-selected remote or hybrid work scheme, where, for volunteers, the resources at home may be greater and the demands lesser, as understood in a work-home resources model, than of the employees more generally (Ten Brummelhuis and Bakker, 2012).

Mplus Group, a leading business process and technology outsourcing (BPTO), employs more than 13,000 individuals in 14 countries to provide contact centers, information technology, and employment services to address global customer support challenges. Before the COVID-19 pandemic, 27.8% of its employees worked from home, 4.7% worked in a hybrid manner, and 70.7% worked from the office. Since March 2020, the company has emerged as a leader in telework, with 70.7% having to work permanently from home (a 61% increase), 14.9% in a hybrid model (a 68% increase), and only 18.8% working from the office (a 276% decrease). This makes MPlus Group an appropriate case study to explore the association of working from home as the default working model with satisfaction levels, work-life balance, and working-model preferences in the BPTO sector, while additionally exploring any gender differences at a company with a woman-majority workforce.

1.1 Work from home and job satisfaction

The association of having to work from home (and other working models) with finding satisfaction in work is fundamental because job satisfaction is one of the key aspects of general satisfaction and quality of life (Rice et al., 1980; Montuori et al., 2022), making it important to study the possible dependence of job satisfaction on the work model. Furthermore, because employee attrition is, on average, higher in BPTO than in most industries and was a specific concern in the context of working from home amid the COVID-19 pandemic (NICE, 2022), the association of the latter with satisfaction is critical from the perspective of organizational economics. Giving greater weight to the above-discussed evidence from randomized controlled trials (Bloom et al., 2015, 2022), our first hypothesis is:

> (H1) Satisfaction with work will be higher among employees working from home.

This relationship between satisfaction with work and working models may be dependent on gender. Working from home may mean providing child care during work hours, and the persistence of traditional gender roles in child-care can lead to gender differences in the ability to perform in a work-from-home set-up and affect career progression for women (Singh et al., 2022; Vaitilingam, 2022). We thus hypothesize that:

> (H1a) The positive difference in satisfaction with work among employees working from home is attenuated among women.

1.2 Work from home and work-life balance

The greater flexibility and reduced commute-time brought about by working from home may empower employees to achieve a better work-life balance. In line with reports from previous research by Bloom et al. (2015, 2022), we hypothesize that:

> (H2) Self-reported work-life balance is higher among employees working from home.

However, again due to the likely uneven distribution of home and child-care duties across genders, we hypothesize that:

> (H2a) The positive difference in self-reported work-life balance among employees working from home is attenuated among women.

1.3 Working-model preference

Although finding satisfaction in work and work-life balance are key lenses through which to assess the implications of working from home for the employees as well as the organizations, the importance of the employee's ability to directly express a preference for a particular working model should not be overlooked. Focusing on employees who have to work from home, we hypothesize due to the greater autonomy associated with the working model that:

> (H3) Employees working from home are likely to prefer to continue working from home.

2 Methods

2.1 Procedure

In July 2022, the Mplus Group conducted a pilot study in Germany at several Invitel GmbH (a subsidiary of the Mplus Group) sites. Over 2 weeks (between the 25th of July and 5th of August), a distributed engagement survey was conducted based on Gallup & Willis Tower Watson methodology, comprising 40 Likert-type, categorical, and open-response questions. The pilot also assessed employee perception of survey tool confidentiality (Survey Monkey). In collaboration with 11 workers' councils (WC) in Germany, the surveyed respondents' highlighted cognitive load and suggested adding questions on well-being and working models (hybrid, remote, on-site) to gauge employee adjustment and motivation. Complexity reduction across countries discouraged the introduction of multidimensional constructs.

Based on feedback from the pilot study, Mplus Group streamlined the questionnaire to enhance translatability across seven additional countries and improve response rates. We prioritized respondent anonymity and the confidentiality of their perceptions. Participants were informed that the survey would take approximately 15 min to complete. The questionnaires were translated into local languages and distributed through Survey Monkey from October 10th to 23rd, 2022. The survey consisted of standardized Likert scale items and a separate analysis of open-ended questions.

2.2 Study design

To create a convenient sample that was still as representative as possible within the organization, 9,426 employees were invited to participate in the survey, including staff in Bosnia & Herzegovina, Croatia, Georgia, Serbia, Romania, Slovenia, and Turkey (after the pilot in Germany). Both open-ended questions and Likert-scale items were distributed in the same questionnaire, without interval differentiation. We removed respondents who were not customer experience/service and support agents (and excluded management in the same sector) to keep comparisons consistent and most pertinent to generalizations about working from home for staff within the BPTO industry.

2.3 Measures

Recognizing the limitations of single-item measures (Wanous et al., 1997; Nagy, 2002), we compromised to reduce questionnaire complexity and increase the sample size (Paas et al., 2003). Our quantitative analysis followed the approach of Cheung and Lucas (2014) regarding single-item measures and large samples. As a result, qualitative responses were excluded from this study.

2.3.1 Job satisfaction

The Employee Engagement questionnaire was designed based on well-known methodologies (Gallup & Willis Tower Watson), and was simplified to a single item: "My work gives me a sense of personal satisfaction." Respondents were asked to rate their perceptions from 1 (strongly disagree) to 5 (strongly agree).

2.3.2 Work-life balance

The work-life balance measure was adapted from Self-Perceived Health measure developed by Eurostat (e.g., Shaaban et al., 2022), and was simplified to a single item: "I have work-life balance at my job." Respondents were asked to rate their perceptions from 1 (strongly disagree) to 5 (strongly agree).

2.3.3 Working-model preference

To assess which working model they prefer, respondents were asked to answer: "What is your understanding now, after the

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TABLE 1 Sample characteristics.

Variable	Mean/Frequency
Work model	
From home	3,587 (78.77%)
Hybrid	252 (5.53%)
Required on-site	453 (9.95%)
On-site by choice	125 (2.74%)
NA	137 (3.01%)
Age group	
18–25	2064 (45.32%)
26–35	1885 (41.40%)
35–50	523 (11.48%)
>50	73 (1.60%)
NA	10 (0.22%)
On-site by choice	125 (2.74%)
On-site by choice	125 (0.02%)
Gender	
Women	3,201 (70.29%)
Men	1,353 (29.71%)
Country	
Bosnia and Herzegovina	305 (6.70%)
Croatia	271 (5.95%)
Georgia	23 (0.51%)
Romania	4 (0.09%)
Serbia	331 (7.27%)
Slovenia	131 (2.92%)
Turkey	3,487 (76.57%)

pandemic, of which working model (remote, hybrid, on-site) suits you best?"

2.4 Statistical analyses

We first estimated the simple proportion (and 95% confidence intervals, CI) of respondents stating they either "strongly agree" or "agree" with the statement "My work gives me a sense of personal satisfaction" (as opposed to not expressing a stance, disagreeing or strongly disagreeing) across the different models of work and among women and men. We introduced the distinction between required to be on-site and on-site by choice based on two questions about the working model and the reason for working on-site, in addition to the remote (which always meant working from home) and hybrid categories. We also used multilevel logistic regression models to formally test the association of the working models with personal satisfaction and adjust the estimates for the age group (18–25 as the reference group, 26–35, 36–50, 50+) and gender. To formally test whether the relation between working models and deriving satisfaction from work was dependent on gender (in addition to the simple comparison of proportions answering positively), we again used a multilevel logistic regression but included an interaction between the working model and gender.

We similarly estimated the proportion of respondents replying with either "strongly agree" or "agree" with the statement "I have work-life balance at my job" across working models and among men and women, and tested the association while adjusting for the above-mentioned covariates and in a model featuring an interaction between the working model and gender.

Finally, among the subset of respondents who were working remotely, we estimated the proportion (and 95% confidence interval) stating their preferred working model was remote (as opposed to at-the-office or hybrid); we again analyzed the association between so responding and age groups and gender using a multilevel logistic regression.

In sensitivity analyses, we took into account the original ordinal nature of the data on satisfaction and work-life balance, first with Kruskal-Wallis tests, followed by pairwise Mann–Whitney U tests for differences across work models; additionally, we analyzed the outcomes using ordinal logistic regression models, adjusting for the same covariates as in the multivariable regression models described above.

3 Results

Out of the 5,540 respondents (response rate of 58.8%), 4,554 worked as customer service agents and were included in the final sample. The majority worked remotely (78.77%), and fewer than 10% were required to work on-site. The largest age groups were of 18–25 years of age (45.32%) and 26–35 years of age (41.40%), with women being more prevalent in the sample, at 70.29%. Sample characteristics are summarized in Table 1.

3.1 Work from home and job satisfaction (H1)

The proportion and 95% CI of respondents stating their work gives them a sense of personal satisfaction by each working model is shown in Figure 1, overall and stratified by gender.

The levels of reported satisfaction were very high and similar across all working models. Consistent with our hypothesis, respondents working from home were in fact slightly more likely to report finding satisfaction in their work (70.3, 95% CI: 68.7–71.7) than respondents choosing to work at the office (64.8, 95% CI: 56.1–72.6), although the precision of the evidence was also consistent with there being no difference (Figure 1).

The adjusted odd ratios (ORs) of finding personal satisfaction in work are reported in Supplementary Table 1 (model 1): on average, the odds were somewhat higher among respondents working from home (OR: 1.31, 95% CI: 0.89–1.91) compared with those choosing to work on-site, though the evidence was again consistent with no differences. Odds were also somewhat higher in a hybrid model (OR: 1.32, 95% CI: 0.83–2.10), and higher among those required to work on-site (OR: 1.64, 95% CI: 1.06–2.51).

Both women and men working from home reported slightly higher levels of satisfaction than those working at the office by choice, with similar uncertainty about the estimate. In the model featuring an interaction term between gender and work models and adjusting for other factors (Supplementary Table 1, model 2), men working from

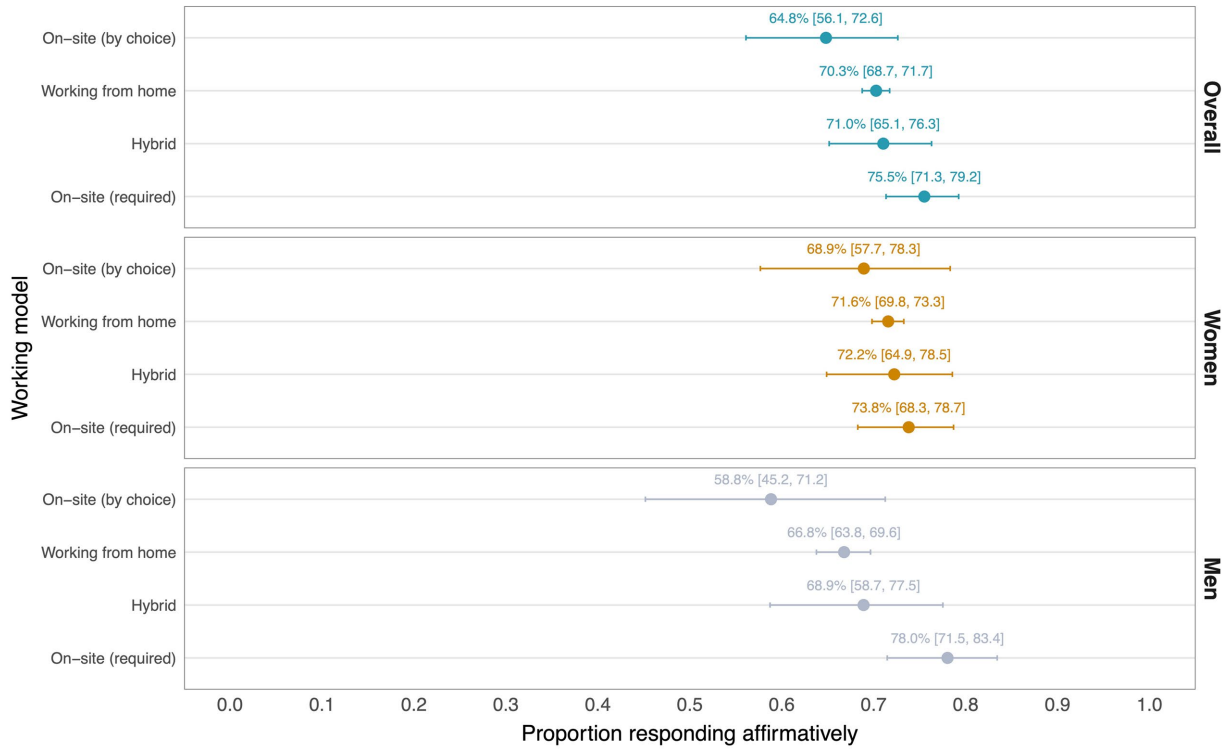

FIGURE 1
The proportion [95% confidence intervals] of respondents stating their work gives them a sense of personal satisfaction, by working model, overall and stratified by gender.

home were estimated to have higher odds of finding satisfaction in their work than those choosing to work at the office (OR: 1.81, 95% CI: 0.97–3.22) when adjusting for other factors. As expected, this positive association was, on average, attenuated among women working from home (OR: 0.60, 95% CI: 0.28–1.25), despite the slightly higher satisfaction among women working from home in absolute terms. Again, the evidence was also consistent with there being no difference.

Sensitivity analyses taking into account the ordinal nature of the satisfaction data (Supplementary Tables 2, 3A,B) were consistent with the above.

3.2 Work from home and work-life balance (H2)

The proportion and 95% CI of respondents stating they have work-life balance by each working model is shown in Figure 2, overall and stratified by gender.

The percentage reporting having work-life balance was high across working models, both for women and men. A slightly higher percentage of respondents working from home stated they had work-life balance; however, again, the evidence was also consistent with there being no difference across working models. The adjusted ORs of reporting to have work-life balance were on average higher among respondents working from home (OR: 1.29, 95% CI: 0.84–1.92) compared with those choosing to work on-site, though again these adjusted estimates were less precise (Supplementary Table 4, model 1).

In the model featuring an interaction term between gender and work models, women were estimated to have higher odds of reporting having work-life balance in their work (OR: 2.31, 95% CI: 1.02–5.28), an association that was on average attenuated among women working from home (OR: 0.46, 95% CI: 0.20–1.06) — a finding consistent with our hypothesis 2a (H2a) (Supplementary Table 4, model 2).

Sensitivity analyses taking into account the ordinal nature of the work-life balance data (Supplementary Tables 5, 6A,B) were again consistent with the analyses of the dichotomized outcome.

3.3 Working model preference (H3)

Among the 3,587 respondents working from home, 78% (95% CI: 0.77–0.79) stated their preferred model was to continue working from home, thus confirming our hypothesis 3 (H3). While all the age groups were more likely to prefer working from home than the youngest employees (18–25), there were no substantive differences between women and men. The estimates are presented in Supplementary Table 3. The country-specific varying intercepts from all the multilevel logistic regression models are reported in Supplementary Figures 1–5.

4 Discussion

4.1 Results in the context of previous work

This study explored the association of having to work from home with self-reported satisfaction, work-life balance, and working model preferences in a diverse sample of 4,554 employees of the MPlus

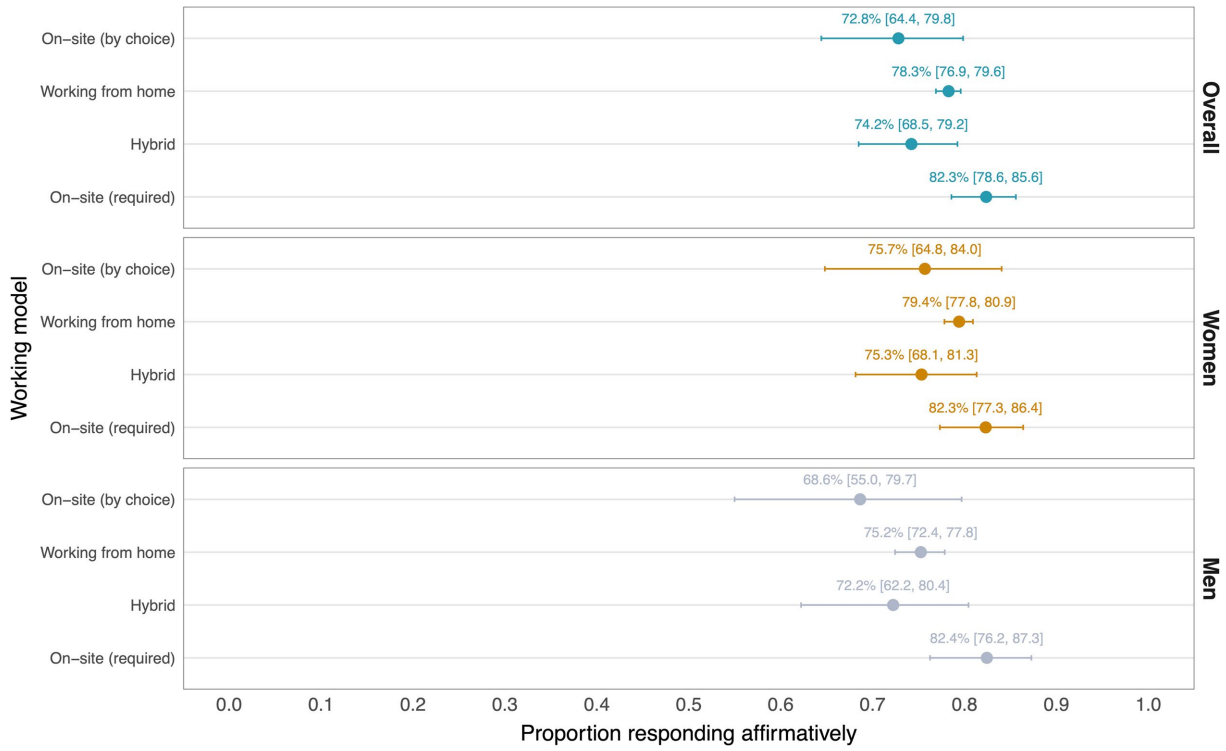

FIGURE 2
The proportion [95% confidence intervals] of respondents stating they have work-life balance, by working model, overall and stratified by gender.

Group, a leading business process and technology outsourcing company that switched in large part to remote work during the COVID-19 pandemic and did not revert to its previous distribution of work arrangements. Satisfaction and work-life balance levels were overall very high and respondents were very likely to prefer to continue working from home. These results were similar across all working models at the company, with minimal differences between women and men in the sample.

More specifically, working from home was associated with somewhat higher levels of personal satisfaction and work-life balance compared to choosing to work at the office. While the uncertainty of these estimates prevents concluding that there are genuine substantial generalizable differences, we can confidently state that working from home was not associated with substantially lower employee satisfaction or work-life balance. While women appeared to, on average, benefit less from working from home in terms of personal satisfaction and work-life balance, these estimates were uncertain, and the evidence for this difference thus not strong. Finally and critically, respondents who had to work from home were very likely to state they prefer to continue working from home.

Much of the recent research on work from home has focused on its productivity implications. In addition to informing this perspective indirectly, our study helps answer the more straightforward questions about the implications of having to work from home on the well-being of the working population in the BPTO and similar industries. Aksoy et al. (2023) reported that workers saved 72 min daily on commuting, allocating 40% of their time savings to work, 34% to leisure, and 11% to caregiving activities, which may help understand the positive associations with working from home observed in this study.

The results of this study are also not surprising in the context of the two randomized controlled trials of volunteers assigned to hybrid and remote work, respectively by Bloom et al.'s (2022) and Bloom et al. (2015); however, the positive differences in job satisfaction and work-life balance observed in the present study were considerably smaller and thus statistically uncertain. This difference could be explained in part by the distinctive feature of this study — the fact that the sub-sample of the employees working from home in the present study did not self-select to participate in an experiment, but continued working from home as a continuation of a policy introduced and deemed successful by the company's management during the COVID-19 pandemic. On the other hand, the results stand in contrast with those of other observational studies, such as those by Makridis and Schloetzer (2022) and Niebuhr et al. (2022), which found negative associations with satisfaction.

With respect to the estimated negative interaction of gender with working from home, the uncertainty of the estimates precludes confident conclusions. However, considering absolute values, the clearly high level of satisfaction, work-life balance, and preference to continue working from home observed among women in this study are perhaps unexpected given previous research (Singh et al., 2022) and are encouraging in terms of equity as well as enhanced productivity considerations (Yang et al., 2022).

4.2 Limitations and future research

This study has several important limitations. Despite the large and culturally diverse sample, appropriate generalizations based on this

study may be limited to similar industries. Further, the single-item measures may not reflect the complexity of the studied phenomena, but were chosen to simplify the conduct of the survey and interpretation. One of the distinguishing features of the study, i.e., the fact that the respondents were not self-selected as volunteers but were rather regularly working from home as a consequence of the company's policy (Yu and Wu, 2021), also means that working from home was not randomized — the results, therefore, fall short of addressing questions about the causal effects of having to work from home. A longitudinal exploration of each of the questions addressed here would also have been informative, especially if it included the period before the shift of many respondents to working from home. Exploring the relation between remote work and employees' motivation more generally, and as reflected in burnout and turnover, may be another valuable research avenue, possibly as understood through Self-determination theory (Deci et al., 2017; Tudu and Singh, 2022).

5 Conclusion

This brief research report examined the association of having to work from home with job satisfaction, work-life balance, and working model preference within the BPTO industry. Both women and men in all working models, including fully remote work from home, reported high levels of job satisfaction and work-life balance. Respondents working from home were also very likely to prefer continuing to do so. Overall, this study contributes to the ongoing discussions on remote work and provides insights to organizations and policymakers navigating the changing landscape of post-pandemic work dynamics. Further research is needed to explore working from home arrangements in other industries, as well as to study the phenomenon longitudinally.

Data availability statement

The datasets presented in this article are not readily available because sharing them may make certain participants easily identifiable. Requests to access the datasets should be directed to tin.oreskovic@balliol.ox.ac.uk.

Ethics statement

Ethical approval was not required for the studies involving humans because it was based entirely on a survey conducted by the HR department of a company. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

TO: Conceptualization, Formal Analysis, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. MM: Conceptualization, Formal Analysis, Methodology, Software, Writing – review & editing. BK: Conceptualization, Data curation, Project administration, Writing – review & editing. DH: Conceptualization, Data curation, Project administration, Writing – review & editing. TG: Conceptualization, Data curation, Project administration, Writing – review & editing. AS: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. C-IK: Conceptualization, Writing – review & editing, Supervision. SO: Conceptualization, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

BK, DH, and TG are employees, SO is a shareholder of, and TO provides advising to MPlus Group.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1258750/full#supplementary-material

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A qualitative analysis of STEM female's coping strategy under the COVID-19 pandemic

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The purpose of the research was to realize the STEM female's career coping under the pandemic. We conducted in-depth interviews with three STEM female engineers in Silicon Valley, California. After analyzing the research results, we found that: (1) In response to the impact of the pandemic, technology companies and female workers have demonstrated their ability to respond quickly; (2) While working from home, STEM females experienced five notable challenges, but also developed corresponding coping strategies; (3) Corporate systems and teamwork in the STEM fields utilize external resources to help female workers respond effectively to the pandemic.

KEYWORDS

COVID-19, career coping strategy, STEM, female, qualitative research

1 Introduction

The COVID-19 pandemic has transformed the lives of people around the world, bringing about drastic changes and life-altering shifts to the workforce as a whole. Employers are facing significant challenges affected by the impact of the pandemic on multiple levels, such as the expansion of underemployment (1), the surge in employment pressure (2), and the increased need to balance work and family (3).

Akkermans et al. (4) claimed that the impact of the pandemic on careers is a product of the interaction between personal coping methods and the surrounding factors. Therefore, the effective coping strategy is to turn "crisis" into "opportunity." Hite and McDonald (5) have suggested that coping strategies such as career resilience, developing multiple career skills, and enriching on-the-job training are all critical elements in developing a sustainable long-term career.

According to statistics from previous studies on the pandemic and careers, this research found that most of those studies examined the impact of the pandemic on the careers of the general public, and the related responses (2, 4, 6), while this research focused on a specific group of STEM (science, technology, engineering, and mathematics) female workers. There are two reasons why STEM females are chosen to be subjects of this research. (1) Previous studies have found that the proportion of STEM females is increasing. However, they still face more adversity than men (7), thus warranting more research efforts. (2) Previous studies have found that female employees are responsible for taking care of their families and are exposed to more family-work conflicts during the pandemic (3). It is worthwhile to investigate whether the work-from-home working type in the STEM field increases internal conflicts among female employees.

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For reasons outlined above, this research was conducted with STEM females, aiming to understand the challenges they faced in their daily work during the pandemic, and the coping strategies they used.

2 Method

2.1 Participants

This research conducted purposive sampling (8) to invite research participants, and selected three female engineers who all worked in technology companies in Silicon Valley, California. The research participants all have master's degrees; two participants (renamed as Illy and Candy) have more than 25 years of work experience and one participant (renamed as Yeh) has more than 3 years of work experience. The first two participants, Illy and Candy, aged between 50 and 55 and the third participant, Yeh was about 30–35 years old. I and C have their own marriages with two children, respectively. At the time of the study, they all work from home. Same as their husbands. All the children grow up and also work from home. The third participant Yeh is single.

2.2 Measures

Research tools used in this research included invitations, participation consent documents, interview outlines, and interview notes. The interview outline consists of four main parts: an introduction to the main content of the current work, the history of career development in the STEM field, the work difficulties encountered during the pandemic, and personal coping strategies.

2.3 Procedure

First, we determined the purpose of the research and then developed the interview outline. We then invited the participants to engage in an in-depth interview. Due to the pandemic, research interviews were conducted via Google meet or MS teams. Each interview lasted approximately 60–90 min. We then compiled and analyzed the data after the interviews and wrote this research report.

2.4 Qualitative analysis

Data compiling included two steps: (1) Writing a note after each interview to record the overall impression about participants. (2) Turning the audio file into a transcript, numbering the data, and anonymizing for privacy.

The data analysis was conducted through Content Analysis (9), which included four steps: (1) Repeatedly reading the transcript and supplementing with interview notes to outline the content related to the research topics. (2) Labeling the content related to the research topics as meaningful units. (3) Comparing the meaningful units, categorizing similar units, and naming them according to their connotations. (4) Comparing the associations between the topics, and categorizing them into broader themes.

3 Results

3.1 Quick responses to pandemic, new experience of working from home

The research participants indicated that in response to the pandemic, the work-from-home policy was implemented in a hastened manner. The advantage of working from home includes saving commute time, more freedom and flexibility during work hours, and the ability to take care of family life. Disadvantages of working from home include being forced to put hardware testing on hold, and your work may be affected by problems with the utilization of software and equipment. However, the research participants also pointed out that technology companies are high-tech industries and have demonstrated the ability to respond quickly. For example, technology companies quickly improved network systems, solved technical problems with network connections for working from home, and provided remote, timely, and personal assistance to employees. These quick responses not only solved the technical problems in the network connection of working from home, but also improved the efficiency of employees. Overall, after the pandemic, employees generally prefer to work from home, and reported being able to maintain their level of efficiency. The work of technology industries is also suitable for flexible working schedules.

> "…When the pandemic started, the company's network was not strong enough, and the network at home might not be stable as well. It often disconnected at the beginning, and I was very nervous at first. They (the company) specially arranged an IT person to help solve problems. There's always an IT person available. When you need help in maintaining the machine or doing something else, IT would help you to do it immediately." (I-36)

> "The company has become very efficient in responding to these problems, and the whole company has become a work-from-home work unit, and everyone likes this instead." (I-37)

The children of research participant C are also working in the technology field. They found that after the pandemic, young people preferred to work from home. In particular, young people want to travel to different places, and working from home allows them to work from different places.

> "I've asked my kids who have a job, and they say that their peers who are looking for jobs now prefer those allowing them to work from home, because working from home allows them to travel…they are taking the opportunity to stay in different places…" (C-28)

3.2 New challenges of working from home

From the perspectives of the three participants, there are five challenges that STEM females experienced while working from home: time management, work efficiency, work and family balance, online teamwork maintenance, and adjustment to the environment.

3.2.1 Time management

The most important feature of working from home is that it saves commute time and provides more flexibility in time arrangement. With a computer readily available, you can work whenever and wherever you want. However, this has also become a test of employees' time management skills.

Research participants reported being allowed to schedule their own work hours at home. For example, participant I was able to incorporate life tasks, such as walking the dog and preparing meals, into her work intervals. In another example, participant C directly placed her desk near the kitchen to make the best use of spare minutes, such as preparing meals as the code is running. Participant Y, for example, found that working from home increased the amount of time being alone, which could be used for reading and thinking about future career planning.

> "Now I put my office near the kitchen for work. I can wash the vegetables when running code or compare. For those (tasks) not completed, I can check it out around six or seven o'clock. It was originally a huge block, but now I can break the whole into parts. It seems to be a little more flexible." (C-13-1)

However, the blurred boundaries between work and life caused by working from home can easily lead to overtime. For example, participant I pointed out that before the pandemic, she would actively avoid working overtime on weekends or in the middle of the night because of the need to commute or not having food in the middle of the night. However, working from home makes everything convenient, with a computer right beside you and food at your fingertips, it becomes easy to work when you need to, or to work overtime in times of urgency. Research participant C observed the way young people worked from home and found that they needed to be on call all the time, with no concrete distinction between being at work and leaving work.

> "…In the past, if you wanted to do work on the weekend, you would feel troubled because you have to go into the office or something, and you would struggle a little bit and think, 'Forget it, I'll do it on Monday'. Nowadays, it's most unlikely to be like this, and if you want to do your work, the computer is right next to you, so you can go anytime and start doing it." (I-40)

> "…Now my kids who do software are working from home, and he is, they are, always on. For example, when they have a problem, colleagues want to contact each other, he's always on call, always online…" (C-29-1)

3.2.2 Efficiency in work

Companies are most concerned about the efficiency of their employees working from home. Research participant I believed that productivity of working from home had not decreased but rather was higher than before, however, this increase in efficiency was caveated with the need for self-discipline. For example, if delaying work was necessary for avoiding disrupting a colleague's vacation, Research participant I would need to establish a clear work schedule arrangement. Research participant Y had a different view. She thought that working from home was not only slower but also significantly less productive and had lower job satisfaction. Research participant Y believed that there were two reasons for the decrease in work efficiency: (1) Working from home did not allow for hardware testing, and regular work was easily interrupted by the pandemic. (2) Formal and informal brainstorming interactions between colleagues were not available due to the pandemic, and there was a lack of sources of creative inspiration, which are important factors for improving work efficiency.

> "I think it (working at home during a pandemic) is more efficient than before." (I-35)

> "Working from home is not as efficient as usual. I'll start with a few reasons, first, there's less collaboration, and second is that… we need hardware to test, and in the case of a pandemic the testing becomes more complicated, which leads us to deliberately do more works related to software and less to hardware." (Y-56)

3.2.3 Work and family balance

The three research participants were unanimous in stating that working from home helps to balance their work and family. For example, research participant I found that working from home allowed her to schedule leisure activities in a convenient manner, such as walking the dog before returning to work or working while on vacation. Research participant Y also found that working from home was more comfortable and convenient, given that you can better handle things in your own home while working, such as renovating your house.

However, since work and family are shared in the same space, it can be a challenge to manage them simultaneously. For example, participant Y pointed out that it was convenient to eat and exercise when working in the office, while working at home required more effort to handle things such as cooking and cleaning. In another example, the chief executive of participant C left his job because of the stress of taking care of his children while working at home. It is evident that the task of balancing work and family life is a new challenge for people working from home.

> "It's like my former boss. He quit on his own because at that time his two kids were both on-line, and then the couple had to work. The kids were just in elementary school, so he had to spend time with them. They couldn't sit still, which was very stressful for him, making him quit the job last June." (C-35)

3.2.4 Online teamwork maintenance

In the science and technology field, there is an emphasis on teamwork, and working from home transforms the original team communication into an online format. Regular formal online meetings would be arranged by the company, allowing employees to update their project progress. The staff also arranged informal online meetings to stimulate creativity through online discussions. For example, at the beginning of the pandemic, the efficiency of participant Y was affected by a lack of communication with colleagues. But as the team's online communication increased, she found that online meetings could still have the same brainstorming benefits as before. The three research participants agreed that the outbreak had little impact on teamwork, with the only change of format to more frequent online meetings.

> "…Basically, we have an update of your current progress every Monday, Wednesday, and Friday, so meetings are more frequent than before instead…" (I-35-2)

> "Now the strategy is that we try to have more social time. We used to plan once every 2 weeks about our work, but now it has become once a week, more frequent, giving everyone the opportunity to communicate, formal and informal, and more channels to communicate." (C-64)

3.2.5 Adjustment in such an environment

The pandemic has hit the job market. The U.S. government has offered many vocational training projects to help the unemployed switch to new occupations, but there is still a need for active cooperation from the workforce. The three research participants agreed that American culture values freedom and autonomy, and that the government does not need to do much because people will find their own way out. For example, Research Participant I believes that the government had too much control and has done too much, and that it should give more freedom. In another example, research participant C found in her communication with young people that they are reconsidering the meaning of work. Some wanted to take a break from work, and some wanted to leave their jobs to start up their own businesses.

> "In a free society like the United States, of course, individualism is still more important. It seems that the government doesn't need to do anything, and people themselves will find opportunities to grow and keep their jobs going." "Right, but I also know a person in the STEM field who said he didn't find a suitable job, but he wanted to quit and emailed me at the end of last year, around Christmas. (C-30)

3.2.6 Inner resources: the typical characteristics and beliefs of STEM women

While working from home, the STEM females we interviewed had a deeper view of their characteristics and career beliefs, which were inner resources to help them cope effectively with the pandemic. The results of the interviews show that STEM females have five major personal characteristics and beliefs: (1) Interest-oriented career choices, passion for STEM, and a sense of accomplishment from their jobs. (2) Emphasis on logical thinking, active learning, self-improvement, and a high sense of self-efficacy. (3) Enjoying innovation and adventure, embracing challenges, advocating freedom, and attaching importance to planning. (4) Being light on fame and fortune, reacting by nature, living in the present, and (5) Preferring relationships that are friendly, equal, and working together.

> "I think the work now is quite interesting because every day there are some very challenging things or problems that no one has ever solved, and I would be very happy if I could solve them. I don't think anyone is truly doing robots, intelligent robots, and I think our group is very likely to make it. Now the daily work is very challenging…" (Y-35-1)

3.3 External resources: corporate systems and teamwork in the technology field

Corporate systems and teamwork in the technology field are external resources that help STEM females respond effectively to the pandemic.

The three research participants unanimously pointed out that technology companies provide a free, open, stable, and fair environment, encourage autonomy and innovation, proactively help employees balance work and life, and provide substantial and consistent support. For example, research participant I shared that the company offers open space for creativity, excellent benefits, and there were little to no fear of layoffs. In another example, research participant Y shared that the company where she worked at was stable, paid well, and gave her enough freedom. There was no need to be afraid even if there were not any results in the short term.

> "Because whenever you want to do some new work, new projects, the company will let you have a try, it won't make you always do the same work. If you are willing to try new stuff, the company will let you do it. I think the company is stable, so you wouldn't have that fear of being laid off…" (I-15)

Research participants I and Y mentioned that colleague relationships are generally friendly, balanced, understanding, and respectful. The team works together to achieve mutual success, which is crucial support for daily work. For example, participant I stated that team members could respect and accommodate each other. Research participant Y appreciated the teamwork and felt that her colleagues not only got along well with each other, but also demonstrated their talents, supported each other, and worked together, including actively participating in brainstorming to stimulate each other's creativity and make contributions to each other's achievements.

> "I will propose some ideas, and then a good point is that colleagues are all nice, and then, there is no competition between coworkers in the workplace, people help each other to realize your idea." (Y-35-2)

4 Discussion and implication

Summarizing the above research results, this research integrated the career coping patterns of women in STEM fields during the pandemic into Figure 1. In response to the impact of the pandemic, technology companies responded quickly, and working from home has become the main working type. During the period of working from home, female workers experienced five challenges, including time management, work efficiency maintenance, work and family balance, and online teamwork development. In addition, in the face of the pandemic's impact on the job market and the government's multiple response measures, employees are trying to adjust themselves to help them settle into their work and family life in the environment. A proactive response to the pandemic cannot be achieved without both internal and external resources. The STEM females we interviewed found the company provided powerful backing, and team members also offered strong support. Meanwhile, female workers also found that the typical characteristics and beliefs of STEM females are inner resources that help them respond effectively to the pandemic. Overall, with the best use of inner resources and strong external support, STEM females have been able to minimize the impact of the pandemic on their daily work, and keep their work moving forward.

Although the pandemic has little impact on the day-to-day work routine for women working in STEM, this research did identify three

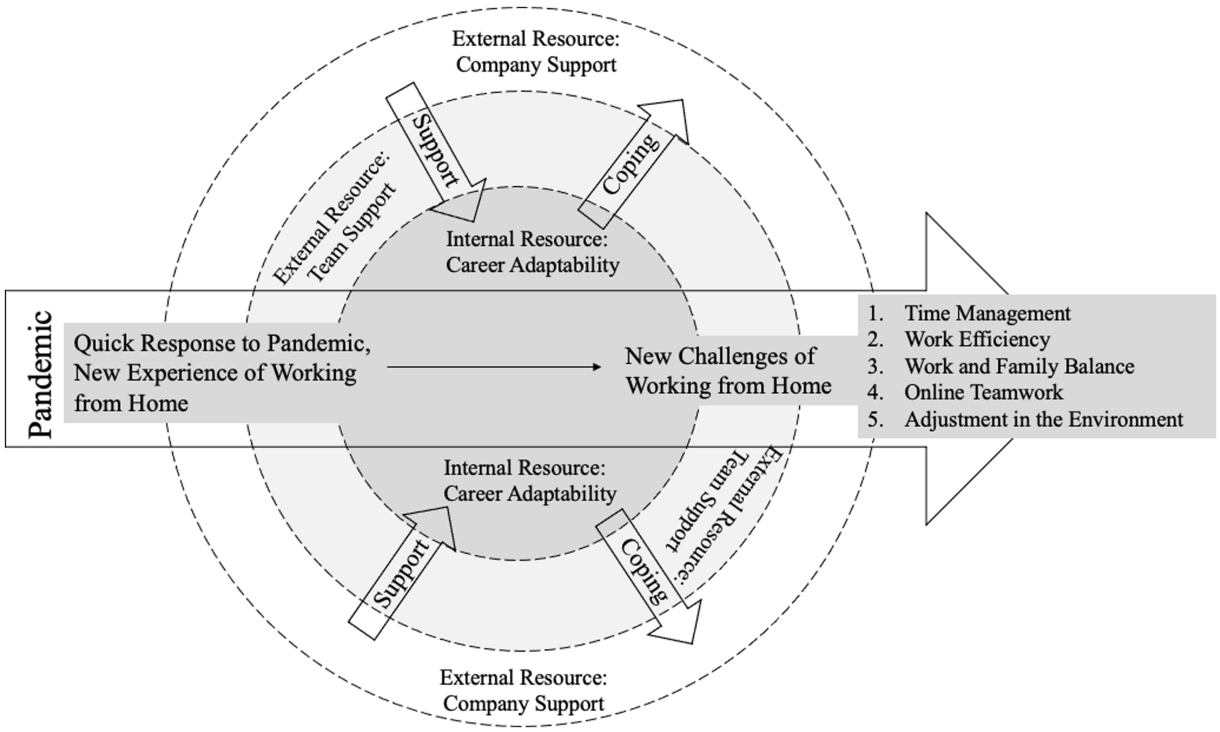

FIGURE 1
STEM female's coping strategy under the COVID-19 pandemic.

important findings that are worthy of further discussion in follow-up research.

Firstly, this study found that all three women entered the field of science and technology based on their interests, and because of their high self-efficacy and excellent mathematical ability, they were identified to have a high sense of accomplishment stemming from their career. Schultheiss's (7) maintains that interest, self-efficacy, and mathematical ability are important factors affecting employment in the field of science and technology. While our findings support these hypotheses, the study also further found that the influence of personal characteristics, beliefs, and values in effectively allowing women to face major environmental challenges such as the pandemic. These characteristics, beliefs, and values were identified as pivotal self-regulatory resources that assist in coping effectively with challenges. The results of this study also support the theoretical proposition of Savickas (10), that is, when faced with work difficulties, individuals will activate self-regulatory resources to actively cope with challenges. In other words, the unique personal characteristics, values, and beliefs of women in the field of science and technology are an important part of shaping women's career adaptability.

Secondly, the three women unanimously emphasized the importance of external resources in coping with the impact of the pandemic, which is consistent with the findings of Lent et al. (11), where support systems are identified as a critical element affecting women's performance in the STEM fields. In another study by Neo et al. (12), the findings suggested that family support is an important predictor of women's career experience during the pandemic. To further expand on past research findings, this study found that the support received from tech companies and their respective teams also act as an important factor affecting women's home office proficiency. Family support is always an important facilitator for females' mental health.

Furthermore, this study found that STEM females who were currently in different career stages had various opinions regarding the efficiency of home office work. On the one hand, nearly all women in the tech industry believed that the boundaries between work and family were blurred due to the home office environment, and individuals needed to adjust and respond to maintain the balance between work and family. The results of this study are consistent with the findings of Neo et al. (12), that is, during the pandemic, the boundaries between work and family are blurred, and it has been quite challenging for female workers to balance work and family. On the other hand, consistent with the findings of Mockaitis et al. (6), the results of our study support that the pandemic affects workers at different stages of career development differently. Specifically, the two female employees in this study who were closer to the age of retirement believed that work efficiency only fluctuated at the beginning of the pandemic, but with the adjustment of the company and individual familiarization, the level of work efficiency was actually higher than being in the office. Female employees who are still at the beginning stages of their careers, however, believed that work efficiency has dropped significantly due to the pandemic, and they looked forward to more assistance to improve work efficiency. Regarding this finding, this study speculates that the soon-to-be-retired women, as senior women in STEM, may pay more attention to job stability and take job completion as the primary goal; while women who are just starting out aspire to pursue more challenges, desire to develop more work results, and are not as satisfied with the status quo. More challenges

might be valued by young workers. The sense of success and accomplishment might be part of resources to promote their mental health and wellbeing (13).

Finally, the results of the interviews demonstrated that daily work of STEM females is mildly affected by the pandemic, this in part may be related to the U.S. work culture. As Guan et al. (14) argued in their study, people's career lives in individualistic cultures are less affected by the pandemic than in collectivist cultures. Similarly, the three women selected for this study were Chinese-Americans who have worked in Silicon Valley for a long time. During the pandemic, their career coping has been deeply influenced by Western culture, emphasizing proactive response to external challenges and improving personal coping skills (14). The findings of this study also support the view of Akkermans et al. (4) where the impact of the pandemic on personal career is the product of the interaction between the individual and the situation. In addition, for the female STEM workers we interviewed, it seems that they can cope with the family–work conflict quite well under the pandemic. The main reason is that they do not have to drive to the office. Working from home saved a lot of time and money caused by transportation.

As far as the limitations of this study are concerned, due to the small number of samples in this study, the results of the study are still somewhat limited in the application of inference. Future research could be conducted in two directions: (1) working from home is more demanding in terms of balancing family and work life, which could be explored in more depth in future research; (2) working from home reduces face-to-face interpersonal communication, but increases online interaction. However, Riva et al. (15) found that there are still essential differences between online interaction and face-to-face communication, so future research can also further explore the impact of online interaction on routine work.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Research Ethics Office, National Taiwan Normal University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Return to work after Post-COVID: describing affected employees' perceptions of personal resources, organizational offerings and care pathways

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Background: Most individuals recover from the acute phase of infection with the SARS-CoV-2 virus, however, some encounter prolonged effects, referred to as the Post-COVID syndrome. Evidence exists that such persistent symptoms can significantly impact patients' ability to return to work. This paper gives a comprehensive overview of different care pathways and resources, both personal and external, that aim to support Post-COVID patients during their work-life reintegration process. By describing the current situation of Post-COVID patients pertaining their transition back to the workplace, this paper provides valuable insights into their needs.

Methods: A quantitative research design was applied using an online questionnaire as an instrument. Participants were recruited via Post-COVID outpatients, rehab facilities, general practitioners, support groups, and other healthcare facilities.

Results: The analyses of 184 data sets of Post-COVID affected produced three key findings: (1) The evaluation of different types of personal resources that may lead to a successful return to work found that particularly the individuals' ability to cope with their situation (measured with the FERUS questionnaire), produced significant differences between participants that had returned to work and those that had not been able to return so far ($F = 4.913$, $p = 0.001$). (2) In terms of organizational provisions to facilitate successful reintegration into work-life, predominantly structural changes (i.e., modification of the workplace, working hours, and task) were rated as helpful or very helpful on average ($mean_{workplace}$ 2.55/SD = 0.83, $mean_{working\ hours}$ 2.44/SD = 0.80; $mean_{tasks}$ 2.55/SD = 0.83), while the remaining offerings (i.e., job coaching or health courses) were rated as less helpful or not helpful at all. (3) No significant correlation was found between different care pathways and a successful return to work.

Conclusion: The results of the in-depth descriptive analysis allows to suggests that the level of ability to cope with the Post-COVID syndrome and its associated complaints, as well as the structural adaptation of the workplace to meet the needs and demands of patients better, might be important determinants of a successful return. While the latter might be addressed by employers directly, it

might be helpful to integrate training on coping behavior early in care pathways and treatment plans for Post-COVID patients to strengthen their coping abilities aiming to support their successful return to work at an early stage.

KEYWORDS

return to work, work ability, post-COVID syndrome, long COVID, occupational health

1 Introduction

The global impact of the COVID-19 pandemic has been unprecedented, affecting millions of individuals and profoundly reshaping societal as well as occupational norms (1). While much attention has been focused on preventing and treating acute cases of COVID-19, a significant number of individuals who have recovered from the initial infection continue to experience persistent symptoms and functional limitations (2). These lingering effects, commonly referred to as Post-COVID syndrome or long COVID (3, 4), have emerged as a significant health concern with implications for individuals' ability to resume their normal daily activities, including returning to work (5).

Emerging evidence indicates that 5–10 percent of patients suffer from the so-called Post-COVID syndrome, i.e., experience persistent symptoms for more than 3 months after the infection with the SARS-CoV-2 virus (4, 6). Post-COVID syndrome may manifest in a broad range of symptoms, such as shortness of breath, post-exercise malaise, cognitive decline, chronic fatigue, musculoskeletal pain, and mental health deterioration (7). These symptoms can vary in severity and duration, creating unique challenges for individuals seeking to resume their professional roles (8). Physical limitations and reduced stamina may hinder their ability to perform previously manageable tasks. Cognitive impairments, such as difficulties with concentration and memory, can impact job performance and decision-making abilities. Furthermore, the emotional toll of the illness, combined with the uncertainties surrounding long-term health outcomes, may contribute to increased anxiety, stress, and reduced confidence among affected individuals (9). Previous studies on the Post-COVID syndrome address different realms. First, a lot of research deals primarily with the treatment of Post-COVID. Those studies predominately consider the medical symptoms (i.e., coughs, embolisms, coronary artery diseases) (3, 4), cluster symptoms and cohorts (7, 10, 11), and focus on developing treatment guidelines (e.g., the German S1 guideline or the UK NICE recommendations). Other studies analyze psychological factors after a COVID infection, especially after long-term treatments (i.e., anxiety) (12, 13). Another research field explores determinates or predictors for developing the Post-COVID syndrome. Here, previous studies reported disease severity during the acute phase of COVID-19 as one of the strongest predictors of Post-COVID (14–16). In another study, Dias et al. (17) found that hypertension, higher body mass index, lower hemoglobin, female sex, admission to intensive care unit, and longer stay were independent predictors of long COVID. Other research focuses on the effects of the Post-COVID syndrome and its different outcomes. Here, studies have assessed the patients' quality of life and found that inferior quality of sleep (18), pain and discomfort (19), or chronic exhaustion (20) are primary reasons for diminished quality of life. Eventually, limited research exists assessing occupational cohorts affected by the Post-COVID syndrome and the effects on their work ability and issues of returning to work after or with the Post-COVID syndrome. Here, Gualano et al. (21) provided with their systematic review of existing literature a comprehensive overview highlighting that Post-COVID is a rising problem in occupational medicine, with consequences on workers' quality of life but also on productivity. In this context, Tabacof et al. (22) found that the Post-COVID syndrome negatively impacts physical function, cognitive function, health-related quality of life, and also participation, which are all determinates that eventually influence workers' productivity. In a case study of a long COVID patient returning to work, Tan and Koh (23) described the challenges and occupational health issues that occurred on his way back to corporate life. The authors found that managing the return to work of Post-COVID affected employees is a highly individual task and requires a multidisciplinary approach.

Nevertheless, there is a lack of occupational reintergation programs particularly for Post-COVID affected employees that draw upon multidisciplinary research from fields such as medicine, psychology, occupational health, and rehabilitation. Public health researchers largely attribute this to the neglect of participatory research that focuses on the patients' perspective and voice and identifies their personal and external resources that might restore their work ability (24). However, understanding the strategies employed by Post-COVID patients as well as their subjective views on the effectiveness of different care pathways and organizational offerings can inform the development of such evidence-based programs. Therefore, the research aims of this study were to

(1) describe personal resources and stressors that might facilitate or hinder the Post-COVID patients' return to work,
(2) identify external support programs that can aid individuals in navigating their way back to work,
(3) feature the patients' different (medical) care pathways and subjective ratings of these offerings pertaining to their return to work.

By doing so, this scientific paper contributes to the collective knowledge base surrounding the return-to-work process. It aims to inspire future research, encourage collaboration among various stakeholders, and inform the development of evidence-based programs and policies that enhance the work experiences and well-being of individuals recovering from the Post-COVID syndrome. Eventually, it seeks to raise awareness among employers, healthcare providers, and

policymakers about the specific needs of this population, fostering a proactive approach.

2 Materials and methods

2.1 Study design and instruments

A cross-sectional quantitative research design was applied using an online questionnaire to describe the situation pertaining the patients' reintegration into work-life. The survey consisted of 148 items clustered in nine scales.

2.1.1 Socio-demographic data

Basic socio-demographics (age, sex, material status, children, education, residency) and information on the participant's current employment situation were collected.

2.1.2 COVID-19 infection

Questions on the initial COVID-19 infection date, information on inpatient healthcare, and the prevalence of a Post-COVID diagnosis were asked. The Gießener Beschwerdefragebogen GBB24 (25) was also applied to evaluate physical health complaints that persisted even 3 months after the initial infection with the virus. The GBB24 comprises a list of 24 complaints. The level of complaints are measured via 5-point likert scale with the following response options 0("not at all"), 1("slightly"), 2("somewhat"), 3("considerably"), and 4("very much").

2.1.3 Care pathways

To enable the comparison of different care pathways, participants were asked to indicate the types of care and support they had received so far and rate how helpful they perceived these measures. In addition to a list of pre-defined options (Post-COVID ambulance, inpatient rehab facility, outpatient rehab facility, support groups, consultation with general practitioner, information via social media, and platforms), participants could also add own items. Finally, they were asked which types of care they would have preferred but had not received.

2.1.4 Health-related quality of life

The SF-12 questionnaire (26) was used to assess physical and mental health functioning and wellbeing to measure the current level of health-related quality of life. The SF-12 is a self-reported outcome measure assessing the impact of health on an individual's everyday life. It comprises of eight domains which are: (1) limitations in physical activities because of health problems, (2) limitations in social activities because of physical or emotional problems, (3) limitations in usual role activities because of physical health problems, (4) bodily pain, (5) general mental health, (6) limitations in usual role activities because of emotional problems, (7) vitality, (8) general health perceptions. The SF-12 is designed as a general measure of health so can be used with the general population.

2.1.5 Stressors

To identify chronic stressors that might impede return to work or arise while returning to work, the Trier Inventory for Chronic Stress (TICS) questionnaire (27) was applied. The TICS is a standardized German questionnaire that has been tested with respect to its factorial structure and psychometric properties, showing good to very good reliability. Internal consistency (Cronbach's Alpha, α) was good to very good with values ranging from 0.84 to 0.91 (mean of α=0.87). Nine interrelated factors of chronic stress are assessed. The nine factors were derived from 57 items rated on a five-point rating scale (1–5, labeled as: "never," "rarely," "sometimes," "frequently," and "always"). Participants rate the occurrence or frequency of specific situations with a recall period of the previous 3 months. For the present study, four sub-scales (social overload, lack of social recognition, social tension, and social isolation) were selected to control the effect of perceived chronic stress. The remaining 5 scales of TICS handling work-related stress were deliberately excluded, as it was assumed that most participants had been incapable of working for an extended period.

2.1.6 Overall quality of life

The World Health Organization Quality of Life-BREF inventory (WHOQOL-BREF) (28) is a shorter version of the WHOQOL-100. The questions stem from multiple statements about quality of life, health and well-being from people with and without disease, and health professionals. It can be applied for specific populations or groups with a particular disease. The WHOQOL-BREF comprises 26 questions on the individual's perceptions of their health and well-being over the previous two weeks. Responses to questions are on a 1–5 Likert scale where 1 represents "disagree" or "not at all" and 5 represents "completely agree" or "extremely." In the present study it was applied to measure the quality of life in the five domains. Besides a total quality of life score, sub-scores in physical health, psychological wellbeing, social relationships, and environment were assessed.

2.1.7 Personal resources

The German FERUS questionnaire (Fragebogen zur Erfassung von Ressourcen und Selbstmanagementfähigkeiten) (29) was applied to reveal the participants' health-related resources and self-management skills. The FERUS is a German questionnaire to assess individual resources, like social support and motivation to change, as well as skills in self-management, like coping, introspection, self-efficacy, self-verbalization, and hope. For the current study, only the coping as well as social support scale of the FERUS was used and thus consisted of 22 statements. The degree of consent to each statement is rated on a five-point Likert scale from 1 ("not true") to 5 ("very true"). Two sub sum-scores were calculated and compared to norm values.

2.1.8 Work ability

The full version of the Work Ability Index WAI (30) was used to assess the participants' current level of work ability. The WAI is an established instrument that underlies the assumption

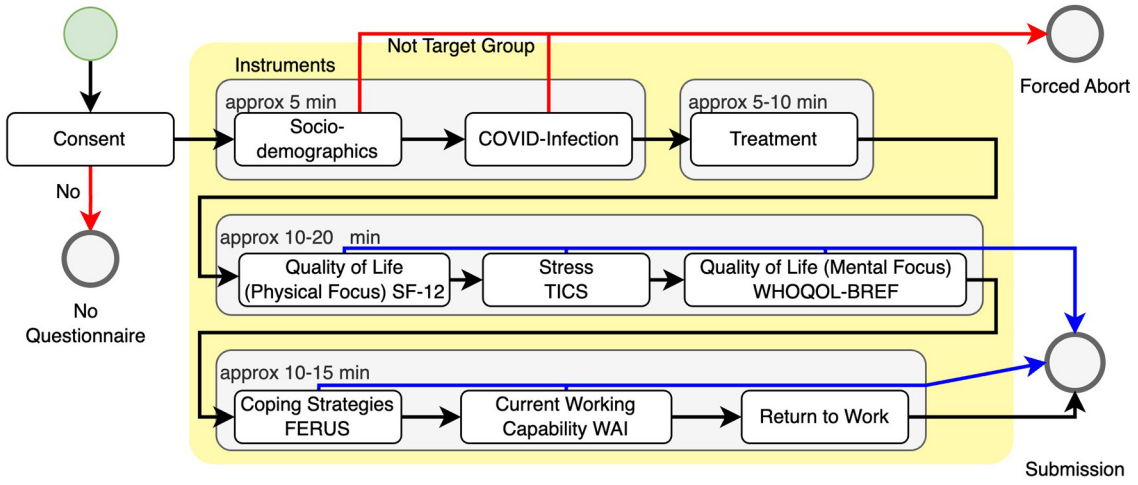

FIGURE 1
Overall study design. The user starts at the top left (green circle) and should follow the black arrows to the bottom left (gray submission circle). If they do not consent to the use of their data or are not part of the target group, the study is aborted (red arrows). After the initial questions, the user may be able to skip several instruments and complete the study early (blue arrows).

that work ability is represented by the factors of subjective work ability and resources, as well as the health conditions. The WAI consists of 7 items, including current work ability compared with the lifetime best, work ability in relation to the demands of the job, number of current disease groups diagnosed by a physician, estimated work impairment due to diseases, sick leave during the past year, personal prognosis of work ability for 2 years from now and mental resources, referring to the participant's life in general, both at work and during leisure time. The total WAI score is calculated by summing up the scores of all items and is ranged from 7 to 49. The total WAI scores are categorized into 4 levels: poor (7–27), moderate (28–36), good (37–43), and excellent (44–49).

2.1.9 Return to work

In this section, participants were asked to indicate if and to which extent (i.e., full-time, with reduced working hours) they had already returned to work as well as how long it took them to return to work after the initial infection. Additionally, participants were asked how many days of sick leave they had called in after returning to work. Then, the participants had to provide information on organizational offerings (i.e., job coaching, adjustments of working hours, working place or tasks, health consulting, and reintegration plan) they had received to foster a successful return to work. Eventually, they had to rate if these offerings helped them to reintegrate successfully. Finally, they were asked about obstacles they experienced while returning to their workplace.

2.2 Participants and procedure

The link to the online questionnaire was distributed through Post-COVID outpatients and inpatient rehab facilities, general practitioners, support groups, and other healthcare facilities to generate a heterogeneous sample. Flyers and posters were handed out to inform potential candidates about the study. Primarily, the German-speaking area (with a strong focus on Germany) was addressed. Inclusion criteria for the study were as follows: (a) participants had to be at least 18 years old, (b) had a confirmed infection with COVID-19 at least three months prior to study enrollment, (c) had or still have self-reported symptoms consistent with Post-COVID syndrome, and (d) have been employed for the last 12 months (even if currently on sick leave).

First, a pre-test was conducted ($n = 6$) to minimize comprehension problems, control for motivational confounding, and assess technical consistency. The study was carried out anonymously. As no personal data was collected, the survey had to be completed in one sitting, with no option to continue later. Per GDPA (Art. 7 §3), participants could drop out at any point in the study. Thereby, no information was persisted on the server.

Figure 1 illustrates the procedure of the study. The black arrows indicate the envisioned sequence of questions if the participant is part of the target group and answers all questions. The questionnaire was online available from 1st November 2022 till 31st January 2023 and resulted in 222 data sets. Of those data sets, 184 were part of the target group and used for further evaluation.

Ethical aspects of the research, including the selection of materials and methods, were reviewed and approved by the Joint Ethics Committee of the Universities of Applied Sciences of Bavaria (GEHBa) in accordance with current scientific best-practice guidelines under vote GEHBa-202209-V-074. All participants gave their informed consent.

2.3 Data analysis

Data was analyzed using SPSS version 29.0 (SPSS Inc., Chicago, IL, United States). A descriptive analysis was conducted to outline personal resources, care pathways, and organizational offerings of Post-COVID affected. Mean and standard deviation were

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compared to describe relationships between specific results and return to work. Multiple submissions were controlled by checking internal consistency as well as dates and times of answers. To interpret scores such as the TICS score, the FERUS score, or the WAI, the average scores of the sample were compared to normative controls.

3 Results

Based on the cross-sectional evaluation of the 184 data sets, the majority of respondents (57%) were between 30 and 49 years old, followed by 36% of the participants being between 50 and 64 years, while the remaining 7% were either between 18 and 29 or above 64 years old. Female respondents outnumbered male participants by a total of 77%. Around 80% resided permanently in Germany, with the remaining 20% being residents in Austria. In total 58% of all respondents had worked full-time before their COVID-19 infection, 40% were employed on a part-time contract, and 2% were undergoing vocational training. In accordance with the age profile of the respondents, 83% had more than 9 years of working experience, 14% of all participants had been working between 3 and 9 years, and 3% had only 1–2 years of working experience (a minimum of 12 months working experience was an inclusion criterion). Almost half of the sample (48%) was infected with COVID-19 between 6–12 months prior to completing this survey, while 27% reported an infection between 12 and 24 months before participating in this study, and 17% had been infected more than two years ago. Only 8% were infected between 3 to 6 months prior to their participation in this study. While 90% had received a Post-COVID diagnosis from a physician, the remaining 10% suffered from symptoms other physical or mental reasons cannot explain and thus are most likely attributed to the Post-COVID syndrome. Nearly 94% of all respondents still suffered from different symptoms, and only 6% stated they had no more complaints. Eventually, 98 participants (54%) had returned to work since their COVID-19 infection, with 36% being back on their regular working hours and 18% still on reduced working hours. The remaining 82 participants indicated they had not returned to their workplace. This allowed to split the sample into the following two cohorts: (1) RTW ($n_{RTW} = 98$): participants that had returned to work after their initial infection and (2) NRTW ($n_{NRTW} = 82$) participants that had not returned to work since their COVID-19 infection.

Analysis of the GBB24 showed that being easily exhausted was the most prevalent as well as severest symptom persisting even after 3 months of the initial infection with COVID-19. A two-sample t-test indicated that the RTW cohort showed significantly ($t = -4.695$, $p = 0.003$) lower levels of being easily exhausted with a mean score of 2.95 (SD = 1.06) (on a 5-point Likert scale ranging from 0(=not at all) to 4(=very much) than the NRTW cohort with a mean score of 3.57 (SD =0.70). Table 1 presents mean scores for all 24 complaints assessed by the scale.

When assessing the different types of care or support the participants had received, nearly all respondents had consulted a general practitioner (96%). In total 62% of all participants had searched for information on the Post-COVID syndrome online, and another 56% had joined an online support group. Considerably fewer participants had been referred to a specialized Post-COVID health facility such as an inpatient rehab facility (41%), a Post-COVID ambulance (31%), or an outpatient rehab facility (6%). When exploring the reasons why less than half of the participants had received specialized Post-COVID healthcare, the answers provided a clear picture: lack of availability, as well as lack of specific information about inpatient rehab facilities (39.6%), or ambulances with specialized Post-COVID treatments (24.5%), were the most common answers given.

Being asked to rate on a 4-point Likert scale ranging from 0(=not helpful at all) to 3(=very helpful) how helpful the received treatment or care was perceived by the respondents, the mean index showed that only onsite support groups (mean index 2.45, SD = 0.69) or online support groups (mean index 2.28, SD = 0.72) were perceived as helpful or very helpful on average. In contrast, treatment at outpatient (mean 0.73, SD = 0.47) or inpatient (mean 1.75, SD = 1.021) rehab facilities as well as treatment at Post-COVID clinics (mean 1.61, SD = 0.78) and consultation of general

TABLE 1 Perceptions of level of complaints (GBB24): means and standard deviations.

Complaint	N	Mean[a,b]	SD
Being easily exhausted	182	3.23	0.964
Tiredness	182	2.77	1.146
Feeling of weakness	182	2.74	1.065
Excessive need for sleep	180	2.48	1.217
Faintness	183	2.46	1.083
Headache	182	2.24	1.259
Feeling of heaviness in the legs	181	2.22	1.385
Melalgia	181	2.07	1.417
Daze feeling	178	1.95	1.254
Feeling of pressure in the head	181	1.84	1.279
Palpitations or heart pounding	180	1.77	1.295
Dizziness	181	1.67	1.188
Shortage of breath	183	1.64	1.359
Neck or shoulder pain	180	1.42	1.337
Stabbing chest pain	182	1.25	1.313
Backache	177	1.20	1.293
Cardiac pain	180	1.15	1.301
Feeling bloated or distended	179	1.07	1.270
Lumb in the throat	178	0.72	1.120
Stomachache	179	0.58	0.964
Nausea	179	0.52	0.968
Heartburn	179	0.48	0.932
Burping	178	0.39	0.824
Vomiting	179	0.10	0.398

[a]measured via 5-point Likert scale with the following response options 0 "not at all," 1 "slightly," 2 "somewhat," 3 "considerably," and 4 "very much."
[b]higher scores present higher level of complaints.

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TABLE 2 Quality of life (WHOQOL-BREF): means and standard deviations of t-scores compared to the normative control group.

	N	Min	Max	Mean NRTW (SD)	Mean RTW (SD)	Mean Normative Control (SD)
Overall	179	.00	75.00	27.78 (15.81)	42.84 (19.60)	67.59 (17.93)
Domain environment	177	21.88	100.00	66.09 (15.29)	74.05 (13.92)	70.38 (14.17)
Domain physical	174	7.14	96.43	34.23 (14.48)	54.99 (20.80)	76.92 (17.68)
Domain psychological	178	10.71	100.00	51.67 (17.17)	60.33 (17.57)	74.02 (15.68)
Domain social relationships	173	.00	100.00	62.87 (20.79)	64.58 (21.56)	71.83 (18.52)

TABLE 3 Stressors (TICS) means and standard deviations compared to the normative control group.

	N	Min	Max	Mean NRTW (SD)	Mean RTW (SD)	Mean Normative Control (SD)
Social overload	163	0.00	24.00	9.18 (5.51)	12.22 (4.99)	9.70 (5.23)
Social isolation	165	0.00	24.00	8.88 (5.42)	7.13 (5.15)	6.22 (4.84)
Social tensions	166	0.00	24.00	5.41 (3.99)	5.44 (3.90)	5,69 (3.91)
Lack of social recognition	164	0.00	16.00	4.38 (3.56)	5.42 (3.55)	4.48 (3.18)

TABLE 4 Personal resources (FERUS)—means and standard deviations of t-scores compared to the normative range.

	N	Min	Max	Mean NRTW (SD)	Mean RTW (SD)	Mean Normative Control (SD)
Coping	174	26.00	74.00	35.92 (10.47)	49.33 (11.06)	40–60
Social support	165	26.00	44.00	37.98 (5.00)	35.96 (5.41)	40–60

practitioners (mean 1.24, SD = 0.84) were rated as less or not helpful at all throughout the whole sample.

To evaluate the participants' health-related quality of life, the SF-12 was applied. Results showed a meager mean index score of 12.6 (SD = 5.57) compared to the normative control range (22–28) of the validated scale. The overall score on satisfaction with the quality of life of the WHOQL-BREF reported similar results: with a mean score of 27.78 (SD = 15.81) for the NRTW cohort and of 42.84 (SD = 19.60) for the RTW cohort, results are far below normative controls of the general population (mean = 71.83, SD = 18.52). When evaluating the response scores on the different domains of the WHOQL-BREF, this relatively low score seems to be mainly affected by physical issues of the Post-COVID infected persons (mean score RTW cohort 54.99/SD = 20.81; mean score NRTW cohort 34.23/SD = 14.48; mean score normative control cohort 74.02/SD = 15.68). A two-way analysis of variance clearly denoted a significantly lower index in this domain for the NRTW cohort compared to those who had already returned to work ($F = 9.267$, $p = 0.003$), but not for the other domains, i.e., social interactions, environment, and psychological. Table 2 shows all means and standard deviations of the two cohorts compared to the normative control levels.

Besides physical issues that affected the participants' quality of life, the study revealed stressors that might also lead to significantly lower levels of quality of life in the Post-COVID affected population. Therefore, responses to four sub-scales of the TICS questionnaire were analyzed. A comparison of mean scores showed that the RTW cohort particularly suffered from higher levels of social overload (mean score 12.22/SD = 4.99) compared to the normative controls (mean score 9.70/SD = 5.23). In contrast, the major stressor for the NRTW cohort was found to be social isolation (mean score 8.88/SD = 5.42) compared to the normative controls (mean score 6.22/SD = 4.84). Table 3 illustrates further details of the TICS results.

To evaluate which type of personal resources might lead to a successful return to work, the FERUS scale revealed the following: While a comparison of the mean score of the sub-scale social support did not show any significant difference between both cohorts, the sub-scale coping showed a significant difference ($F = 4.913$, $p = 0.001$). For participants that had returned to work, a mean score of 49.33/SD = 11.06) was calculated and found to be within the range of the normative control (40–60). However, for the NRTW cohort, a significantly lower mean score of 35.92/SD = 10.47 was calculated. Table 4 shows the means and standard deviations of the FERUS scale.

The work ability index (WAI) of the total sample was 24.9, which is referred to as poor work ability on a scale ranging from 7 to 49. Only index scores from 37 onwards denote good work ability. On average, participants returned to work after 9.45 weeks (SD = 13.95) after their initial COVID-19 infection, with a maximum of 78 weeks after initial infection with the virus. In terms of organizational provisions and offerings for reintegration into work-life, results showed a heterogeneous picture. Nearly half of the cohort ($n = 42$) were allowed to reduce working hours and/or were offered an occupational reintegration plan ($n = 39$). Moreover, structural changes such as adjusting the workplace ($n = 35$) or tasks ($n = 29$) were offered to Post-COVID affected. Health courses ($n = 28$), as well as general consultation ($n = 31$) and

job coaching ($n = 12$), were also provided. However, when being asked to rate on a scale from 0 (=not helpful) to 3 (=very helpful) how helpful the offerings were perceived in order to facilitate successful reintegration into work-life, only structural changes such as modification of the workplace, working hours and task were rated as helpful or very helpful on average ($mean_{workplace}$ 2.55/SD = 0.83, $mean_{working\ hours}$ 2.44/SD = 0.80; $mean_{tasks}$ 2.55/SD = 0.83), while the remaining offerings were rated as less helpful or not helpful at all.

4 Discussion

The conducted study performed an in-depth evaluation of care pathways, personal resources, and organizational offerings that might facilitate the individuals' return to work after or while still being affected by the Post-COVID syndrome. As a novelty, this study has taken a Post-COVID patients centric approach to understand what may be crucial for a successful transition from care pathways back to corporate life.

First, results showed that the overall and health-related quality of life of the sample was significantly diminished compared to normative controls. While here it it can be argumented that a decline in health-related quality of life amid the pandemic might not only be related to the Post-COVID syndrome but can also be attributed to specific workplace settings and procedures such as wearing personal protective equipment that led in some cases to e.g., dermatological issues (31, 32), the study was able to provide further insights. With a relatively low average work ability index of 24.9 across the whole sample, Post-COVID patients seem to be strongly affected in their work ability. Hence, it can be assumed that e.g., external workplace seetings might be not fully able to explain reduced quality of life. These observations correlate with the findings of a recent study that also demonstrated a substantial impact of the Post-COVID syndrome on the work ability of an occupational cohort (5) and stresses at the same time the relevance of this study to research on the subject of Post-COVID and its impact, particularly on the working population. In this context, the study was able to provide further insight into reasons for such high impacts on the Post-COVID patients' work ability. As shown, being easily exhausted was the most prevalent symptom, followed by tiredness, feeling of weakness, excessive need for sleep, and faintness – all complaints that can be summarized under the phenomena of fatigue. More detailed analyses showed that the sub-cohort NRTW showed significantly higher levels of these fatigue symptoms than those participants that had already returned to work. Therefore, in accordance with earlier research in the realm of chronic fatigue and Post-COVID (33–35), these findings can be considered preliminary evidence that fatigue and exhaustion are essential predictors of an individual's level of work ability.

In light of the above, the results were able to demonstrate another critical aspect: The majority of participants, that completed rehabilitation programs or received treatments or consulting at Post-COVID ambulances, rated those offerings as not or little helpful with regard to their way back into working life. On the contrary, the entire sample rated both inpatient and outpatient rehab facilities as well as Post-COVID outpatient clinics as less helpful or not helpful in the return to work process. Analysis of the responses to the open questions provided further explanation of these findings, with additional comments stating that the received treatments even worsened the level of exhaustion and fatigue, resulting in extended rest and recovery needs incompatible with work demands. These findings lead to the conclusion that at an early stage of a Post-COVID diagnosis, all patients need to be administered a validated measure of fatigue such as the Fatigue Severity Scale (FSS), the Multi-Dimensional Assessment of Fatigue (MAF), or the Multi-Dimensional Fatigue Inventory (MFI) (36) to predict the individuals' work ability at an early stage of treatment. Following a recent scholarly discussion (37), this results in the practical implication that fatigue management strategies have to be included in all types of care pathways, given their high relevance for the individuals' quality of life but also occupational health.

Then, the findings provided enlightening results regarding personal resources that might facilitate the return to work after being affected by the Post-COVID syndrome. While both subgroups (RTW and NRTW) showed similar results in terms of social support, there was a significant difference in the participants' ability to cope with stressors. Those who had already returned to their workplaces showed an average score of 49.33 (SD = 11.06) for their coping levels, comparable to the normative controls on the applied FERUS scale. However, those participants who had not returned to work so far showed considerably lower levels of coping abilities. These results suggest that the ability to cope with health stressors might be another vital determinant when it comes to the individuals' journey back into work-life. While there exists earlier literature in the area of coping, resilience, and health-related stressors such as breast cancer (38), HIV (39), or heart diseases (40), that back those findings of the present study, there is still a lack of in-depth research on coping and the Post-COVID syndrome. However, existing evidence from those studies might be transferred and applied to Post-COVID treatment plans. By integrating the patients' education on psychosocial coping techniques widely into all types of care pathways and offerings, the patients' quality of life and successful return to occupational life might be fostered.

Finally, when it comes to organizational offerings supporting Post-COVID patients' return to work, the study reinforced that structural measures such as reduced working hours, level of tasks, and working environment were perceived as most helpful from the employees' perspective. These observations contrast with earlier findings of studies with occupational cohorts that suffered from, e.g., heart or musculoskeletal diseases, where workplace health management measures produced positive outcomes (41). These contrasts can be attributed to the fact that the cohort mainly suffered from fatigue as a cardinal symptom, so sports and physical activity might not be suitable to improve their condition. As was shown in earlier studies in the context of chronic fatigue and physical activities (35). Moreover, as the analysis of the open responses on the effectiveness of organizational offerings showed, participants also emphasized the importance of open communication with employers, colleagues, and healthcare providers to facilitate understanding and accommodate their unique needs during the transition back to work. These findings lead to the conclusion that organizational offerings for Post-COVID patients have to include modifications to work

environments, schedules, and tasks but also have to cater to their specific needs, such as education on how to pace one selves' resources to match energy levels with work activities, prioritize rest and cope with demanding work environments. Those needs imply that existing workplace reintegration must be revived and revised according to the unique needs of Post-COVID affected employees. In this context, digital tools might be an innovative approach, as previous research has shown that, particularly in areas where multidisciplinary care is needed, e-approaches could support patients at the interface between medical care, e.g., inpatient rehab treatments, and their return to work (42–44).

This study presented has some limitations. One major limitation concerns the sample size. We calculated a minimum sample size of $n = 385$, assuming the prevalence of Post-COVID within the population was between 5 and 10% and a confidence interval of 95%. After talking to experts from involved Post-COVID clinics and rehab facilities, 200 participants. They assumed that a large proportion of Post-COVID patients are still not diagnosed or have not consulted a Post-COVID ambulance, rehab facility, or joined a support group, so they might not be reached by this study's recruitment strategy. As described in Section 2.2, 222 data sets were collected, whereas 184 met the inclusion criteria and were analyzed further. In this light, the presented study overachieved the expectations of experts. As this study provides some in-depth description of patients' needs and paves the way for further investigations, statistical significance was not the main focus. Although the recruitment strategy was well designed, reaching out to post-COVID patients proved quite tricky. This may be explained by the fact that those who had already returned to work were too busy with their daily tasks, so they could not join the study. Then, as mentioned before, those still at home suffered from high levels of fatigue, which led to the fact that some of them struggled to respond to a questionnaire with 148 items in one sitting.

Another limitation of this study was the composition of the cohort. Although the recruitment strategy was intended to produce a heterogenous sample, female respondents outnumbered male respondents by far. Furthermore, the age groups between 18 and 30 and above 64 were underrepresented. While the latter probably derives from the fact that the recruitment channels did not reach those age groups as well as inclusion criteria excluded retirees, the former might be attributed to earlier studies' findings, which stressed that women are more prone to suffer from Post-COVID syndrome than men (19). Although these limitations might challenge the generalizability of the results, the findings foster a comprehensive understanding and indications of the perspective and needs of Post-COVID patients pertaining to their return to work. Nevertheless, future research in Post-COVID and return to work should consider shorter questionnaires to produce larger sample sizes and prevent a high dropout rate. However, as this study has shown, it seems worthwhile to investigate further topics such as personal resources and coping strategies of Post-COVID affected to learn more about different patterns of coping strategies applied, such as the patients' ability to seek or use social support, behavioral escape-avoidance, or focusing on the positive. Here, it may be instructive to use qualitative study designs to produce a more profound understanding from the patient's perceptive.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Gemeinsame Ethikkommission der Hochschulen Bayerns Hochschule Bayern e.V., Hohenzollernstraße 102, 80796 München. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

CS: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Validation, Visualization, Writing—original draft, Writing—review & editing. DH: Data curation, Formal analysis, Investigation, Resources, Software, Visualization, Writing—original draft, Writing—review & editing. MK: Conceptualization, Funding acquisition, Project administration, Resources, Writing—review & editing. MJ: Conceptualization, Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing—review & editing. JS: Conceptualization, Funding acquisition, Project administration, Resources, Software, Supervision, Writing—review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Managing the unknown or the art of preventing SARS-CoV-2 infection in workplaces in a context of evolving science, precarious employment, and communication barriers. A qualitative situational analysis in Quebec and Ontario

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Introduction: The issue of communications in the public space, and in particular, in the workplace, became critical in the early stages of the SARS-CoV-2 pandemic and was exacerbated by the stress of the drastic transformation of the organization of work, the speed with which new information was being made available, and the constant fear of being infected or developing a more severe or even fatal form of the disease. Although effective communication is the key to fighting a pandemic, some business sectors were more vulnerable and affected than others, and the individuals in particular socio-demographic and economic categories were proportionately more affected by the number of infections and hospitalizations, and by the number of deaths. Therefore, the aim of this article is to present data related to issues faced by essential workers interacting with the public and their employers to mitigate the contagion of SARS-CoV-2 (COVID-19) at work.

Methods: Following the constructivist paradigm, an interpretative qualitative design was used to conduct one-on-one interviews with precarious/low-wage, public-contact workers ($N = 40$), managers ($N = 16$), and key informants ($N = 16$) on topics related to their work environments in the context of COVID-19 prevention.

Results: This article has highlighted some aspects of communication in the workplace essential to preventing COVID-19 outbreaks (e.g., access to information in a context of fast-changing instructions, language proficiency, transparency and confidentiality in the workplace, access to clear guidelines). The impact of poor pre-pandemic working relations on crisis management in the workplace also emerged.

Discussion: This study reminds us of the need to develop targeted, tailored messages that, while not providing all the answers, maintain dialog and transparency in workplaces.

KEYWORDS

COVID-19, frontline workers, communication process, workplace, health information, occupational health, information—access and interaction, qualitative study

1 Introduction

The issue of communications in the public space, and in particular, in the workplace, became critical in the early stages of the SARS-CoV-2 pandemic. This issue was exacerbated by the stress of the drastic transformation of the organization of work, the speed with which new information was being made available, and the constant fear of being infected or developing a more severe or even fatal form of the disease. Some researchers in the fields of communication in workplaces and knowledge transfer suggest that it is enough to be open and transparent, not to withhold information, and to put in place good communication practices and strategies (1, 2). Irrespective of the form of communication, the right interpretation depends on the definition of the "object/subject" to agree upon, the intent behind the message to share, and the communication style used (3, 4). Most theories on communication would concur that the effectiveness of the message depends at least in part on a common definition of the "object" to be discussed (5), whether at the level of mass communication (6), organization (7) or interpersonal interactions (8). This is the first condition for dialog and exchange. In other words, we need to agree on the definition of the object/subject of the communication prior to forming our opinion on it: the choice of words, understanding of their undertones, and different levels of possible meanings, perceptions, and understandings, as well as the level at which the current exchange takes place and which level and tone should be promoted to enable people to make sense of and adhere to the message they receive (9). For instance, if talking about viruses, we need to know what the word "virus" refers to in its primary, microbiological sense, and possibly, metaphorically, in a figurative sense, e.g., designating a threat, a wound, a danger related to an ideology, a group of individuals, a fad, or a trend that is deemed pernicious or undesirable. The recent introduction of the term "infodemics" (i.e., inaccurate, false, misleading, or unproven information) into the world of humanities, social sciences, and public health research is a good example of this phenomenon, which directly affects the management of the COVID-19 pandemic (10–12). This is particularly evident when the COVID-19-related health policy-making process and the science-making process intersect, leaving room for many unknowns and possible contradictions and generating public feelings of uncertainty and confusion, and possibly of mis–/distrust (13, 14).

As early as January 2020, the WHO alerted governments around the world of the SARS-CoV-2 (so-called 2019-nCov) outbreaks in the city of Wuhan, China, and its alarming contagiousness (15). When a pandemic was formally declared in March 2020, the main affected countries began taking drastic measures to control the situation. Workplaces have not been exempt from having to implement seemingly inconsistent measures to protect their employees (16). Eliminating or controlling the potential source of a SARS-CoV-2 infection risk, as prescribed by many national occupational health and safety (OHS) laws, is not a straightforward process, especially when the scientific community does not agree upon the virus' various modes of transmission in a closed environment, as in the case of aerosol transmission (17, 18). Is the wearing of surgical masks sufficient or should N95 masks be recommended? In the early stages of the pandemic, workers requested accurate and fair information, but their employer or even their trade union often had to deal with unclear government guidance on certain issues when, for example, scientific advice differed from one organization to another.

Public health and OHS authorities have worked—sometimes jointly, sometimes in parallel, depending on the different national governance structures—to provide the public with practice guidelines, fact sheets, and procedures to follow for any infection or outbreak (11). Although effective communication is the key to fighting a pandemic (19), some economic activity sectors were more vulnerable and affected than others, and some socio-demographic categories were proportionately more affected by the number of infections and hospitalizations, and by the number of deaths (20, 21). Poor living conditions and various social or economic vulnerabilities (e.g., housing, transport, access to communication means, access to healthcare facilities, language and cultural barriers, working environment, migratory status) amplified workplace health and safety issues (22–26).

Such epidemiological differences between groups, especially minority ethnic groups are amplified by the prevalence of other public health problems (e.g., air pollution, malnutrition, population density) that reveal not only disparities, but also social inequalities in health (21, 27–29). Very early on in the development of the pandemic, it became clear that public health and OHS needed to be better integrated or harmonized, necessitating more efficient communication between institutional bodies and in their strategies for relations with the general public (11).

The increased vulnerability of certain categories of workers to the risk of occupational injury has long been known, although an effective institutional response has been slow to emerge (30). Many of the so-called essential workers during the pandemic find themselves in vulnerable and precarious situations. They include precarious or low-wage workers, agency or limited-contract workers, under–/unprotected workers, ethnic or racial minority workers, immigrants and workers with poor language skills, and ageing, low-educated, or disabled workers (16, 23, 31). The gendered nature of precarious employment has also long been known (32, 33) as men and women are not equally represented in the various industries, and the pandemic has not affected them in the same way (31). Not all of these workers

have equal access to information and appropriate job training (and occupational risk) (30, 34), and as such, communication efforts (or lack thereof) have left them at increased risk.

This article reports some results from a broader qualitative study whose main objective was to explore in a comprehensive manner how essential workers interacting with the public and their supervisors understand the situation, make choices, and navigate through public health recommendations to mitigate the contagion of COVID-19 at work.[1] Many essential workers were employed in jobs involving direct contact with the public, many of them in various forms of precarious work.

In this study, precarious work has been defined on the basis of the following dimensions of income and revenue (i.e., low wage, platform workers), job security and type of employment (i.e., temporary placement, agency work), and the enforcement of rights and protection (i.e., social benefits, paid sick leave) (34–36).

The aim of this manuscript is to present data related to issues workers face in accessing medical or public health information and accessing clear and sound guidelines. These data highlight the challenges associated with rapid changes in public health guidelines or instructions and their impact on the communication and information management and transmission chain.

This study received ethics approval from the University of Waterloo Human Research Ethics Board (Protocol certificate number: 42449). Informed participant consent was obtained verbally and recorded before a telephone or videoconference interview.

2 Methods

Following the constructivist paradigm, which posits the existence of multiple social realities constructed from individuals' perceptions that vary over time and context (37), an interpretative qualitative design was used to address the objectives of this study.

The constructivist paradigm is a philosophical and theoretical framework which asserts that reality is socially constructed and subjective, shaped by individual experiences, interpersonal interactions, and interpretations. In the context of research, the constructivist paradigm can have a substantial impact on methodological choices, data interpretation, and the overall design of a study. It prioritizes qualitative methods and in-depth exploration of how people make sense of their everyday world and the influences on their choices and reasoning. Data interpretation involves recognizing and understanding multiple perspectives and the overall design of the study is characterized by flexibility, iteration, and participant involvement. This means that rather than imposing pre-defined categories or theoretical frameworks on the data, constructivist researchers often allow themes to emerge organically from the data. Researcher reflexivity is also a key element of constructivist research, recognizing the impact of the researcher on the study.

Workers, managers, and key informants were recruited using purposive sampling strategies, combined with elements of snowball sampling. The inclusion criteria for workers were: (a) over 18 years old; (b) working in an essential sector (i.e., essential to preserving life, health, and basic social functioning) during the first-wave SARS-CoV-2 lockdown; (c) low-wage workers (approximately CAN$4 above the provincial minimum wage); and (d) working in a public-contact job (i.e., having physical proximity with clients in order to deliver the service). These criteria were established to focus on the experiences of workers who were already in a precarious situation when the pandemic began and had to maintain work deemed essential. The vulnerability of these workers in terms of OHS and protection is well documented by research; the aim here was to see how the pandemic might affect their already precarious working conditions and how this precariousness might influence their choices in terms of risk prevention and control. Inclusion criteria for managers and key informants were: (a) over 18 years old; (b) holding a management or supervisory position in an essential sector that hires precarious workers or an organization dedicated to the defense of workers' rights or the promotion of OHS (e.g., OHS prevention and inspection, legal clinics, advocacy NGOs, trade unions, public health). Interviews were held from August 2020 to March 2021. Since interviews in Quebec started and ended later than in Ontario for logistical reasons, researchers on the Quebec team added questions about the second wave (September–December 2020) and the vaccination campaign (begun in mid-December in both provinces). Seventy-two participants were selected and divided into three groups: low-income workers ($N=40$), supervisors/managers ($N=16$), and key informants ($N=16$). Two participants (trade union representatives) were interviewed together at their own request (called "paired-depth interviewing": people from the same organization but holding different titles and hierarchical positions; 38). Semi-structured interviews were held in English ($N=36$), French ($N=33$), or Spanish ($N=3$), and conducted according to an interview schedule on topics related to their work environments in the context of COVID-19 prevention (see Table 1). The interviews allowed sufficient time for participants to raise any other issue or theme they considered relevant to our understanding.

Interviews were recorded and transcribed by a professional transcriber using a word-processing software, and then transferred to qualitative analysis support software NVivo for researcher coding, inference, and interpretation following baseline qualitative content analysis (39). Data analysis was based on situational analysis (SA) (40), using conceptual mapping to frame and analyze the workplace situations and social worlds. The analytic process was iterative, involving constant weekly team meetings to discuss emerging themes, situations, and possible logical relations and hypotheses.

The majority of workers were women (65%), and despite some missing information on origin, roughly equal numbers were Canadian-born or immigrants. About 33% were union members (mostly in Quebec), more than half (25/40) had a college or university degree, and about 18% worked at two or more jobs to supplement their income. Half of the workers reported being part of a racialized group. The average age was around 37 years. A majority of workers were employed in the retail sector ($N=19$), health and social services ($N=8$), and accommodation and food services ($N=4$), and the others, in education, security agencies, agriculture, manufacturing, hairdressing and beauty, and transport. All workers but one were in direct contact with the public. To preserve the anonymity of our participants, we have used pseudonyms in the extracts presented in the results section.

Thematic development is a crucial aspect of qualitative research, particularly in the context of grounded theory methods, including situational analysis. It involves the systematic identification, analysis, and

1 Hopwood P, MacEachen E, Côté D, Meyer S, Majowicz S, Huynh AT, et al. (accepted). Occupational pressures of frontline workers enforcing COVID-19 pandemic measures.

TABLE 1 Guide for interviews with workers, managers, and key informants.

Workers	• Description of their work responsibilities and working conditions • The health measures implemented in their workplaces • Their risks of COVID-19 exposure and transmission in the work context • Changes to be made to better protect workers • Their decision-making process about taking time off to go for COVID testing or when symptoms are present • Discrimination • The second wave (QC only) • Anticipated view of the vaccination (QC only)
Managers or key informants	• Main health risks for their employees • Management of COVID-19 in the workplace • Challenges of workers' returning to work after a COVID-19 absence • Frequency of leave requests • Changes needed to better protect essential service workers • Issues faced by low-wage public-contact workers

refinement of themes or patterns within the data collected. Researchers began to categorize and label data from an initial set of codes, often short descriptive labels attached to segments of data (e.g., working conditions, pressures at work, what is risky, plans vs. practice, customer problems, response to risk measures, sick leave-COVID, sick leave-any situation, policies, organizational changes needed, personal or home issues). New data were compared with existing codes and categories to identify similarities and differences. This iterative process helped the researchers to refine and expend their codes, gradually building a more nuanced understanding of the data. The initial codes did not include communication issues. This issue arose during axial coding when the researchers explored relationships between different codes. This involves linking categories and subcategories to reveal patterns and relationships. Axial coding helps to identify central themes and concepts that emerge from the data. The themes of communication are described below using quotes from the interviews. From these quotes, the researchers attempted to make connections between categories of meaning and, through discussion between team members, to produce the conceptual maps presented at the end of the Results section.

3 Results

The data analysis identified several themes (to be discussed in other articles). The theme discussed in this article is communication in the workplace in the context of a COVID-19 health crisis.

In Figure 1, communication issues in the workplace were divided into three subtopics. The first subtopic was access to information in a context of fast-changing recommendations and information updates. The notion of access is also expressed in another way, where the earliest information might be accessible in terms of location (addressing the 'where to find it' question), but hard to understand due to French or English language-proficiency issues in both provinces. The second subtopic was access to clear guidelines when several organizations are involved and must coordinate their actions in the field. The third subtopic pertained to cooperation and information management among complex hierarchical structures and bureaucracies, creating delays in the provision of clear guidelines, indications, or timely response to employees (see Figure 1).

3.1 Access to information

3.1.1 Context of fast-changing recommendations and information updates

The SARS-CoV-2 pandemic was a new phenomenon requiring everyone to adapt quickly and implement protective measures in accordance with public health instructions. However, they were no better prepared to fight the virus, as it was still largely unknown by scientists (or epidemiologists) only a few months earlier. Thus, sometimes the institutional response gave the impression that the State did not provide clear enough guidelines or that they changed too quickly, as the following extracts illustrate:

> …in addition to not knowing, in addition to changing often, when we have the instruction, we do not know how it applies until a week later. So you'll understand that yes, yes, we have the instruction, [but] how does it apply? We do not know, and we cannot tell you. In the meantime, well, everyone does whatever they want for a week, and then a week later, we realize that no one has done it properly, and so it changes again. (...) The problems were continuous, you know, happening every day, and the ministerial orders changed daily (Véronique – key informant, president of a local trade union).

For this worker in the social services sector, who works specifically with homeless people, the expectation of clear instructions was palpable:

> Well, I read the information, but it keeps changing, the screening clinics are no longer there the week after, but what do you do, you know? I think that people should be told that there is a lot of information, and that it keeps changing. At one point it was the mask, the faceshield, and then that changed, then came the Plexiglas, you know, I try to follow the instructions, but (...) basically, they should say clearly what you should do (Catherine – worker, community-based organization working with the homeless).

Public health and OHS authorities worked collaboratively to develop fact sheets, and sometimes with the help of local NGOs

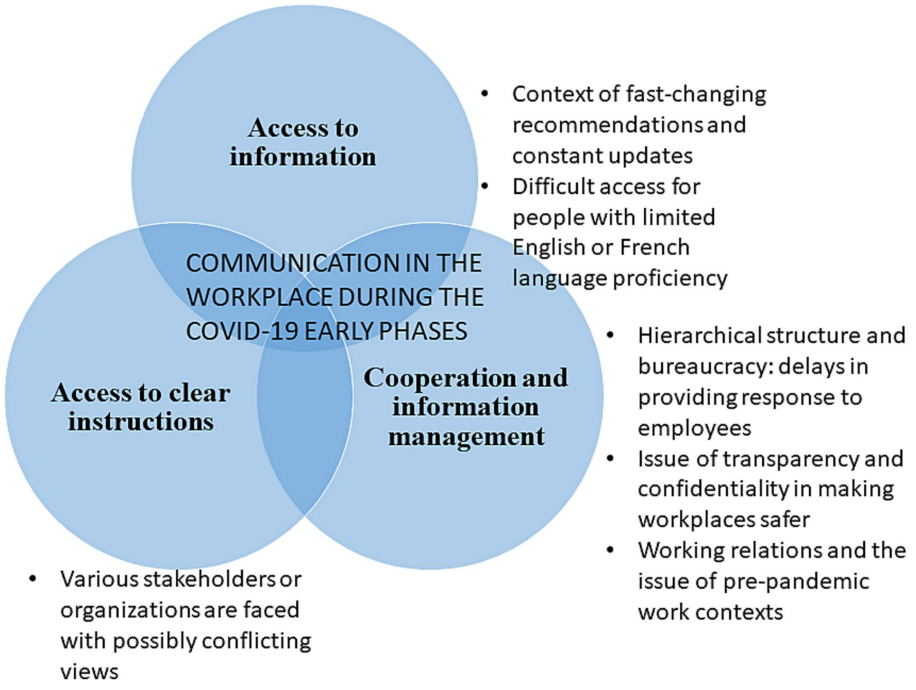

FIGURE 1
Subtopics of workplace communication during the pandemic.

dedicated to specific populations such as newcomers or cultural and linguistic minority workers. Sectoral associations and professional bodies also developed their own material. Fact sheets and information tools were created for specific workplaces or sectors. However, these efforts did not reach or hardly reached sectors such as food delivery workers, who were not deemed a priority according to some jurisdictions.

> During the pandemic, we saw a lot of people who stopped working [in the workplace] and found the option of working on or using platforms, right? For food delivery, etc. (...) one day, when I was looking at the information from the CNESST [Workers' Compensation Board] in the different sectors, at the guides they had developed, there was nothing for these sectors (the gig, platform economy) (...) there were people, from (*name of platform*) who had caught COVID. Because they were delivering food. There were no specific instructions for them (this sector, this specific task) to protect themselves against that (Alejandro – key informant, volunteer for an NGO dedicated to immigrants).

While the rapid change in prevention measures is a concern for many workers, it is also an issue when a worker who has been absent for a period of time returns to work. The challenge for the employer is to ensure that the information on the latest implemented health measures has been communicated and that the employee understands it. Here is what this prevention-inspection agent told us:

> But going back to work, the same thing happens again. While I was away, what's changed, what's new? What are the... what's 'a reminder of the rules'? It really depends on the work environment. In a restaurant, it's simpler, but in a daycare centre, it's something else. A hospital, a hospital environment, a [long-term care home], that's another thing. You know, in all cases, when someone returns to work, the worker must have the information he needs, so the employer who gives him the information must make sure that he really understands the instructions (Mathieu – inspector, Workers' Compensation Board).

While the expectation for clear guidance was palpable among many participants, it also suggested that the changing nature of the information could have been made more explicit to better prepare people to receive information that is bound to change rapidly as knowledge evolves (rendering obsolete what was assumed true a week earlier). Transparency on the part of health authorities and the government about the limited knowledge about COVID-19 might have better prepared the public to receive information that was subject to rapid change.

3.1.2 Context of difficult or limited access for people with limited French or English language proficiency

Communication and access to information in a language which workers know and in which they are sufficiently fluent is another important issue that emerged from the data collected in this study. In times of crisis, ensuring access in a language that is understood by everyone to ensure that they all understand the instructions seems logical or common sense. Yet language barriers were reported, as this nurse indicates:

> And so, you know, identifying that language barrier is number one for me because I do not want to continue with the case investigation if I know that they are not understanding me, right,

> and they are not getting that information so I would either transfer the case to someone who can communicate with them or that (…), so language is one big thing (Piper – key informant, public health nurse).

Some categories of workers, such as temporary foreign workers in Canada, are more vulnerable, as no language-based selection criteria (proficiency in either official language) apply to them (as for economic immigrants) even though they are exposed to many sources of workplace hazards without access to adapted or translated instructions, notices, or sectoral information sheets.

> Well, it's a bit complicated because there are several of us and we come from different places, and there are people who come from rural areas who are not so used to being in places where there are a lot of people and there are even (*sic*) people who cannot express themselves very well in French. This makes us shy at the same time and we cannot talk to them because they speak French, and there are very few who speak Spanish (Miguel – foreign farm worker, translated from Spanish).

The possibility of obtaining information, and the existence of such information, is probably what first comes to mind when we think of access to information. However, access to information is also about the comprehensibility of the transmitted message. From an anthropological point of view, most of the world's languages contain different levels of complexity and sophistication which may be less "accessible" to some people depending on their level of education or level of knowledge of a specific language (e.g., specialized language, jargon specific to a given profession or sector, or even regional or class-based patois). This discrepancy can alter the understanding of the message, or even compromise it by suggesting an interpretation that is not the one originally expected by the sender, as this director of a public health unit suggests:

> Typically, these manufacturing settings are, you know, are conducive, I would say, to transmission, simply because of the fact that you have, in many cases, you know, low-wage workers who, you know, to some degree, may not have the education from an IPAC—infection, prevention and control perspective—so that's certainly one of the limitations. Education, in general, may be a limiting factor, as well, as it relates to this population (Brian – key informant, director, public health unit).

According to this public health nurse, effective communication needs to be attentive to education and health literacy:

> And then even without language, even if they can speak English fluently, but they are not health care, they are not in the health care field, they are not in the public health realm. And so for them, when you say things like period of communicability [of the virus] or when you say acquisition or transmission exposures, it can get very confusing, and so what I try to do is obviously just kind of break it down into really simple terms, layman's terms, pretty much. Just pretty much say like, 'OK, where did you go? Where could you have potentially caught it?' And then going over [the term] isolation, just saying, you know, do not worry about the term isolation (Piper – key informant, public health nurse).

This public health nurse noted the importance of clear communication in terms of what language is best understood by the contact (calling in a multilingual colleague as needed). Terminology and avoiding jargon are important as well. Other issues prior to COVID-19 transmission, which may seem more trivial or self-evident, also represent a communication challenge, such as the wearing of masks. Therefore, obtaining the latest information on the best protective measures and protocols may well be an issue when even how to use procedural medical masks is difficult to convey (although such information has been known for a long time). As this employee of a large supermarket pointed out:

> …but we are not, after we take our masks off, we are not washing our hands before we touch our face; we are washing our hands, we are taking our masks off and then we are touching our faces, and she said that, that has been a, a great source of misinformation towards the public, you know, because whatever bacteria or anything that's accumulated on the outside of the mask is now on our hands and now in our eyes, and now in our noses, and now in our mouths, you know? (Claire, worker, multinational retail corporation).

This accessibility issue not only concerns the knowledge of official languages or the existence of multilingual material, but also a relationship that can sometimes be distant or strained between health organizations and certain sections of the immigrant or cultural minority population.

> …it's useful to speak the language spoken by the person when it is not among the official languages; it creates a bond of trust (...) You know, I do not come here only to, let us say, just as a public health representative, I also come because you are a citizen and you are a human being (...) You know, it shows a certain interest, deeper than just coming as the public authority (Roxane – key informant, public health practitioner).

Language is a means of creating bonds, of breaking the chains of mistrust and misunderstanding, well beyond its instrumentalization for the purpose of transmitting messages of public interest.

3.2 Access to clear guidelines when several organizations (health institutions, ministries, associations) are involved

Clarity of information is another issue that emerged from our data collection and subsequent analysis. In this section, the issue of the presence of several stakeholders or government agencies involved in the development and implementation of health protocols is discussed. Depending on the availability or accessibility of materials dedicated to specific sectors, the impact of these issues may have varied. Our data is limited on this subject, but the experience of the following taxi company manager and school bus driver, both in the transportation sector, nevertheless raises some questions:

> The thing I would say, and that is not obvious, is that between the parties involved in setting up protocols, nobody talks to each other. That's, that's rough, you know, take Public Health

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> (...), the INSPQ [public health institute] (...), the Ministry of Transport (...), the Employers' Council (...), where everybody says something different, [and] the SAAQ [public automobile insurance plan]. Everyone has a different opinion or makes a different recommendation, [so] for us it's extremely complicated (...) You know, I had to call the elected officials. I had to call the Ministry. I had to call doctors from Public Health to get the right information, and each time I got different information; I had to make, I had to amalgamate this information and sort it out myself and put in place what was logical to me. But, you know, I told myself, that's just the way is it (Camille – manager, taxi company).

And:

> I think that perhaps the Ministry of Education should not have interfered; that's what this is about. [They should have] let the authorities—the INSPQ [public health institute], the [Workers' Compensation Board], all the public health authorities—dictate what was appropriate and what wasn't. Unfortunately, we have ministries that sometimes interfere when they should not (John – worker, school bus driver).

This overload of information can therefore cause confusion among workers as well as the general population, and possibly frustration at finally having to synthesize the information themselves according to what 'logic' tells them. Similarly, the inconsistency between the different public health bodies affects the credibility of these organizations and the level of public support. Yet referring to a credible and knowledgeable interlocutor is the first thing that every employee, supervisor, manager, or stakeholder would like to do. This suggests that people wanted a message; they were motivated to try and find the message (i.e., not resistant to it). In other words, a typical barrier of an unreceptive audience was perhaps not at play, but rather, the message was hard to find despite their best efforts and readiness to act.

Lack of coordination between various government entities often leads to delays in information dissemination in the service sector. For this union leader in the education sector, one of the main challenges was the delay in the information transmission chain in a context of rapidly changing safety instructions.

> So the school had to, the school board had to put things in place [e.g. whether or not masks should be worn, what to disinfect and frequency of disinfection, addition of new tasks] without having the right instructions, without being aware of them because they were too last minute, so it was done so much, like fast, on the fly, but that continued to increase people's anxiety (Karine – key informant, local trade union).

Here again, the rapid change in relevant information on financial compensation schemes for employees, their union representatives, and employers too was a source of considerable confusion and uncertainty, as people wanted answers to their questions and, more importantly, did not expect answers to be so transient.

> There is a major flaw, and that is the lack of understanding of the countless measures that were put in place for workers (...) They introduced a host of measures that varied over time, in both amount and eligibility rules, so that this created a certain amount of confusion among workers and, and the entire work environment, both union and management and employers' lawyers. Things were always somewhat vague. There was never any certainty and we had to give answers to these people by saying 'here's how it is now, but it could be something else next week' (Patrick – key informant, local trade union).

This same union leader argued for a more uniform or centralized system of information management, which would have created a stronger sense of safety, despite the changing instructions:

> I think it would have been better to (...) I think we would have benefited from having a single system that would have done everything, where we would have said 'this system, we guarantee that this will be the case until such and such a time.' So for the worker, there would have been a certain, a certain feeling of safety (Patrick – key informant, local trade union).

There may also have been a combination of factors, for example, the effect of rapid changes in safety and prevention instructions regarding COVID-19 and the so-called "bureaucratic structure" of the institutions under the Ministry of Health, which presumably led to undue delays between requests for information, the receipt and processing of requests, and institutional responses. This was expressed by a human resources department director in a health care facility:

> The instructions changed extremely quickly so that, you know, an employee who's a bit afraid and who does not really know [what to do], and then we say 'put on your glasses,' 'take them off, you do not need them.' But you know, you have to explain to him why we are doing this, what's the point. And you know, when it comes from the Ministry, well, sometimes we, we make up the meaning (laughs). You know, yes, we can question the Ministry but sometimes it takes three weeks before they answer us (...) You know, there's, there's a bureaucracy that's not easy, especially since we have the CIUSSSs [integrated university health and social service centres]. It's good to have centralized certain things for more consistency, but for other things, this means [additional] delays. And in a health crisis, there cannot be any delays (Constance – human resources department director, CIUSSS).

There are certain contextual elements to be clarified in this excerpt, as this participant is referring to the merger of institutions that took place a few years ago in Quebec, during the reorganization of health and social services institutions. This reform, carried out in the name of effective public management and more effective patient care, led on the one hand to more centralized management of staff and programs, which this informant felt was more coherent, but also led to more bureaucracy in the information transmission chain. Expectations of quick, clear answers or instructions are hard enough for authorities to meet in normal times, but are that much harder to meet during an unprecedented health crisis, especially in this sector that has experienced an extremely high number of outbreaks and deaths given its very high-risk clientele.

3.3 Information management

3.3.1 Communication in the workplace, transparency, confidentiality, and the issue of making workplaces safer

While access to information posed a significant challenge for workplaces during the pandemic, particularly in the early stages, in terms of how to obtain information and its comprehensibility (level of language, multilingual tools, etc.), it also posed an internal challenge for companies concerned with protecting their workers while ensuring the confidentiality of personal health information. What information should be disclosed for the sake of transparency and worker protection, and how it should be disclosed to ensure maximum discretion without compromising the flow of information needed to develop the best prevention measures? This pharmacy manager expresses these concerns as follows:

> In addition, it [the information we receive] tells us that everything is confidential. So we do not know if people are coming to work or not. For example, we had one person who was laid off because she was in a high-risk age group. But after that she left [for good]. But we never knew if it was because of her age, because she had symptoms (of COVID-19), or because she'd been tested (and was waiting for the results). At the lab, it's the same. In fact, we are always told that people are on holiday. But in reality, you do not know if they are on holiday or if they have symptoms (Sofia – supervisor in a pharmacy).

While respecting employees' right to confidentiality, a minimum of transparency on the part of the employer regarding his own actions and strategies seems to be required, as expressed by this Workers' Compensation Board inspector:

> Often, workers would leave work from one day to the next. People would learn that one of their coworkers had taken a COVID test. They learned that the test was positive. Some employers are transparent, others a little less so. A lot of rumours were going around. I heard that a fellow in human resources was removed for COVID, so what does the employer do? We do not know. Are any people infected, any actions to be taken? We do not know what it is (...) I felt that there was a lot of panic among the workers at that time, especially between March and May (...). People want, they just want to be reassured. They just want to know what's going on, to know what the employer has done (Mathieu – inspector, Workers' Compensation Board).

This suggests a degree of transparency, despite the paucity and lack of certainty of the information to be shared with employees. It allows for a certain degree of openness and frankness. However, there are arguably conditions that must be met to achieve this, as discussed in the next section.

3.3.2 Working relations and the issue of pre-pandemic work context

Transparency has a blind spot: the prevailing climate and working relationships within the workplace at any given time and which may hinder smooth communication. As this union leader points out, poor working relations before the pandemic would only worsen the conditions for communication during a health crisis:

> I do not know if it's limited to work relations (...) but where work relations were [already] bad, that's where they were the worst during the pandemic. So when communications were not going well before, it became hellish, hellish (Véronique – president, local trade union).

In terms of counter-examples, we have compiled some data that reflect the positive side of communication in a healthier work environment, one that is more conducive to solidarity between workers and even a certain proximity between managers and staff. As one supermarket branch manager put it:

> So I was recognized as a manager who was close to the customers, close to the operations, supporting the team. So without necessarily working physically with [my] coworkers, I was, I was very, very, very close to them physically (Ian – manager, grocery store).

Here is how a coordinator of a homeless shelter also talks about it:

> I talk to them regularly, I talk to everyone about twice a week, so that we... I try to see how they are doing, how their motivation is, what's going on in their daily work activities, [or] if they have any problems with their work (Gaston – homeless shelter program coordinator).

In unionized environments, the atmosphere can be one of cooperation and solution finding:

> They worked together. You know, the union would come in and say, 'Oh no, this is not going well.' And she (last name of the executive director of the school service centre) would say, 'Oh, okay, we had not thought of that. What if we did that [instead]?' You know, they used to work like that here; yes, we lost people in the battle due to fatigue and overload, but many fewer than elsewhere. She [the director] found solutions. They worked together (Karine – president of a local trade union).

To summarize and illustrate the salient concepts regarding communication in the COVID-19 context, as well as their logical interconnections, Figures 2, 3 present conceptual maps on intra-organizational OHS communication in a pandemic context and communication in the COVID-19 context outside the workplace, respectively. Although the subject of this article focusses specifically on communication within the workplace, we have chosen to illustrate aspects of communication outside the workplace also, as this communication directly impacts both workers and organizations. Based on the data collected, the health crisis has shown that the boundaries between mass communication, general public communication, and communication within organizations are clearly very thin and porous. Furthermore, not only have we included concepts from the field data in these conceptual maps, but also those from a previous scoping review (23), informally supplemented with keywords related to COVID-19 risk communication in the workplace. This provides a more holistic understanding of the concepts/knowledge related to this theme.

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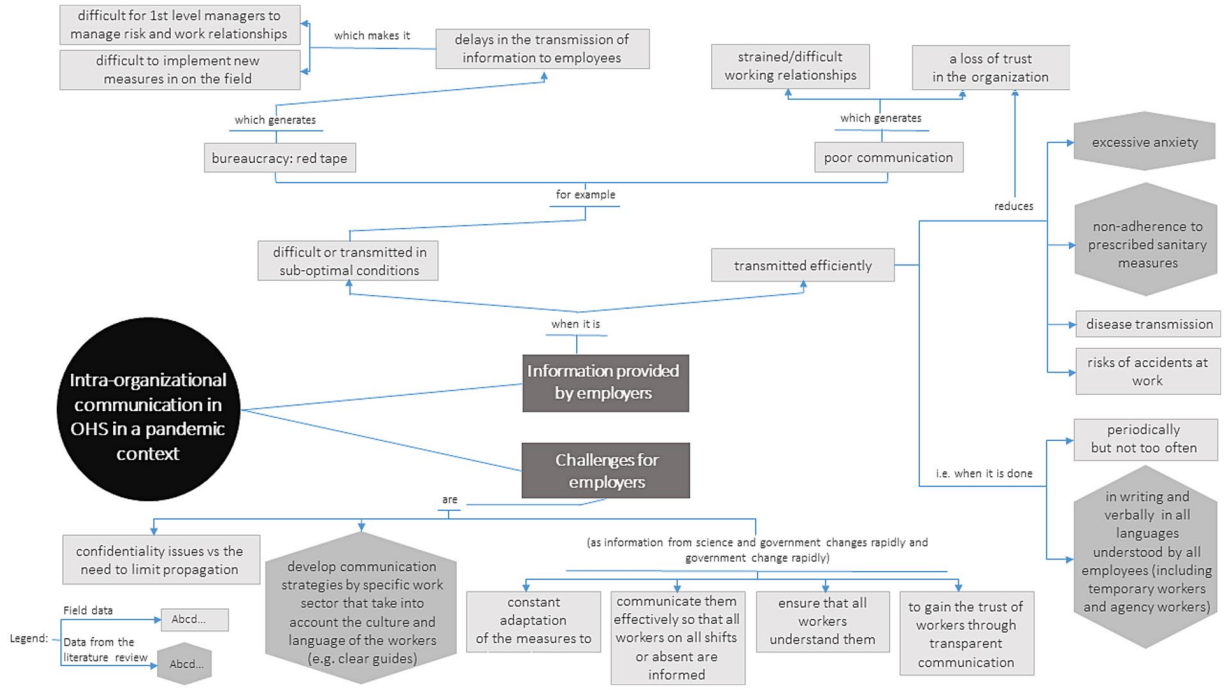

FIGURE 2
Intra-organizational OHS communication in a pandemic context.

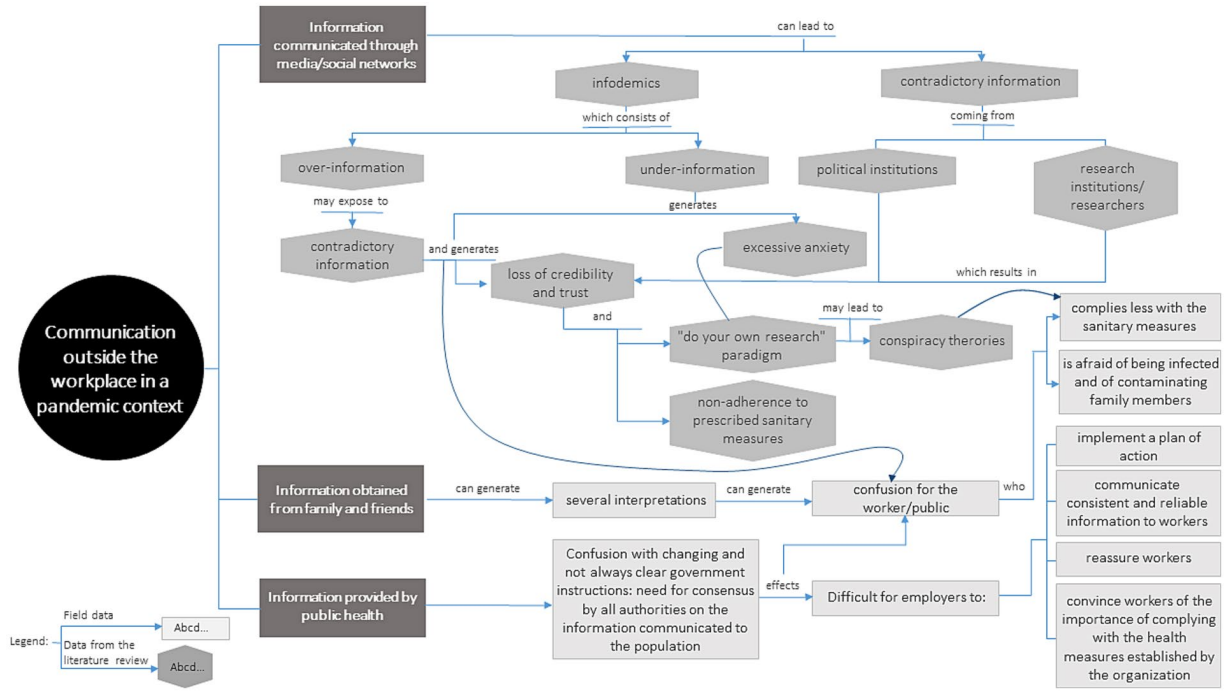

FIGURE 3
Communication outside the workplace.

4 Discussion

The new coronavirus spread very rapidly from when it was first identified, taking all the world's governments by surprise. By the time the WHO formally declared a pandemic in mid-March 2020, very few states had a well-developed plan of action, and they had to act extremely quickly with drastic and unprecedented measures: lockdowns, closing of non-essential businesses, etc., which had

devastating effects on the economy, employment, and the ability of some companies to continue operating. Frontline workers in essential businesses were vulnerable during the early phase of COVID-19. They were often low-wage and precarious workers (16) or facing communication issues involving lack of proficiency in their host country language (41). Like governments, workplaces in turn had to react quickly and support their employees.

Our data suggest different variations on the theme of workplace communication during the earliest stages of the pandemic. Access to information in a context of fast-changing recommendations or instructions was one such variation, along with access for people with limited English or French language proficiency (or any other language serving as a working language and used in official written or verbal communication) and access to clear guidelines when various stakeholders were involved and sometimes had conflicting views or instructions, and deficient cooperation and information management. The nature of pre-pandemic working relations and communication patterns was also reported as having tremendous impact on management's ability to provide satisfactory responses during the pandemic crisis.

In our study, the difficulties of accessing and understanding the right information were reported by many participants, whether ordinary employees, managers, or stakeholders. There was an element of urgency, as they had experienced difficulties accessing information quickly, which in turn hampered their ability to implement appropriate actions. In the world of work, which is our main focus here, we found that the sources of information were also diversified, and that the same uncertainties and confusion could be present in different workplaces: information transmitted by employers, conveyed through the internet and social media, or transmitted by public health and OHS authorities (and not necessarily in sync), in addition to information shared during daily exchanges between people in the immediate environment (neighborhood, family, social network). All of this can be a source of confusion that often leads people to draw their own interpretations (42, 43). In the world of OHS and disability management, the uncoordinated presence and sometimes concurrent actions of several health specialists and experts can lead to this kind of confusion through differential diagnoses, and this has been shown to significantly alter the therapist-patient relationship and, not least, trust in the system (44, 45).

This empirical study, combined with the results of other studies, clearly indicates that under-information may be an obstacle when science is being developed at the same time as different communication strategies are emerging in the workplace and in public health. However, over-information is no less damaging, and this calls for a more sustained drive for coordination, concertation, and the introduction of a rapid and updated, single source of the latest knowledge in order to deliver a coherent and consistent message to the public, including workplaces (42).

In a world where mass communication and social media have become pervasive, it is not always easy to separate the relevant information from the irrelevant. Moreover, not all individuals are familiar with or instinctively consult a public health or OHS agency website for answers to their questions. Moreover, it has been reported elsewhere in numerous academic works that precarious workers or workers in vulnerable situations are unaware of or have little knowledge of their OHS rights and protections, and indeed, sometimes they have only a vague idea of even the existence of a workers' compensation board (referred to as a WCB in OHS literature) in their respective jurisdiction (46–49). In Montreal, early in the pandemic, working groups were formed and met regularly to address issues related to immigrants and precarious workers, COVID prevention, and OHS. It was reported that "ethnic" or multicultural media that may use languages other than the official ones in the country concerned (newspapers, radio, etc.) had been under-utilized to disseminate information about the pandemic (50). Fact sheets were prepared in multiple languages to convey information about the disease, workers' rights at work, financial assistance, isolation instructions, face coverings, and recommendations about grocery shopping and working at home (51). In Quebec and Ontario, standard guides and specific sector-based toolkits for workplaces were produced by OHS authorities (WCB) in both French and English, with Spanish instructions for the Agriculture sector, about a third of whose workforce is foreign temporary workers, almost exclusively from Latin America (52, 53). Despite the efforts made, their access to this information was uncertain, for how could they access it if they were unaware that these bodies even existed. This raises the issue of how to establish more robust communication platforms to disseminate public health/OHS information, strategies, or models, particularly for workers with precarious employment and/or marginalized public-contact workers from diverse cultural backgrounds.

Lack of access to information, partial access to information, or ambiguous information can lead to information seeking from unexpected or less-than-ideal sources (e.g., fake news, conspiracy theories, outdated information) (11). As the saying goes, nature abhors a vacuum, and the uncertainty created by this apparent vacuum can drive people to other sources of information (12). Inadequate communication strategies can lead to ambiguity and confusion (54), and do not help build trust between health authorities and the public (42, 55, 56). It is therefore likely that these inconsistencies will increase public anxiety and undermine the credibility of the science and, consequently, the adherence of workers and the public to health measures or restrictions. Transparency and consistency of messages is important, even if the information is subject to change (42, 57). Transparency implies a certain management style, which, in turn, is based on trust. When relationships are strained, i.e., not conducive to exchange, and when interpersonal and organizational relationships are fragile, disrupted, or broken, it becomes difficult to think about transparency and openness. It may seem natural to see attitudes of withdrawal and silence appear. This can become a vicious circle, with mistrust or tension feeding opacity, opacity feeding mistrust, and so forth. Current knowledge does not allow us to state whether this is more prevalent in contexts of precarious work (e.g., job insecurity, piecework income, no social benefits, no long-term contract, and temporary status) and where there is a history of labor disputes and litigation.

In addition to issues related to the absence of information, its lack of accessibility, its over-abundance, and its broad dissemination over the Internet, some studies have reported the importance of adapting content—including cultural and linguistic adaptation—to specific sectors of economic activity (11, 42, 56, 58–62). Although commendable in itself, the idea of cultural adaptation is rarely developed and often remains little more than wishful thinking to show sensitivity to the issue, but without providing clear guidance that could be a step toward intercultural competence (23, 63). For instance, in a population study of highly precarious foreign workers in Thailand

working in essential services, it was recommended that these workers be encouraged to participate and that some of them become relay persons who could understand the community's concerns, adapt their actions accordingly, and provide an appropriate response (55).

Faced with varied modes of communication and multiple accesses to information, the neologism "infodemic" has been proposed by some authors (11, 12, 42). A blend of parts of the words "information" and "epidemic," "infodemic" suggests the idea of large-scale transmission of more or less reliable information, possibly erroneous or rendered obsolete by the rapid progress of science. Infodemics can work in two opposite ways: (1) information is abundant but too dispersed or ill-adapted to the target groups, excessive, confusing, or even misleading; and (2) information is deficient. Quite conceivably, the result may be the same in both situations as communication suffers from a lack of coherence and consistency (57, 64).

The solutions to this problem are not easy to identify in the context of the mass media, which are continually growing. However, the work of Einwiller et al. in Australia, carried out on a sample of 1,033 workers, is instructive as it shows the correlation between the sharing of factual and substantial information on COVID-19, the positive appreciation of communication in the workplace, and the acceptance of managerial decisions on preventive measures to mitigate the risk of SRAS-CoV-2 infection (64). However, very few studies have raised the very contextual problem (and challenge) of constructing an effective communication plan in workplaces when knowledge about SARS-CoV-2 is constantly evolving, leading to multiple changes in health guidance. These challenges are discussed as if the basic information is undisputable and unchanging. Yet the challenge of building a public health or corporate communication plan in a context where the knowledge to be transferred is being generated simultaneously must be addressed, or at the very least, should be part of the message (11).

When evidence and information about a new virus are scarce or likely to change rapidly, it can be difficult to implement control measures. As was the case with SARS-CoV-2 in the early stages of the pandemic, employers and trade unions alike struggled to find the most accurate information (modes of transmission, contagion, hygiene and prevention measures, return to work measures, etc.). And securing up-to-date information did not seem obvious to them, even though public and occupational health services were active in producing and disseminating information. In addition, the development of multilingual information adapted to different sectors took time and not all citizens necessarily knew where to look for it. In this context, basic OHS principles could be mobilized in workplaces, such as the hierarchy of workplace control measures developed by NIOSH to show that design, elimination, and engineering controls should be used first, as they are the most effective when available or feasible (65), and adapted to COVID a few months after the pandemic. The underlying philosophy is that it is always best to try to eliminate hazards first, if possible. If not possible, the first step should be to control the hazard at source, then to isolate people from the hazard, to change the way people work through administrative controls such as policies, training, and providing information in languages that workers understand (66), and finally to provide and ensure use of PPE. These are the universal precautions strategies used to prevent occupational injuries and illnesses, including the transmission of infectious diseases. The ILO has also provided some guidelines on prevention for health workers and responders during public health emergencies, as well as key principles for risk communication with health and other emergency workers during an outbreak (67). The evolving nature of the pandemic should also be introduced as an element of the message, as current recommendations may change and become outdated (66). Providing details of the development of the original and updated material may also be important to dispel any doubts about its accuracy. In addition, language policies and laws that require the use of exclusive languages during a health or public health emergency should be relaxed to allow as many people as possible to understand the information.

The primary objective of our study was to examine the conditions for prevention in essential services where there are precarious working conditions and workers in vulnerable situations. Without asking our informants explicitly about the latter, communication issues emerged as a key theme in our data.

Since the dawn of time, communication has always been at the heart of the human experience. Whether verbal or non-verbal, written, visual or otherwise, any experience of interaction is necessarily a communication experience, which remains a culturally imbedded one (68). However, communication and the exchange or sharing of information takes on its full meaning in the concrete context of interactions. Moreover, it can be said that the modalities of exchange take shape within the very structure of social relations and symbolic capital (69). How do communication challenges affect precarious workers in particular? For example, do agency workers have access to the same information and training as regular workers (70)? Do managers or team leaders pay the same attention to them? Have steps been taken to ensure that the existing material on OHS prevention is provided to everyone and that the content has been adapted culturally or linguistically (22, 71)? Has COVID widened the gaps in OHS prevention (72)?

The pandemic has revealed existing problems and challenges that needed to be addressed by governments long before the SRAS-CoV-2 outbreak. Providing safe and decent working conditions for all workers, regardless of their employment status, is one of the major issues in OHS, and communication is a fundamental part of the equation encompassing every working condition and social position. Yet some workers on the ground with specific vulnerabilities may face additional hardships that are not acceptable in "normal" circumstances and clearly are a bigger concern in times of a health crisis.

5 Strengths and limitations

This article highlights some aspects of communication in the workplace that are vital to preventing COVID-19 outbreaks. It shows that access to information cannot be reduced to material access (availability of information), but requires symbolic access (mastery of the cultural code and language level) as well. Various organizational aspects also emerged such as bureaucratic complexity, transparency and confidentiality, and the impact of poor pre-pandemic working relations on crisis management in the workplace. The latter is important and is an area warranting further research given its importance not only for the fight against SARS-CoV-2, but also for OHS in general. Some aspects of managing a health crisis can also be examined in the light of organizational culture, and in particular OHS culture (e.g., training, prevention policy, sickness absence policy, disability, and return-to-work management). One question that could be explored is how the COVID-19 crisis may have prompted a complete review of

general OHS practices in some organizations. This study also reveals the importance of better understanding the issues of communication in complex systems where several partners are involved and where divergent viewpoints can be a source of uncertainty and frustration for the general public. The limitations of this project are that the emerging theme of communication was not fully anticipated, and that the researchers may conceivably have only scratched the surface. Another limitation is the sampling bias and study design, which focused exclusively on precarious/low-wage, public-contact workers, who, by the nature of their tasks, must have minimal language skills in either English or French. This population may not necessarily represent the characteristics of precarious workers—such as low literacy levels—in non-public-contact industries (e.g., food processing plants, clothing industry). Other communication issues may emerge from studies that focus on a population other than those working with the public.

In addition, this study took place during the second wave of the pandemic (characterized by the dominant presence of the Delta variant or B.1.617.2). Therefore, it is likely that the concerns of the workplaces mainly reflect the situation at the time (knowledge about the virus, implementation of new mitigation measures, etc.). It is necessary to consider the temporal variable in this type of study, and for future studies, to favor longitudinal designs to attest to the adaptation of workplaces.

This study was not conducted on a large scale and therefore does not provide a generalizable framework for our analyses. On the other hand, it has enabled us, through its in-depth qualitative approach, to gain a better understanding of workers' health concerns in the field, as well as the concerns of employers and various other stakeholders, from an interactional-systemic perspective, giving us a better grasp of the nature of the communication issues to be addressed during a health crisis. We believe that it is neither premature nor precipitate to recommend implementing a concerted action plan for the communication of health information. In this respect, the recommendations of OSHA and other international bodies already provide a good basis for ensuring that all workers can understand the guidelines, instructions, and fact sheets on any specific health issue, in a language they can understand. Focusing on priority sectors would also be beneficial for the deployment of prevention teams, and it would be up to each jurisdiction and its local partners to establish the criteria.

6 Conclusion

The COVID-19 pandemic is not yet over and we have not yet taken all the distance we need to draw all possible lessons from this experience. However, we do know that it has shaken the most vulnerable parts of society; that despite the best intentions, it was not always easy for workplaces to obtain all the answers to their questions; and that communication and response plans were developed simultaneously with the construction of knowledge about SARS-CoV-2. And finally, the availability, but also the quality, of information is an issue in this age of multimedia where it is possible for anyone to develop and disseminate content. The emergence of infodemics calls for vigilance against misinformation. Insofar as the pandemic hit vulnerable populations or those already facing public health and OHS challenges the hardest, this study reminds us of the need to develop targeted, tailored messages that, while not providing all the answers, maintain dialog in workplaces and transparency.

Data availability statement

The datasets presented in this article are not readily available because they are restricted to the research team. Requests to access the datasets should be directed to daniel.cote@irsst.qc.ca.

Ethics statement

The study involving human participants was approved by the University of Waterloo Human Research Ethics Board (Protocol certificate number: 42449). Informed participant consent was obtained verbally and recorded before a telephone or video-conference interview.

Author contributions

DC: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. EM: Conceptualization, Formal analysis, Methodology, Project administration, Resources, Writing – review & editing. A-TH: Data curation, Formal analysis, Investigation, Project administration, Visualization, Writing – review & editing. AL: Data curation, Formal analysis, Investigation, Writing – review & editing. ML: Writing – review & editing. SaM: Conceptualization, Writing – review & editing. ShM: Conceptualization, Writing – review & editing. JA: Data curation, Formal analysis, Investigation, Writing – review & editing. YJ: Data curation, Formal analysis, Investigation, Writing – review & editing. JD: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Navigating job satisfaction in family firms during crisis

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Occupational health is one of the aspects significantly affected during crisis periods. It is essential to learn about the factors that improve organizational capacity in coping with such shocks. This study investigates how the working environment of a family business influences job satisfaction during crises. Conducting a survey with 516 employees at the peak of the pandemic, the research utilizes structural equation analysis, revealing that family business environments can mitigate burnout, enhance affective commitment, and consequently, boost job satisfaction. The study highlights the need to manage burnout and utilize resources, such as employee commitment, for family firms to sustain job satisfaction amidst disruptions. It deepens the comprehension of family businesses' crisis response, emphasizing the significance of human resource commitment and management. The investigation illuminates the dynamic interplay between the work environment, employee well-being, and organizational resilience, providing valuable insights for both theoretical understanding and practical application.

KEYWORDS

family firms, job satisfaction, crisis, affective commitment, burnout, COVID-19

1 Introduction

Family businesses constitute a predominant organizational type, representing over 70% of enterprises globally and employing 50–75% of the worldwide working population (Poza and Daugherty, 2013). In Latin America, family firms make up 65–98% of private enterprises, with Chile exhibiting a particularly high dominance of family control at around 90% of all firms. These businesses enjoy elevated levels of legitimacy in the region, attributed to their survival-focused orientation, network-based relationships, and in-group solidarity (Berrone et al., 2022).

The advent of COVID-19 has presented new challenges for family business research, prompting investigation into whether these firms possess more resilient work environments in the face of external shocks. Existing research on family firms' post-disaster recovery suggests such resilience (Danes et al., 2009; Mahto et al., 2022). Determining the elements supporting this resilience, particularly at the occupational health management level, becomes crucial (Calabro et al., 2021; Llanos-Contreras et al., 2023). This investigation is significant due to the substantial impact family firms have on economies and their social relevance as workplaces. Understanding this phenomenon is essential for these firms to effectively navigate external shocks while concurrently fortifying their working environments.

A means of evaluating occupational health is through job satisfaction (Giménez-Espert et al., 2020). Family firms exhibit both advantages and disadvantages in cultivating working environments that either enhance or preserve job satisfaction. On the downside, family firms tend to offer lower wages, fewer career development opportunities, limited decision-making authority, and diminished influence on work design and business activities for non-family employees (Block et al., 2018; Waterwall and Alipour, 2021). Conversely, they are recognized as positive stewards, providing high job security, fostering social relationships, cultivating strong organizational cohesion, and promoting shared values and vision (Arregle et al., 2007; Hauswald et al., 2016; Llanos-Contreras et al., 2022a).

A recent study suggests that the advantages outweigh the disadvantages in family firms' working environments, leading to higher levels of job satisfaction despite lower wages for employees (Block et al., 2015). This aligns with the propositions of enhanced proactive stakeholder engagement and socioemotional wealth preservation (Cennamo et al., 2012; Mahto et al., 2022), indicating that family firms prioritize preserving social ties with stakeholders, yielding benefits in the quality of working environments (Llanos-Contreras et al., 2022a,b). This, in turn, creates a resources advantage in terms of employee identification and emotional commitment crucial for family firms to face external shocks and adapt to disruptive change (Hoekx et al., 2022; Mahto et al., 2022). Research also indicates that certain policies, such as those oriented towards job benefits like the Job Benefit of Care, are more effective in driving job satisfaction in family-owned firms (Querbach et al., 2022). While intriguing, it remains unclear whether these mechanisms (flow of process and policies) and structural organizational conditions (resources) yield the same results (employee satisfaction) when family firms confront external disruptions like the COVID-19 pandemic. To address this gap, this study aims to answer whether family business working environments exhibit higher levels of job satisfaction than non-family firms during an external shock like Covid-19 and how employees' affective commitment (resource asymmetries) and their management of burnout (flow of process) influence job satisfaction.

To address these questions, this study employs Partial Least Squares Structural Equation Analysis (PLS-SEM) using survey data collected from 516 Chilean employees. The survey includes information on whether they work in a family firm, along with responses to assess their affective commitment, burnout, and job satisfaction. Implemented at the peak of the pandemic concerning sanitary restrictions and mortality rates, the results affirm that, amid the COVID-19 scenario, family business working environments exhibit lower levels of burnout and higher affective commitment, subsequently positively influencing job satisfaction. The findings also indicate that family business working environments demonstrate higher levels of job satisfaction when confronted with the challenges of the COVID-19 pandemic, but this effect is observed only when mediated by burnout and affective commitment. The direct effect was not confirmed. This suggests that a family firm's capacity to preserve employees' job satisfaction hinges on their ability to manage processes that control burnout during external shocks, coupled with resource advantages, such as heightened affective commitment, to navigate adverse scenarios like those imposed by the pandemic.

This study makes at least three contributions to the existing body of theory. Firstly, it adds to the literature examining how family firms navigated the COVID-19 crisis, extending beyond general management perspectives provided by previous research (Kraus et al., 2020; Llanos-Contreras et al., 2023). While prior studies focused on family firms' reactions to disruptions caused by COVID-19, our research uniquely delves into human resources commitment and its management as a crucial factor influencing these firms' resilience during sudden external disruptions, such as the pandemic. Secondly, the research contributes to the field of family business resilience (Danes et al., 2009; Salvato et al., 2020). Contrary to the assumption that merely being a family firm guarantees higher job satisfaction during external disruptions, our study highlights the necessity of factors like employees' affective commitment and controlled burnout for achieving this outcome. Finally, the study contributes to the domain of family business human capital management research (Lambrechts and Gnan, 2022; Pelaez-Leon and Sanchez-Marin, 2023) by identifying and testing specific resources that confer advantages to these firms, such as heightened employee affective commitment. Additionally, it confirms the family firms' ability to maintain lower levels of burnout compared to non-family firms when confronting external disruptions.

Following on, this article unfolds with a theoretical discussion supporting the hypotheses. The subsequent section details the research design and outlines the procedures followed for data collection and analysis. Following this, the results are presented and discussed, aligning with the existing literature that guided the study. The final sections encapsulate the main conclusions, theoretical contributions, and practical implications, while also addressing the study's limitations and proposing avenues for further research.

2 Theoretical background

The COVID-19 pandemic has presented unparalleled challenges for organizations and their employees, introducing heightened stress, uncertainty, and work-life imbalance (Le Breton-Miller and Miller, 2022). Existing research indicates that the prioritization of preserving socioemotional wealth is crucial in elucidating family firms' capacity to manage occupational health, specifically addressing burnout, and fostering employee commitment during challenging times. Socioemotional wealth serves as the primary motivator propelling these firms to persist despite minimal financial rewards (Glover and Reay, 2015). It also plays a pivotal role in explaining their continuity and survival in the face of natural disasters (Mahto et al., 2022). Moreover, socioemotional wealth is recognized as the driving force behind turnover following organizational decline (Llanos-Contreras and Jabri, 2019). In this context, socioemotional wealth emerges as a potential driving force compelling these firms to manage occupational health effectively, enhancing their resilience to survive external shocks such as the COVID-19 pandemic (Llanos-Contreras et al., 2023).

At the core of socioemotional wealth preservation lies these firms' priority for fostering strong social ties with various stakeholders, with a particular emphasis on their staff (Cennamo et al., 2012; Llanos-Contreras et al., 2022b). Recently, Christensen-Salem et al. (2021) has indicated that the pursuit of socioemotional wealth explains why family firms exhibit a heightened concern for developing caring practices toward their employees. In a similar vein, Jennings et al. (2018) suggested that in family firms, employees are treated by owners as if they were part of the family. This may elucidate why non-family employees in family firms display higher levels of organizational commitment compared to employees in non-family firms (Pimentel

et al., 2020). Furthermore, socioemotional wealth has been employed to clarify why family firms adopt a more cautious approach to firing practices during crises, resulting in enhanced social welfare and happiness within these firms (Rivo-López et al., 2022). This lends support to our proposition of an improved ability to manage burnout under crisis situations.

In the midst of the Covid-19 crisis, family businesses have demonstrated unique strategies utilizing resources and mechanisms to ensure their survival. Le Breton-Miller and Miller (2022) discovered that a long-term orientation, robust relationships with employees, and close connections with stakeholders empowered family firms to effectively navigate the challenges posed by the pandemic. Llanos-Contreras et al. (2023) highlighted how these firms strategically balanced business demands and resources to mitigate employees' psychological risks amid the pressures of the Covid-19 pandemic. Alonso-Dos-Santos and Llanos-Contreras (2019), as well as Llanos-Contreras et al. (2020), argued that during crises, family firms place a heightened emphasis on fostering strong social ties with employees, considering it a cornerstone that bolsters the continuity of these businesses in the face of adversities. The literature on occupational health further supports the link between working conditions and the health and safety of employees in family business environments (Madden et al., 2020). Crucially, affective commitment, burnout, and job satisfaction emerge as key indicators shedding light on occupational health in the workplace (Amponsah-Tawiah and Mensah, 2016).

Drawing from the aforementioned research, it is suggested that family businesses cultivate more resilient working environments, characterized by a distinct organizational dynamic (process) that effectively manages psychological risks in the workplace. Simultaneously, these environments foster enhanced organizational commitment among employees and contribute to higher levels of job satisfaction. In this line, this paper elucidates the importance of the social environment in the development of individuals, highlighting the crucial role of environmental support in fostering personal wellbeing, and therefore, enhancement of organizational resilence (see Zhang et al., 2023).

2.1 Employees' affective commitment and organizational ability to manage burnout in family firms under a pandemic scenario

Family firms exhibit distinctive characteristics that contribute to the creation of a unique organizational climate, particularly advantageous in managing psychosocial risks on workers' health during external disruptions (Marshall and Schrank, 2020; Mahto et al., 2022; Llanos-Contreras et al., 2023). Their strong emphasis on family values, long-term orientation, and the cultivation of binding social ties create favorable working conditions for addressing external shocks (Miller and Le Breton-Miller, 2005). This environment proves beneficial in maintaining control over emotions, psychological risks, and employee satisfaction during disruptive events (Llanos-Contreras et al., 2019; Bartik et al., 2020). A key element contributing to this resilience advantage is the robust affective commitment of employees within these firms (O'Regan and Quigley, 1993; Tabor et al., 2018).

Affective commitment, defined as an employee's emotional attachment, identification, and involvement with the organization, is marked by the joy of being a member of the organization (Meyer and Allen, 1991). In contrast to normative commitment and continuous commitment, affective commitment is distinguished by its emotional basis, reflecting a genuine attitude toward the firm (Boswell and Olson-Buchanan, 2004). Predictors of affective commitment include personal factors like seniority and education, as well as organizational factors such as organizational culture and leadership integrity (Li et al., 2022). Given family firms' inclination toward a more familial environment compared to non-family firms, there is a heightened likelihood of promoting a sense of belonging and loyalty among employees (Tabor et al., 2018). Additionally, research by Rauscher et al. (2012) supports the notion that family firms offer a social context with protective effects for employees. The literature also underscores that family firms cultivate a supportive work environment, fostering strong relationships among employees (Bassanini et al., 2013; Christensen-Salem et al., 2021). Cumulatively, these findings suggest that family business working environments tend to develop strong levels of employee affective commitment. Consequently, we propose the following hypothesis:

> *H1*: Workers' perception of involvement in a family business enhances the sense of affective commitment of employees, when facing an external shock, such as Covid-19.

Burnout is characterized by emotional, physical, and mental exhaustion resulting from prolonged exposure to stressful work conditions, leading to heightened frustration, increased depersonalization, and diminished personal accomplishment (Maslach, 1998). Employee burnout is associated with discrepancies between job descriptions and actual conditions, work overload, risky work environments, and intense interactions with various stakeholders, including coworkers, superiors, and supervisors (Burke, 1989; Savicki and Cooley, 1994; Dormann and Zapf, 2004; Yagil, 2006; Swendiman et al., 2019). Consequently, burnout is closely tied to how firms manage their daily working activities (flow of process) and, in the case of sudden disruptive shocks, how these disruptions impact daily activities and the firm's ability to cope with the traumatic situation (Prado-Gascó et al., 2020; Torrès et al., 2021).

Existing research suggests a correlation between environmental conditions in family firms and reduced levels of employee burnout. For example, Fotiadis et al. (2019) found evidence that family firms, given their emphasis on employee well-being and work-life balance, contribute to decreasing employee burnout. Additionally, family firms often provide more flexible work arrangements, such as telecommuting or adaptable scheduling, enabling employees to balance work and personal responsibilities, thereby alleviating anxiety and pressure that can lead to job burnout during crises (Stamm et al., 2022). The family-like work environment fostered by family firms may also enhance employees' social adaptability and support, acting as a buffer against the negative effects of stress and burnout during crises (Schwaiger et al., 2022). These strengths collectively suggest a superior ability in family firms to manage employee burnout when confronted with external shocks such as COVID-19, supporting the following hypothesis:

> *H2*: Workers' perception of involvement in a family business decreases their burnout levels, when facing an external shock, such as Covid-19.

2.2 Employees' affective commitment, burn-out and job satisfaction during the COVID-19 pandemic

Work-related stress is a common occurrence in the workplace, often leading to increased levels of burnout. Maintaining control over burnout levels is crucial, as moderate stress can introduce challenges and diversity to a job, contributing positively to the work environment. However, excessive stress poses the risk of detrimental outcomes (French et al., 2000). Since the seminal article from Maslach et al. (2001) hypothesized the negative relationship between burnout and job satisfaction, there has been a considerable amount of research providing empirical evidence on this in different contexts. One influencial study addressing health personnel is the meta-analysis of Zangaro and Soeken (2007). They provides wide evidence of the negative effects of burnout on job satisfaction. Similarly, the meta-analysis from Madigan and Kim (2021) supports that, in contexts of primary education, burnout is correlated to low levels of job satisfaction. In the same line, considering sales personnel, the meta-analysis of Edmondson et al. (2019), confirmed this relationship within the businesses context. These studies contribute to empirical research, offering substantial evidence confirming the negative relationship between the two constructs. For instance, Babakus et al. (1999) provide support for sales personnel within a large international service organization, based on a sample of 350 individuals. Wang et al. (2015) extend this evidence to Canadian teachers, with a sample size of 523. More recently, Ariawan et al. (2023) present additional support for employees in the electronic manufacturing sector in Indonesia. Notably, this last study is part of a broader set of investigations assessing this relationship during the COVID-19 pandemic (Ninaus et al., 2021; Lea et al., 2022; Anand et al., 2023; He et al., 2023; Kraus et al., 2023). All the aforementioned evidence supports the following hypothesis.

> *H3*: Having lower levels of Burnout is related to higher levels of Job Satisfaction, when businesses face an external shock, such as Covid-19.

The concept of employees' organizational commitment has been a focal point in organizational studies for a considerable period (Mathieu and Zajac, 1990; Lincoln and Kalleberg, 1992). It serves as a crucial factor influencing turnover and absenteeism and is recognized as a reliable predictor of a team's capacity to navigate new challenges and organizational change (Porter et al., 1974; Febrianti and Jufri, 2022). Recent research by Chanana (2021) and Liu et al. (2021), focusing on teachers during the COVID-19 pandemic, identified a positive relationship between organizational commitment and job satisfaction. Affective commitment, a key element of organizational commitment, has been highlighted in studies such as Koo et al. (2020). Affective commitment pertains to an employee's emotional attachment to their organization and their inclination to remain a part of it. It is rooted in recognition, emotional attachment, and active participation within the organization (Ko et al., 1997). Individuals exhibiting affective commitment remain devoted to the organization because they perceive that their personal employment relationship aligns with the goals, principles, and values of the organization (Beck and Wilson, 2000). Drawing on this understanding, it is suggested that in periods of external shocks, employees with elevated levels of affective commitment may experience a heightened sense of loyalty and dedication to their organization (Chanana, 2021). This would enhance employees' resilience during external shocks, cultivating motivation and a commitment to continuity, ultimately preserving job satisfaction (Koo et al., 2020). This would be especially relevant in small and medium-sized family firms, where a significant number of employees are also family members (Cruz et al., 2012). Research on family businesses has revealed that bolstering cohesion and solidarity, factors related to affective commitment, is pivotal in elucidating the response mechanisms of family firms to the challenges posed by the COVID-19 crisis (Kraus et al., 2020). Consequently, within these firms, heightened affective commitment from employees appears to play a crucial role in sustaining job satisfaction when confronted with disruptive shocks. Therefore, the following hypothesis is posited.

> *H4*: Having higher levels of affective commitment is related to higher levels of job satisfaction, when firms face an external shock, such as Covid-19.

2.3 Family firms and job satisfaction

The work environment in family firms can significantly influence employee job satisfaction, particularly during external shocks such as the COVID-19 pandemic (Lyu et al., 2021). Previous research on socioemotional wealth has demonstrated that family businesses prioritize non-financial goals, including fostering altruism within the family and the organization (Schulze et al., 2003) and building strong social ties with employees (Block, 2010). Studies indicate that in family firms, a positive work environment often arises from the strong ties and shared values within the organization (Herrero and Hughes, 2019), contributing to increased job satisfaction.

Several factors support the idea that family firms cultivate positive work environments conducive to job satisfaction. Family members, who often work in these businesses, exhibit a positive attitude toward their jobs due to their upbringing in the family business context (Kepner, 1983; Block et al., 2015). Additionally, the prioritization of socioemotional wealth in family businesses leads owners to maintain close, supportive relationships with their employees, considering them part of the extended family (Waterwall and Alipour, 2021; Llanos-Contreras et al., 2022a,b). Employees feeling supported and valued are more likely to experience job satisfaction and long-term commitment to the organization (Christensen-Salem et al., 2021), fostering shared values that create purpose and connection among owners, managers, and employees.

This positive working environment becomes particularly crucial when family firms face external shocks (Salvato et al., 2020; Mahto et al., 2022). During the COVID-19 pandemic, family businesses' strong commitment to employees generated trust and loyalty, contributing to increased job satisfaction (Firfiray and Gomez-Mejia, 2021). Studies on family firms and COVID-19 highlight their provision of emotional support and resources to help employees cope with stress and uncertainty, supporting mental health and job satisfaction (Usman et al., 2021). Based on these considerations, the following hypothesis is proposed:

> *H5*: Workers' perception of involvement in a family business increases levels of job satisfaction, when facing an external shock, such as Covid-19.

As discussed earlier, family firms tend to maintain higher levels of job satisfaction due to their strong position in critical mediating factors like trust, commitment, and loyalty (Llanos-Contreras et al., 2023). However, it is essential to examine whether this pattern holds for all factors crucial in preserving job satisfaction. This study proposes that burnout and affective commitment are two critical mediating variables in this context.

Affective commitment in family firms is linked to higher job satisfaction, stemming from the emotional connection and shared purpose within the organization (Kooij et al., 2010; Swab et al., 2020). Family ties and shared values unique to family firms contribute to higher affective commitment compared to non-family firms (Vallejo, 2009; Picone et al., 2021). When employees feel emotionally invested in the organization's survival or success during crises like the COVID-19 pandemic, they are more likely to take pride in their work, going above and beyond their duties to contribute to the company's well-being (Lapointe and Vandenberghe, 2017). This enhanced sense of accomplishment and fulfillment can boost job satisfaction (Ahlers et al., 2017).

Family firms also create a positive work environment that promotes job satisfaction by controlling daily activities (processes) to mitigate burnout (Edmondson et al., 2019). Research suggests that work environmental conditions in family firms correlate with job satisfaction. For example, Llanos-Contreras et al. (2022b) demonstrate that organizational support, workload reduction, and minimizing job insecurity perceptions in family firms contribute to lower burnout and higher job satisfaction. When employees experience lower levels of burnout, they feel more in control of their work and personal life, leading to greater job satisfaction (Kanwar et al., 2009; Amponsah-Tawiah and Mensah, 2016; Lambrechts and Gnan, 2022). Such Human Resource Management practices are especially crucial during crises, demanding low fault tolerance rates among employees (Pinnington and Ayoko, 2021). Therefore, the analysis supports the hypotheses that both burnout and employees' affective commitment mediate the relationship between family businesses' work environment and job satisfaction.

> *H6*a: Workers' perception of involvement in a family business increases levels of job satisfaction through lower levels of burnout, when facing an external shock, such as Covid-19.

> *H6*b: Workers' perception of involvement in a family business increases levels of job satisfaction through Affective Commitment, when facing an external shock, such as Covid-19.

The Figure 1 summarizes the hypotheses discussed above.

3 Methods

Data was collected in January 2021 through an online questionnaire encompassing various domains of interest. These domains include burnout, affective commitment, family-like working environment (*family firm image*), job satisfaction, and demographic information. The survey was administered in Chile in 2021, approximately 10 months after the global declaration of the COVID-19 pandemic. A total of 516 valid questionnaires were gathered from participants with an average age of 42 years (standard deviation [SD] = 11.57). The sample consisted of 48.64% women, and most respondents held tertiary education degrees (75.58%), with 67.64% earning less than US$1,300.

The assessment of burnout levels utilized the Burnout Assessment Tool (BAT), consisting of 22 items that represent the four dimensions of burnout: exhaustion, mental distance, emotional impairment, and cognitive impairment (Sakakibara et al., 2020; Schaufeli et al., 2020). The family-like working environment (FFI) was assessed using an adapted version of the family firm image scale developed by Beck and Kenning (2015). Affective commitment (AffCom) was measured using the scale by Scrima (2015), and job satisfaction (JobSat) was evaluated through an adaptation of the scale by Eisenberger et al. (1997). In all cases, a 5-point Likert scale was used to measure the responses.

We employed a structural equation model using partial least squares (PLS-SEM) to examine the proposed hypotheses. To assess the reliability and validity of the measurement scales and the structural model, we utilized SmartPLS software (Hair et al., 2014). SEM was deemed appropriate for our study due to its ability to handle multiple relationships and integrate both observed and latent variables. PLS-SEM allows us to model relationships between observed and latent variables (measurement model) as well as relationships between latent variables (structural model), as previously noted by Hair et al. (2014), Richter et al. (2016), and Shiau et al. (2019).

4 Data analysis and results

4.1 Exploratory factor analysis

To test the psychometric properties of latent constructs an exploratory factor analysis (EFA) was implemented (Table 1). The assessment of the fit measure shows adequate levels of reliability and validity. The Cronbach's α (>0.796) and composite reliability (CR > 0.880) confirm the internal consistency of all latent variables (Hair et al., 2014). Testing the convergent validity of the reflective models, the factor loadings (>0.700) and the average variance extracted (AVE) (>0.575) show adequate fit levels (Hair et al., 2014). Considering these results, variables were suitable for subsequent analyses.

To test the proposed hypotheses, a structural equations model by partial least squares (PLS-SEM) was implemented. In this study, PLS-SEM allows the modeling of the relationships between observed and latent variables (measurement model) and the relationships between latent variables (structural model) (Hair et al., 2014; Richter et al., 2016; Shiau et al., 2019).

4.2 Evaluation of the structural model

To assess the structural model's relevance and predictive power, the multiple correlation coefficient ($R^2 = 0.505$) and Stone-Geisser's predictive relevance test ($Q^2 = 0.072$) were used and show good fit measures (Chin and Todd, 1995; Chin, 2009). Also, the standardized root mean square residual coefficient (SRMR = 0.039) has an appropriate adjustment level (Hu and Bentler, 1998). It is possible to confirm the significance of the model, since the measures of the model's fit show appropriate levels and predictive capacity ($R^2 = 0.505$; $Q^2 = 0.072$; SRMR = 0.039; Hair et al., 2017). Table 2 summarized PLS-SEM results.

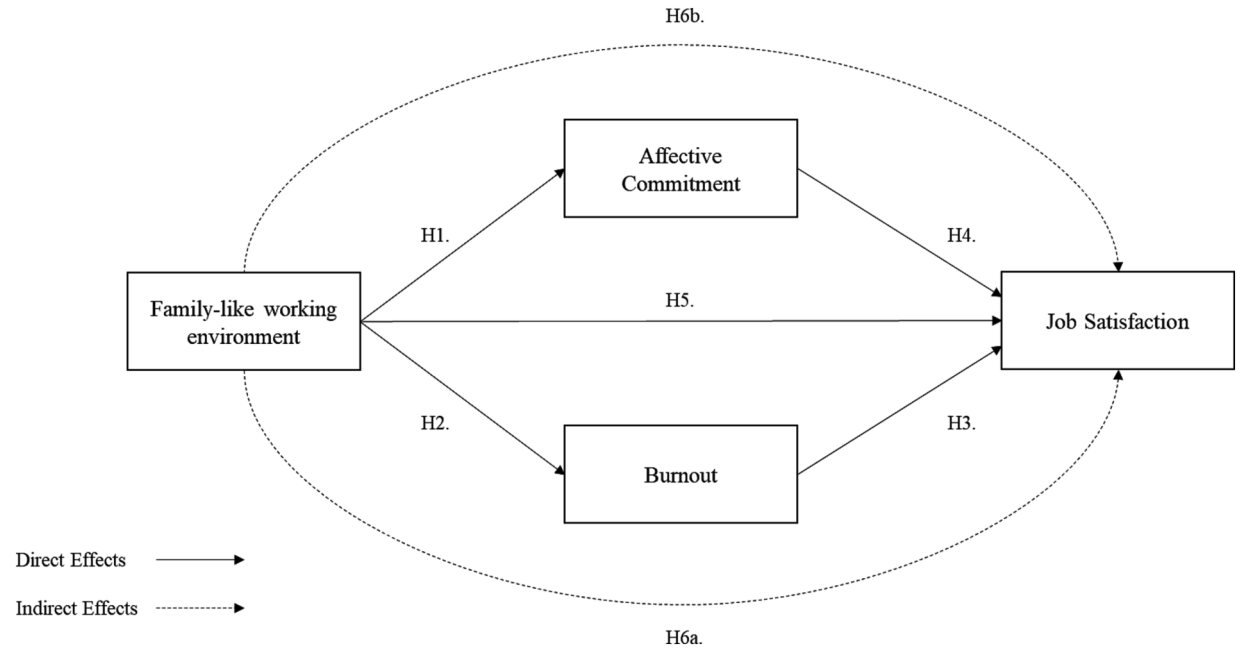

FIGURE 1
Summarizes this study's conceptual model.

TABLE 1 Evaluation of the measurement model.

Construct	α	Rho_A	CR	AVE	Factorial loads
FFI	0.917	0.919	0.960	0.923	>0.700***
Burnout	0.927	0.942	0.937	0.575	>0.700***
AffCom	0.796	0.809	0.880	0.709	>0.700***
JobSat	0.859	0.880	0.914	0.780	>0.700***

***Significance level: $\rho < 0.01$. α, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted.

TABLE 2 PLS-SEM results.

Measures	Path	f^2	R^2	Q^2	SRMR
Direct effects					
FFI → Burnout	−0.157***	0.025			
FFI → AffCom	0.384***	0.173			
FFI → JobSat	0.015***	0.000			
Burnout → JobSat	−0.242***	0.103			
AffCom → JobSat	0.581***	0.519			
Specific indirect effects					
FFI → Burnout → JobSat	0.038***				
FFI → AffCom → JobSat	0.223***				
Burnout			0.025	0.020	
Affective commitment			0.148	0.143	
Job satisfaction			0.505	0.072	
Common factor model					0.039

Bootstrapping = 5,000. Significance level: *$\rho < 0.10$; **$\rho < 0.05$; ***$\rho < 0.01$.

Findings suggest that workers' perception of involvement in a family business enhances the sense of employees' affective commitment toward the firm, i.e., *Hypothesis 1* is supported. *Hypotheses 2* are accepted; as, workers' perception of involvement in a family business decreases burnout levels. High levels of worker burnout decrease job satisfaction, supporting *Hypothesis 3*. Also, a higher level of affective commitment increases workers' job satisfaction, supporting *Hypothesis 4*. Regarding *Hypothesis 5*, workers' perception of involvement in a family business shows non-significant effects on job satisfaction, i.e., *Hypothesis 5* is rejected. The specific indirect effects show that employees' burnout levels and affective commitment moderate the relationship workers' perception of involvement in a family business and job satisfaction. Workers' perception of involvement in a family business has positive effects on job satisfaction even when high levels of burnout are observed. Also, relationship between workers' perception of involvement in a family business and job satisfaction is positive through affective commitment. Therefore, these results support *Hypothesis 6* (a and b). Figure 2 summarizes the hypotheses testing results.

5 Discussion

This study aims to investigate the impact of workers' perception of involvement in a family business on affective commitment, burnout levels, and job satisfaction during external shocks, such as the

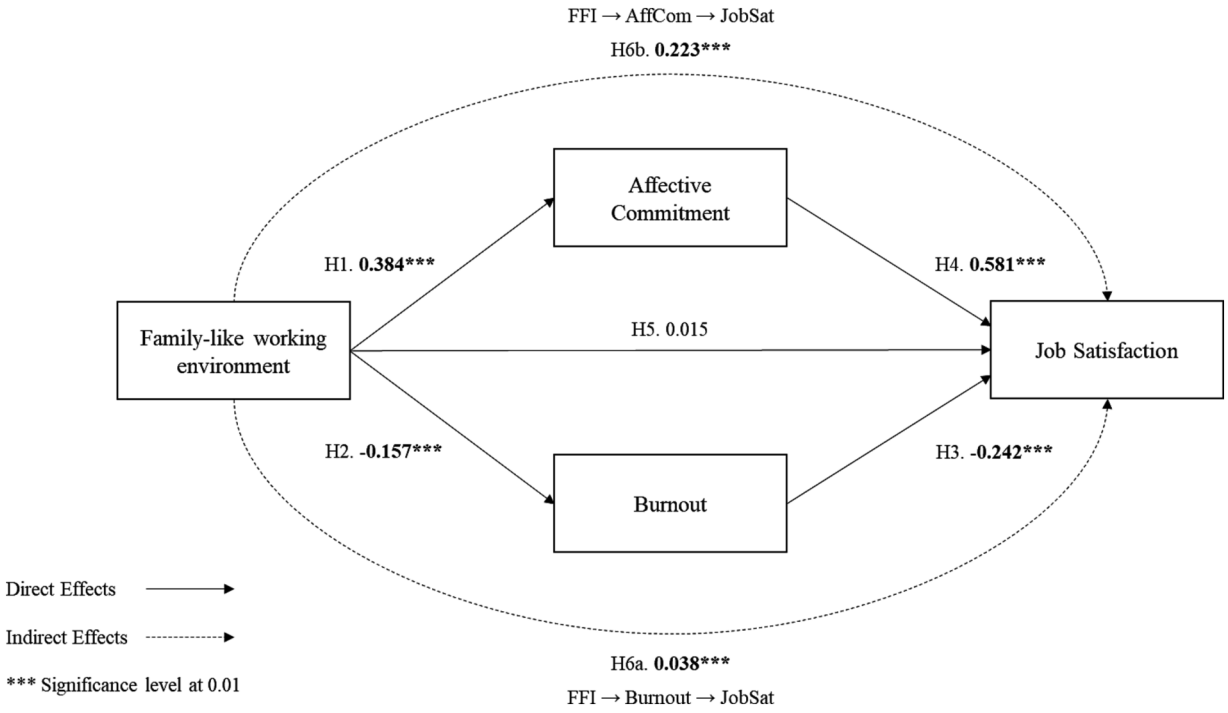

FIGURE 2
Hypotheses testing.

COVID-19 pandemic. Additionally, it explores the indirect influence of workers' perception of involvement in a family business on job satisfaction through the mediating factors of burnout and affective commitment. Employing Partial Least Squares Structural Equation Modelling (PLS-SEM), the results supported all proposed hypotheses except for H5. Family firms are recognized for their ability to face external shocks and unexpected events successfully (Llanos-Contreras et al., 2020, 2023). However, previous research has not provided conclusive evidence regarding these firms' ability to develop a working environment that promotes positive occupational health and employee job satisfaction. For instance, these firms tend to offer lower salaries and fewer prospects for career advancement to non-family employees, as indicated by Block et al. (2018) and Waterwall and Alipour (2021). On the other hand, they are often perceived as responsible caretakers who ensure significant job stability and foster social connections, as noted by Arregle et al. (2007), Hauswald et al. (2016), and Llanos-Contreras et al. (2022a,b). In this context, by comprehending the mechanisms employed by family firms to endure exogenous events, such as the COVID-19 pandemic, this study identifies unique attributes and mechanisms that enable them to navigate external disruptions effectively, thereby preserving the occupational health and job satisfaction of their employees.

Our findings suggest that a family firm's working environment aligns with higher levels of employees' affective commitment when an organization faces an external disruption, such as the COVID-19 pandemic. This is in line with previous research indicating that family firms develop a more robust organizational climate (O'Regan and Quigley, 1993; Tabor et al., 2018), which is acknowledged as an important driver of employees' commitment. Family businesses promote a family-like work environment as part of their organizational culture, values, traditions, and identity (Miller and Le Breton-Miller, 2005; Cennamo et al., 2012; Llanos-Contreras et al., 2022b). Our findings shed additional light on these ideas. Preserving a stronger affective commitment toward the firm is considered an important driver of the resilience advantage of family firms in successfully facing external disruptions. This has been widely documented in previous research (Bassanini et al., 2013; Llanos-Contreras et al., 2019, 2023; Bartik et al., 2020; Marshall and Schrank, 2020; Christensen-Salem et al., 2021; Mahto et al., 2022). This research shows that workers' perception of involvement in a family business increases the worker's affective commitment during an external shock. Consistent with previous research (Llanos-Contreras et al., 2019; Bartik et al., 2020), our study suggests that family business workers feel a higher sense of belonging and loyalty, which helps keep emotions, psychological risk, and employee satisfaction under control when disruptions are faced. Therefore, it may suggest that a family-like working environment provides conditions that help employees efficiently manage potential psychological risks when facing uncertain scenarios.

It is expected that employees' burnout would increase in working conditions of work overload, risky work environments, and a mismatch between the job description and the actual job conditions, among other stress drivers' scenarios (Burke, 1989; Savicki and Cooley, 1994; Swendiman et al., 2019; Torrès et al., 2021; Lyu et al., 2023). During the COVID-19 pandemic, these conditions arose more frequently in employees across all types of firms in different economic sectors (Prado-Gascó et al., 2020). Consequently, many people suffered a detriment to their mental health (Apedo-Amah et al., 2020). Our findings suggest that family firms managed these elements more efficiently, resulting in more controlled levels of burnout. This is in line with previous studies suggesting that family firms have advantages in managing external disruptions, maintaining a resilient workplace, and offering job security in times of crisis (Alonso-Dos-Santos and

Llanos-Contreras, 2019; Llanos-Contreras et al., 2020). In this same line, this study is also in line with research suggesting that the worker feeling part of a family firm decreases burnout levels, even when an external shock happens (Cruz et al., 2012; Fotiadis et al., 2019; Kraus et al., 2020; Schwaiger et al., 2022). Thus, the premise that a family firm's work environment offers a social context in which employees perceive protective effects, as proposed by Rauscher et al. (2012), is supported and maintained during external disruptions. Moreover, it may be suggested that these firms have a superior capability to manage organizational routines through crises generated from external disruption. Consequently, family firms efficiently manage crises to maintain a supportive work environment, which is recognized by employees and may represent a resilience advantage for these businesses (O'Regan and Quigley, 1993; Bassanini et al., 2013; Tabor et al., 2018; Christensen-Salem et al., 2021).

This study also provides further support to previous research suggesting that affective commitment has a positive influence on job satisfaction, while burnout has a negative influence on this variable. Regarding the relationship between affective commitment and job satisfaction, it is known that high levels of affective commitment enhance job satisfaction. Moreover, in times of crisis, workers' affective commitment tends to increase, strengthening family firms' capacity to cope with adverse situations (Cruz et al., 2012; Koo et al., 2020; Chanana, 2021). Similarly, the results also confirm the negative relationship between worker burnout and job satisfaction in previous research, highlighting the influence of mental health on job satisfaction and employee well-being (Edmondson et al., 2019; Madigan and Kim, 2021; Lea et al., 2022; Anand et al., 2023). This suggestion is prevalent in external disruption scenarios (Ninaus et al., 2021; Kraus et al., 2023). While this finding may not be novel, confirming the role played by these two variables in efficiently managing the stress generated by external disruptions, such as the COVID-19 pandemic, is crucial. Building upon the aforementioned research, we propose that family firms possess a stock of commitment from employees (affective commitment), providing them with an advantage to face adverse scenarios and preserve higher levels of job satisfaction. Similarly, the results of this study confirm that family firms have a superior ability to deal with burnout when facing unexpected disruptions. Drawing on Llanos-Contreras et al. (2020) and Mahto et al. (2022) we suggest that such ability is rooted in their prioritization of preserving socioemotional wealth, including commitment to continuity and social ties with employees, among other factors. This orientation leads them to more efficiently manage organizational routines (which, as discussed above, are central in keeping burnout under control) through crises, resulting in better levels of job satisfaction. This finding aligns with Christensen-Salem et al. (2021), who argue that pursuing socioemotional wealth explains why family businesses adopt more caring practices toward employees, despite potentially providing fewer or less comprehensive formal Human Resource Management (HRM) programs and benefits.

Finally, the study also provides support for the idea that a family-like working environment positively influences job satisfaction. This is significant because it suggests that in times of crises, family firms are capable of leveraging their distinctive family-like working environment to impart stability and security to employees (Alonso-Dos-Santos and Llanos-Contreras, 2019; Llanos-Contreras et al., 2020; Madden et al., 2020; Le Breton-Miller and Miller, 2022). Importantly, the results do not provide support for the expected positive direct influence of the family firm's working environment on job satisfaction. However, they do confirm the suggested indirect influences through affective commitment and burnout. This may imply that the family firm condition alone may not be sufficient to increase job satisfaction. However, a family-like working environment would create conditions, such as enhanced affective commitment and more controlled burnout, through which job satisfaction can be preserved when these organizations face disruptive scenarios. Therefore, it is suggested that the structural conditions (in terms of affective commitment) and organizational dynamics (which allow keeping burnout under control) implemented by family firms during the pandemic are effective and valued by the employees.

6 Contributions to theory and practice

This study makes significant contributions to both theory and practice, which will be discussed below. Firstly, it adds to the body of literature examining how family businesses dealt with challenges posed by external disruptions, such as the COVID-19 pandemic (Kraus et al., 2020; Llanos-Contreras et al., 2023). This research sheds light on the critical role played by employees' affective commitment and the control of burnout in preserving job satisfaction when firms face disruptive scenarios. It also provides insight into these firms' superior ability to cope with uncertainty and stress driven by an external shock. For family firms, continuity and preserving the family legacy are ultimate goals (Kotlar and De Massis, 2013). The contribution made regarding how these firms manage crises generated from external disruptions is central to understanding the resources and capabilities that support the longevity of these companies. In relation to specific research on COVID-19 and family firms, earlier studies provide insights into these firms' responses to the upheavals brought about by the pandemic from a broad management perspective. In contrast, our research specifically concentrated on the commitment and management of human resources, recognizing it as a crucial factor influencing these firms' capacity to navigate this abrupt external disruption.

A second important contribution to theory is to the literature on family business resilience (Danes et al., 2009; Salvato et al., 2020). Previous research has provided insights into these firms' ability to manage organizational decline and sustain their business (Llanos-Contreras and Jabri, 2019). Other studies have shown strategies and mechanisms developed by family firms to navigate financial distress and minimal financial rewards (Glover and Reay, 2015). More recently, research has informed on the mechanisms, strategic logic, and motivations behind a family firm's strategic evolution to support sustainable longevity (Welsh et al., 2023). Our study suggests that job satisfaction is critical for these firms' resilience and continuity. It indicates that merely being a family-owned business does not automatically ensure increased job satisfaction when the organization encounters an external disruption and needs to be resilient and adapt to a new context. This outcome is achievable only when both employees' affective commitment and effectively managed (reduced) burnout are in place.

Ultimately, this research adds value to the exploration of human resources management in family businesses (Lambrechts and Gnan, 2022; Pelaez-Leon and Sanchez-Marin, 2023) by pinpointing and examining specific resources that confer advantages to these firms,

such as employee affective commitment. Additionally, the study verifies their capability to maintain lower levels of burnout compared to non-family firms when confronted with external disruptions. A recent work by Christensen-Salem et al. (2021) addresses the debate on whether family firms offer better or worse work environments than non-family firms. Drawing from socioemotional wealth theory and the behavioral agency model, they argue that family owners aim to enhance organizational caring perceptions among employees. Our study suggests that such perceptual conditions would provide an important advantage when family firms face stressful scenarios caused by external shocks. Similarly, we found that under a scenario of external shock, family firms have a superior ability to manage burnout. Recent research from Peláez-León and Sánchez-Marín (2022) indicates that family firms implement High-Performance Human Resources Systems (HPWS) as a mechanism to preserve their socioemotional wealth (SEW). We suggest that our finding regarding the efficient way family firms manage crises and control employees' burnout is also a mechanism to preserve socioemotional wealth. It informs on the critical role played by human resource practices not only in preserving job satisfaction but also in maintaining good levels of performance when organizations face adverse scenarios.

From a practical perspective, the study's results emphasize the critical role of employees' affective commitment and the control of burnout for family business managers in navigating challenges posed by external disruptions and contributing to the overall resilience and longevity of their organizations. Recognizing the relevance of employees' satisfaction during episodes of significant disruption is crucial for family business managers, and job satisfaction is identified as a key factor contributing to the resilience of family businesses. Managers should regularly assess and address factors influencing job satisfaction to maintain a positive work environment. Leveraging a robust position in controlling burnout and fostering employee affective commitment enables family business owners and managers to not only sustain higher levels of job satisfaction but also capitalize on business opportunities arising during external disruptions. This structural advantage positions family firms to face adversities more effectively, potentially improving their competitive position when industries confront environmental threats, competitive difficulties, and external challenges. Conversely, non-family firms can adopt strategies from family firms to preserve job satisfaction during external shocks and cultivate resilience capabilities. Creating a family-like working environment that reinforces workers' affective commitment toward the firm may prove effective for both family and non-family firms in successfully weathering external shocks. Recognizing the positive impact of a family-like environment on job satisfaction, even in the face of high-stress levels generated by events like the COVID-19 pandemic, is crucial. Both family and non-family firms can mitigate the adverse effects of external disruptions on workers' mental health, thereby safeguarding overall business performance.

7 Conclusion

In conclusion, this study conducted during the COVID-19 pandemic sheds light on the resilience of family businesses in Latin America, particularly in Chile. The findings indicate that employees in family firms experience higher levels of job satisfaction when confronted with the challenges of the pandemic. This observation suggests that the working environment fostered by family firms in the sample exhibits greater resilience to unexpected external shocks. Consequently, it is inferred that family firms establish a distinctive and robust organizational climate, proving particularly advantageous in facing adversities arising from external disruptions. Crucially, the study reveals that this advantage is achieved through affective commitment and controlled burnout as mediating variables. Theoretical implications propose that these variables play a crucial role in enabling these firms to navigate external disruptions. Affective commitment is regarded as a resource advantage, representing a foundational condition that offers a structural edge challenging for non-family firms to replicate. On the other hand, the family firms' capacity to manage burnout is seen as rooted in their proficiency in handling organizational processes, particularly in stressful scenarios, as suggested by prior research. This underscores the importance of resource asymmetries and organizational process management at the occupational health level in preserving employee satisfaction under challenging circumstances.

7.1 Limitations and future research

Workers' perceptions of the severity of disruptive events can influence their evaluation of organizational support, and future studies could explore how such perceptions affect preferences for family-like working environments. Additionally, the study did not consider new workplace configurations like remote work implemented during the COVID-19 pandemic. An interesting avenue for research is investigating how remote work influences the benefits of a family-like environment during a pandemic. Changes in employment contracts, such as salary reductions, may also impact perceptions of organizational support and job satisfaction. This raises questions about how evolving workplace dynamics and contractual changes interact with the advantages of a family-like working environment in sustaining employee well-being during challenging circumstances. Exploring these aspects would contribute to a more comprehensive understanding of the dynamics between disruptive events, work configurations, and organizational support.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

MI: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. NA-V: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. OL-C: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The dark side of mobile work during non-work hours: moderated mediation model of presenteeism through conservation of resources lens

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Owing to the development of Information and Communication Technology (ICT) and the inevitability of telecommuting in the COVID-19 environment, the boundary between working and non-working hours has become blurred. mWork, that is, ICT-based off-hour work, which has increased through the pandemic, affects employees' work attitudes, such as presenteeism. Hence, we designed a study to investigate the antecedents and mechanisms of employee presenteeism from the perspective of the conservation of resources theory. We supported our hypothesis using a sample of 325 Korean office workers obtained through three rounds of time-delay surveys. The results show that presenteeism is higher among employees with high mWork. In addition, employees' mWork increases sleep deprivation and presenteeism, and the exchange ideology of employees reinforces the positive effect of sleep deprivation on presenteeism. Additionally, the higher the level of exchange ideology, the stronger the mediating effect of mWork on presenteeism through sleep deprivation. This study verified the conservation of resources theory by identifying the mechanism by which mWork affects an employee's life, which in turn affects their work, and provides practical implications for managing productivity loss due to presenteeism.

KEYWORDS

mWork, presenteeism, sleep deprivation, exchange ideology, conservation of resource theory

1 Introduction

Recently, organizations have been facing fierce global competition and rapid environmental changes, which have had a great impact on the work and life of their members. In particular, the development of Information and Communication Technology (ICT) has enabled the expansion of workspace and time, resulting in both positive and negative effects (1, 2). In other words, ICT makes it possible to overcome the limitations of time and space, facilitate interaction, promote collaboration, and increase productivity (3). However, from the perspective of workers, the development of ICT can lead to an imbalance between work and life, blurring the boundaries between work and daily life and the roles performed by an individual (4–7). Under such circumstances, the impact of mWork on workers' lives is becoming increasingly important (8).

mWork refers to the ICT-based off-hour work (8). There is a lack of research on the negative aspects of the ICT-based work environment even though the performance of work outside of working hours enabled by ICT can cause job stress and negative work attitudes from the employee's perspective. In particular, it has been revealed that changes in the working environment due to the use of ICT can cause technostress, which is related to presenteeism and has recently become an issue (9, 10). Moreover, previous studies have suggested that the use of mobile devices induces sleep deprivation (11–13), which is known to be an important cause of presenteeism (14, 15). Also, using mobile devices at night disrupts sleep, leading individuals to start work in a tired state the next morning (16). Nevertheless, the compulsion for continuous connection, both work-related and non-work-related, provides a motive to keep using mobile devices at night (17). In a ubiquitous environment where individuals' daily lives take place, their leisure and sleep times are decreased (18). This highlights the dark side of mobile work, contrasting with the efficiency gained through the development of information and communication technology.

Presenteeism refers to a state in which an employee goes to work despite having a health problem and works in a state in which attention or concentration is reduced (19, 20). Employees working long hours in physically and mentally uncomfortable conditions can develop low morale or mental health issues due to stress. Furthermore, such conditions can result in a loss of productivity and a depressed organizational atmosphere which can negatively affect organizations (21, 22). Recently, presenteeism is attracting greater attention with the emergence of the concept of "quiet quitting" (23), which refers to a limited commitment to work at the company, reflected in doing only the minimum assigned tasks and no more, and putting personal resources to work at a minimum. According to longitudinal data on US workers compiled by Gallup (24), 2022 is the year with the lowest level of engagement in the past decade. This trend is the strongest among generation Z and younger millennials, who will play an increasingly large role in organizations in the future (25). The degree of immersion in an individual's organization is influenced by personal characteristics such as exchange ideology (26).

The implications of presenteeism extend beyond organizational productivity; it significantly affects the quality of life of the employees (27). Thus, understanding its precursors and underlying mechanisms is crucial (28). Several studies on presenteeism have paid attention to the motives or antecedents of presenteeism. Though several studies have focused on this issue, Lohaus and Habermann (29) argued that there is a lack of empirical research explaining the process of reaching the state of presenteeism in a theoretical framework and that more research on it is needed. Addressing this gap, our study explores the interplay of sleep deprivation and exchange ideology in the nexus between mWork and presenteeism, through the lens of Conservation of Resources theory. This theory posits that individuals strive to accumulate and safeguard their resources, experiencing stress, job dissatisfaction, and a profound sense of loss when confronted with potential or actual resource depletion (30). Consequently, they endeavor to minimize resource loss and recoup any losses, actively seeking to bolster their resource reserves (30).

The Job Demand-Resource (JD-R) model, an extension of the Conservation of Resources theory, offers insights into various job performance scenarios (31). It suggests that when job demands exceed the available resources, leading to physical and mental strain, employees' performance suffers (31, 32). Therefore, to enhance employee quality of life and performance, organizations should focus on balancing job demands with available resources, considering work methodologies and employee characteristics. Our study delves into how factors like mWork, sleep deprivation, and exchange ideology contribute to presenteeism, informed by both the Conservation of Resources theory and the JD-R model.

2 Theoretical background and hypotheses

2.1 mWork and presenteeism

The advancement of ICT fundamentally changes when, where, and how employees work (33). Being connected to work through mobile devices outside of work hours can potentially pose problems for employees (8). When engaging in mWork, individuals invest their personal time, adapt to and handle interruptions, expend energy addressing these disturbances, and manage multiple tasks simultaneously (34).

mWork enables various types of work to be performed without time constraints and anywhere, easily extending work into non-work domains (35). However, such prolonged work activities limit work recovery, leading to long-term tension, sleep issues, and exhaustion (36, 37). In these circumstances, employees lose the opportunity for adequate rest and fatigue recovery, making it difficult to engage in work.

Overwork is a well-known cause of presenteeism (38). Presenteeism refers to a situation where employees are physically at work but unable to fully concentrate (39). mWork reduces free personal time and increases fatigue, depleting the employee's work resources and hindering their ability to concentrate on work. Hence, mWork leads to an increase in presenteeism. Therefore, we propose the following hypothesis:

> *Hypothesis 1 (H1)*: mWork will have a positive (+) relationship with presenteeism. That is, as mWork increases, presenteeism will increase.

2.2 The mediating role of sleep deprivation in the relationship between mWork and presenteeism

Long-term work in a physically or mentally uncomfortable state due to organizational factors can lead to stress, reduced morale, and mental health threats, ultimately having a negative impact on productivity and organizational atmosphere. Previous study found that the more one does not get adequate sleep, the more one loses energy and vitality, which causes emotional exhaustion and fatigue (40).

Lack of sleep reduces job satisfaction and simultaneously causes job burnout (41). The use of mobile devices causes sleep deprivation, which causes fatigue and disease, poor health and presenteeism (11, 15). Presenteeism is forcing yourself to go to work despite being in poor health, and individual psychological symptoms such as worker fatigue, exhaustion, depression, and sleep disorders caused by sleep

deprivation, and physical symptoms such as gastrointestinal and cardiovascular diseases, negatively affect work performance, causing presenteeism (42).

Recent studies have empirically demonstrated that sleep deprivation increases presenteeism and emotional problems (43, 44). From the background discussed above, sleep deprivation is predicted to mediate the relationship between mWork and presenteeism. Therefore, we propose the following hypothesis:

> *Hypothesis 2 (H2)*: Lack of sleep will positively mediate the relationship between mWork and presenteeism. In other words, mWork will increase employee presenteeism by increasing sleep deprivation.

2.3 Moderating role of exchange ideology

Exchange ideology refers to the degree of individual belief that work efforts should differ depending on the degree of treatment received from an organization (45, 46). Employees with low exchange ideologies are less sensitive to the organization's treatment, and the degree of effort they put into work does not change significantly. However, employees with high exchange ideologies do not work hard if they feel that the organization's treatment is bad or unfair. Johns (20) revealed that the relationship between health status and presenteeism is regulated by variables such as organizational fairness perceived by employees and attitude toward work.

In particular, exchange ideology is becoming an important factor in understanding GenZ and millennial young employees, who are occupying an increasing weight in the organization and establishing the management direction of the organization (25). As the term "quiet quitting" implies, the phenomenon of limited participation and immersion in work at a company, doing only the minimum assigned work and no more, and trying to put the individual's resources to the minimum is rampant in workplaces. It is influenced by personal characteristics such as exchange ideology (47).

Previous research indicates that sleep deprivation in employees depletes self-regulatory resources, increasing deviant and unethical behaviors at work. However, this process is influenced by individual control motives and efforts, such as self-control, perceived power, goal orientation, and social influence. Subjective norms, a key component of social influence, are formed by the social pressure of reference groups and the motive to conform to their intentions. High exchange ideology indicates a tendency to respond based on one's subjective reward perception rather than conforming to the group's intentions. Therefore, from the perspective of Conservation of Resources theory, the relationship between sleep deprivation and negative organizational behaviors like the presenteeism is influenced by the degree of an individual's transactional attitude in deciding whether to expend resources on self-regulation.

Based on this theoretical background and previous research, it can be hypothesized that employees with a high exchange ideology are likely to perceive the increase in sleep deprivation due to mWork as less fair and will expend fewer resources for self-regulation against negative behaviors resulting from sleep deprivation. Thus, as exchange ideology increases, the relationship between sleep deprivation and an increase in presenteeism is likely to be strengthened. Therefore, we propose the following hypothesis:

> *Hypothesis 3 (H3)*: The exchange ideology will statically regulate the relationship between sleep deprivation and presenteeism. In other words, the higher the exchange ideology level, the stronger the effect of sleep deprivation on presenteeism.

2.4 Moderated mediation model of exchange ideology

Summarizing the above hypotheses, it can be said that mWork increases sleep deprivation, and increased sleep deprivation increases presenteeism. In this process, exchange ideologies play a controlling role. Exchange ideology is an employee's sensitivity to an organization's treatment (26), and employees with high exchange ideology respond with less effort and commitment if they feel that they are being treated unfairly by the organization (47).

Sleep deprivation due to mWork is an instance of poor treatment received from the organization by employees, which depletes individual job resources. Therefore, exchange ideology reinforces the effect of mWork in increasing presenteeism through sleep deprivation. As the level of exchange ideology increases, sleep deprivation, which acts as a parameter in the relationship between mWork and presenteeism, also increases, and the static relationship between mWork and presenteeism becomes stronger. Therefore, we propose the following hypothesis:

> *Hypothesis 4 (H4)*: The mediating effect of sleep deprivation on mWork and presenteeism depends on the level of exchange ideology, which will positively (+) regulate the mediating effect of sleep deprivation. In other words, the higher the level of exchange ideology, the higher the mediating effect of mWork on presenteeism through sleep deprivation.

The hypothetical research model is in Figure 1.

3 Materials and methods

3.1 Sample

In this study, to minimize the bias of the common method that may occur due to the cross-sectional survey (48, 49), the survey was conducted in three rounds by dividing the variables with a time difference of one month (50). The survey subjects were randomly selected from an online panel composed of office workers working with bosses in Korean companies. Before responding to the survey, the purpose and procedure of the study, the freedom to withdraw from the survey at any time, and the benefits and disadvantages that may occur when participating were explained to the participants. Thereafter, we asked them to sign an informed consent form and collected data only from respondents who signed it.

The first survey was conducted with 1,200 people via e-mail in December of 2022, and a total of 672 responses were obtained, excluding unreliable responses. In January of 2023, the second survey

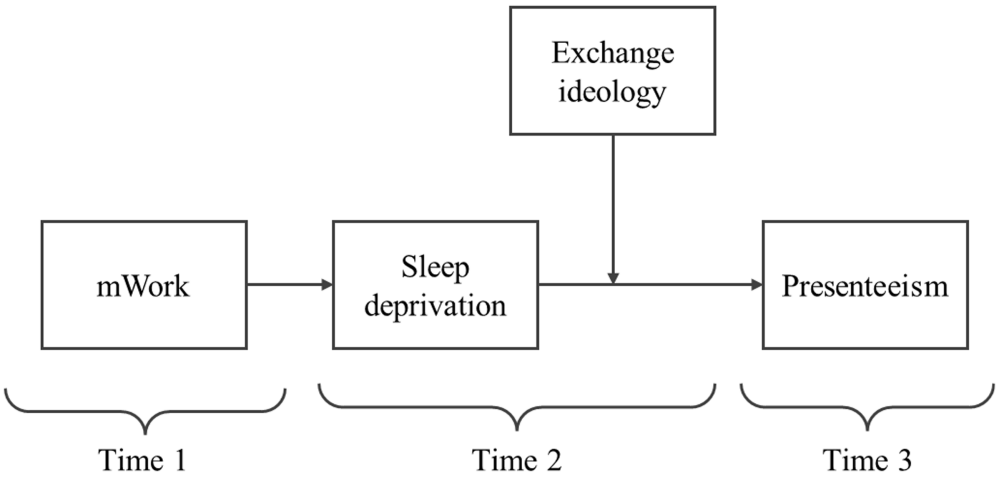

FIGURE 1
Theoretical model of study. Time 1: mWork; Time 2 (4 weeks after Time 1): sleep deprivation, exchange ideology; Time 3 (4 weeks after Time 2): presenteeism.

was sent via e-mail to 672 respondents who had completed the first survey and a total of 450 responses were obtained, excluding unreliable responses. In February of 2023, the third questionnaire was sent to the 450 respondents who had completed the second questionnaire and a total of 325 responses were obtained, excluding unreliable responses. We examined whether there were statistically significant differences in gender and tenure among participants in Waves 1, 2, and 3. Our analysis revealed no significant differences in gender and tenure across the participant groups in Wave 1, 2, and 3. Therefore, we can infer that the likelihood of sample bias introduced by dropouts was minimal.

Of the 325 respondents analyzed in this submission, 50.2% were female and 49.8% were male. The mean age of the respondents was 41.8 years (SD = 11) years. The final education level was four years for university graduates (53.2%), two years for college graduates (20.9%), high school graduates (18.8%), master's graduates (5.6%), and PhD holders (1.5%). The average tenure at the current company was 7.7 years (SD = 6.8). 55% of respondents were married and 45% were unmarried.

3.2 Measures

The participants graded the survey items for the research variables using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The measurement items were originally written in English, and after being translated into Korean, they were subjected to professional review and correction. The validity of the Korean survey was, thereafter, verified through reverse translation into English, where the resemblance of linguistic structure and meaning with the original text was contrasted (see Appendix) (51).

3.2.1 mWork

We used the three items developed by Ferguson et al. (8) to assess the frequency with which individuals engage in mWork during off-hours. An example of a question item is, "I often go to work after work or on weekends using a smartphone or a laptop computer." Cronbach's alpha was 0.92.

3.2.2 Sleep deprivation

We used the four items developed by Barnes et al. (52) to assess sleep deprivation, indicating poor sleep quantity and quality. An example of a survey item is, "I wake up feeling tired and exhausted after sleeping as much as usual." Cronbach's alpha was 0.83.

3.2.3 Exchange ideology

We used the four items developed by Redman and Snape (46) to assess exchange ideology. An example of a question item is, "The degree of effort of members should depend on the degree to which the organization treats them." Cronbach's alpha was 0.87.

3.2.4 Presenteeism

We used two items developed by Johns (53) to assess presenteeism. An example item is "Looking back on the past 6 months, did you often go to work without being able to rest at home even if you were not feeling well?" Cronbach's alpha was 0.92.

3.2.5 Control variable

To confirm the relationship between the variables presented in the research model, female, age, educational background, tenure of employment, and marital status were used as control variables by referring to previous studies dealing with similar research variables (54).

3.3 Common method bias

To minimize the possibility of common method bias, the survey was conducted over three rounds with a time difference, and all responses were measured from all rounds of valid respondents. As a result of performing Harman's single factor test on the survey result ($n = 325$), which is the subject of analysis of this manuscript, the ratio of the first factor was 30.50%, indicating that the research data did not suffer from the serious problem of common method variance (55).

TABLE 1 Means, standard deviations, and correlations.

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1. Female	0.50	0.50	–								
2. Age	41.78	10.97	−0.09	–							
3. Education	2.50	0.92	−0.14*	0.03	–						
4. Tenure	7.67	6.84	−0.12*	0.44***	0.01	–					
5. Marital status	0.55	0.50	−0.13*	0.47***	0.10	0.27***	–				
6. mWork	2.45	1.04	−0.05	0.06	0.21***	0.07	0.08	(0.92)			
7. Sleep deprivation	2.94	0.88	0.12*	−0.07	−0.12*	−0.07	−0.04	0.15**	(0.83)		
8. Exchange ideology	3.52	0.78	0.13*	−0.23***	0.09	−0.19**	−0.13	−0.05	0.09	(0.87)	
9. Presenteeism	2.76	1.10	0.18**	−0.04	−0.10	0.09	−0.03	0.29***	0.35***	0.15**	(0.92)

$n = 325$; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two-tailed); the values in parentheses denote Cronbach's alphas; Female, male = 0, female = 1; Age = years; Education = highest education level achieved: 1 = high school graduates, 2 = 2 years of college graduates, 3 = 4 years of university graduates, 4 = master's graduates, 5 = Ph.D. holders; Tenure = organizational tenure (year); Marital status, unmarried = 0, married = 1.

TABLE 2 Model fit statistics for the measurement models.

Model	χ^2(df)	CFI	TLI	RMSEA	$\Delta\chi^2(\Delta df)$
Hypothesized four-factor model	143.54(88)***	0.976	0.966	0.044	
Alternative 1 (three-factor model)[a]	523.52(96)***	0.816	0.759	0.117	379.98(8)***
Alternative 2 (two-factor model)[b]	1,026.83(103)***	0.603	0.514	0.166	883.29(15)***
Alternative 3 (one-factor model)[c]	1,764.67(109)***	0.288	0.177	0.217	1,621.13(21)***

$n = 325$, ***$p < 0.001$.
[a]Three-factor model with sleep deprivation and presenteeism on the same factor.
[b]Two-factor model with sleep deprivation, exchange ideology and presenteeism on the same factor.
[c]One-factor model with mWork, sleep deprivation, exchange ideology and presenteeism on the same factor.CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation.

3.4 Analysis strategy

We performed CFA to determine model validity and hierarchical regression analysis to test the study hypotheses using STATA 17.0 (Stata Corp., College Station, TX, United States). We followed Hayes's (56) recommendations when using the bootstrapping approach to test the mediating and moderated mediation hypotheses.

4 Result

4.1 Descriptive statistics

The means, standard deviations, correlations, and Cronbach's alpha values are presented in Table 1. It can be confirmed that there are significant correlations between the research variables, consistent with our hypothesis.

4.2 Confirmatory factor analysis

Table 2 shows that confirmatory factor analysis was conducted to verify the construct validity of the study variables. The resultant chi-square/degree of freedom was 1.74, which is less than the cutoff value of 3.00, and the comparative fit index (CFI) and Tucker Lewis index (TLI) were 0.98 and 0.97, respectively (0.95 is the preference criterion) (57). In addition, the Root Mean Square Error of Approximation (RMSEA) was 0.04, which is lesser than the minimum standard of 0.08 and lower than the preferred standard of 0.05 (57). Judging by the goodness-of-fit index, the goodness of fit of the 4-factor model assumed in this study was very good. By setting and comparing three alternative models, it was confirmed that the 4-factor model was the most appropriate. AVE (Average Variance Extract) and CR (Composite Reliability) values of all variables satisfied the standard values (AVE > 0.5, CR > 0.7), and the correlation coefficient between each variable was lower than the square root of AVE (58). Additionally, all standardized factor loadings of the predictors had a cutoff of 0.50 or higher (58).

4.3 Hypothesis testing

Hierarchical multiple regression analysis was performed to verify Hypotheses 1 and 3, and Hypotheses 2 and 4 were verified using bootstrapping (56). First, as shown in Model 4 in Table 3, there was a significantly positive (+) relationship between mWork and presenteeism ($\beta = 0.33$, $p < 0.001$), and Model 4 was significantly more explanatory than Model 3 (Model 3, ➔ Model 4: $\Delta R^2 = 0.11$, $\Delta F = 38.50$, $p < 0.001$). Therefore, Hypothesis 1 is supported.

Next, 10,000 bootstraps were performed to verify Hypothesis 2. As a result of the bootstrap analysis (see Table 4), which does not depend on the normal sampling distribution assumption, the indirect effect was 0.06. The upper limit of the 95% confidence

TABLE 3 Hierarchical multiple regression results for sleep deprivation and presenteeism.

Variable	Sleep deprivation		Presenteeism			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	0.10	0.10	0.18**	0.18***	0.153**	0.141**
Age	−0.05	−0.06	−0.09	−0.10	−0.08	−0.05
Education	−0.11*	−0.15**	−0.07	−0.14*	−0.09	−0.10
Tenure	−0.04	−0.05	0.15*	0.13*	0.15**	0.14**
Marital status	0.02	0.01	0.01	−0.01	−0.01	0.00
mWork		0.19***		0.33***	0.27***	0.26***
Sleep deprivation					0.29***	0.28***
Exchange ideology						−0.21
Sleep deprivation × exchange ideology						0.12*
R^2	0.03	0.07	0.05	0.15	0.23	0.26
ΔR^2		0.04		0.10	0.08	0.02
adj R^2	0.01	0.09	0.04	0.14	0.22	0.24
F	2.14	3.86***	3.71**	9.87***	13.78***	12.58***
F_{inc}		12.10***		38.50***	31.57***	6.65**

$n = 325$, *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed test). The results are standardized regression coefficients.

TABLE 4 Result of indirect effect test by bootstrapping.

Mediator	Dependent variable: presenteeism			
	Indirect effect	SE	95% CI	
			LLCI	ULCI
Sleep deprivation	0.06	0.02	0.02	0.10

$n = 325$, Bootstrap sample size = 10,000.
SE, standard error; CI, Confidence Interval; LLCI, lower limit of confidence interval; ULCI, upper limit of confidence interval.

interval was 0.10 and the lower limit was 0.02; thus, zero was not included in the confidence interval. Therefore, Hypothesis 2 is supported.

Hypothesis 3 is confirmed in Model 6 in Table 3. Presenteeism had a significant relationship with the interaction term of sleep deprivation and exchange ideology ($\beta = 0.12$, $p < 0.05$), and the explanatory power of Model 6 was higher than that of Model 5 (Model 5: ➔ Model 6: $\Delta R^2 = 0.03$, $\Delta F = 6.65$, $p < 0.01$). We illustrated the interaction pattern in Figure 2. Following Aiken and West's suggestion, we conducted a simple slopes test and the results showed that the positive relationship between sleep deprivation and presenteeism was stronger at a high level of exchange ideology ($b = 0.48$, $p < 0.001$) than at a low level ($b = 0.22$, $p < 0.01$) (59). Second, the slopes of the two lines were significantly different ($p < 0.05$) (59). Therefore, Hypothesis 3 is supported.

Finally, Hypothesis 4 was tested. To evaluate the indirect effect, bootstrapping was applied with 10,000 samples, and the indirect effect of mWork on presenteeism through sleep deprivation was estimated at high (+1 SD) and low (−1 SD) levels of exchange ideology. The results in Table 5 show that the indirect effect is stronger at the high level (indirect effect = 0.07, SE = 0.02, 95% CI [0.01, 0.12]) of exchange ideology than at the low level (95% CI [−0.00, 0.06] including zero, not significant). Therefore, Hypothesis 4 is supported.

5 Discussion

5.1 Summary

This study attempted to confirm four hypotheses on the antecedent factors and influence processes of presenteeism from the perspective of the conservation of resources theory. First, we confirmed the relationship between mWork and presenteeism. Moreover, mWork was found to have a positive effect on members' presenteeism. Second, by examining the mediating role of sleep deprivation in the relationship between mWork and members' presenteeism, it was found that sleep deprivation mediated the influence of mWork on presenteeism. Third, the moderating effect of exchange ideologies on the relationship between sleep deprivation and presenteeism was verified. Exchange ideologies have been shown to regulate relationships in a positive (+) way. Finally, due to the verification of the moderated mediating effect, it was confirmed that the indirect effect of mWork on presenteeism mediated by sleep deprivation was stronger when the level of exchange ideology was higher.

5.2 Theoretical implications

This study contributes to the expansion of resource conservation theory and the identification of the mechanism of presenteeism by presenting several important implications. The conservation of resource theory explains how an individual's behavior and attitudes toward organizations are influenced by their resource levels in different environments. The COVID-19 pandemic has led to a significant increase in mobile work, including telecommuting and non-face-to-face work. However, if mobile work continues even after the pandemic ends and face-to-face work resumes, it may result in a lack of sleep, which is a crucial personal resource

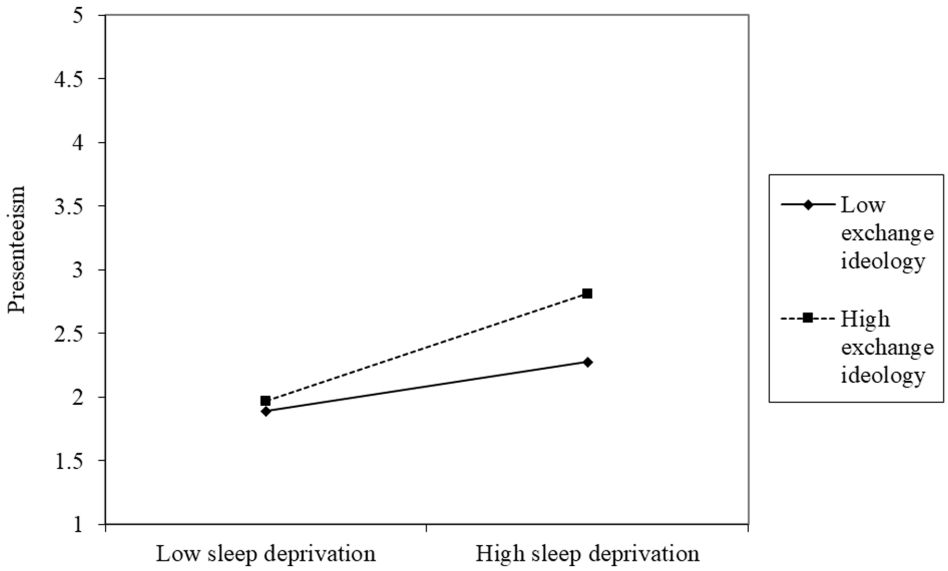

FIGURE 2
The moderating effect of exchange ideology level on the relationship between sleep deprivation and presenteeism.

TABLE 5 Results of conditional indirect effect test by bootstrapping.

Moderator	Level	Dependent variable: presenteeism			
		Indirect effect	SE	95% CI	
				LLCI	ULCI
Exchange ideology	Low (−1 SD)	0.03	0.02	−0.00	0.06
	High (+1 SD)	0.07	0.03	0.01	0.12

$n = 325$, Bootstrap sample size = 10,000.
SD, standard deviation; SE, standard error; CI, confidence Interval; LLCI, lower limit of confidence interval; ULCI, upper limit of confidence interval.

according to the resource conservation theory. Prior research has demonstrated that both work and non-work deviations increase due to constant connectivity to work through information and communication technology, even when not working (60). By applying the theory of resource conservation, this study contributes to the understanding of the relationship between presenteeism and the depletion of personal resources, particularly with regard to mobile work triggered by COVID-19 which continuously affects employee sleep.

First, the relationships between mWork, exchange ideology, sleep deprivation, and presenteeism were verified. Following various previous studies on presenteeism, this study applied the perspective of resource conservation to clarify the structure and relationship of variables based on theory. According to Lohaus and Habermann (29), though many studies tried to find out what the elements related to presenteeism are, most end up listing research results without a theoretical analysis framework or analyzing them based on theory. Moreover, several attempts have been made to theorize inversely by explaining the relationship between variables from the results obtained through analysis. However, it can be seen as a positive phenomenon that research on presenteeism is active and more empirical data are being accumulated (23, 32). This study bridges the existing research gap, expands the theoretical basis for presenteeism, and contributes to the accumulation of in-depth knowledge.

Second, this study revealed the mediating role of sleep deprivation in the relationship between mWork and presenteeism. Engaging in mWork means being simultaneously present in two different spaces and times. That is, one is involved both in the workplace and outside of it, during family time and working hours (61). This blurs the boundaries between work and non-work locations, and between work and personal time, potentially leading to an intrusion into personal life. Indeed, studies on individuals who have experienced remote work during the COVID pandemic have shown that the blending of work and home life in such settings has led to challenges in both domains (62, 63). By revealing that mWork has a great influence on the lives of employees outside of work and can bring about presenteeism through the invasion of personal time and sleep deprivation through the use of mobile devices, an explanation for the other side of work performance using information technology was presented.

Finally, this study contributes to the expansion of Conservation of Resources theory by empirically demonstrating that the relationship between sleep deprivation and presenteeism is moderated by exchange ideology. Individuals strive to acquire and maintain various job resources, but their response to factors that deplete these resources can manifest as presenteeism, with the relationship being strengthened as the level of exchange ideology increases. Specifically, this research proposes that the extent to which an employee's sleep deprivation manifests as negative behavior toward the organization varies based

on the individual's input of self-regulation resources (64, 65), which can differ according to their level of exchange ideology. Additionally, the study explains within the framework of Conservation of Resources theory how exchange ideology moderates the entire mechanism by which mWork increases presenteeism through sleep deprivation.

This demonstrates that in a management environment where there is an increased emphasis on fairness and heightened sensitivity to resource depletion, exchange ideology, closely related to gender and age, acts as a moderating variable in the relationship between sleep deprivation and presenteeism caused by mWork. This empirical evidence of the role of exchange ideology extends the application of Conservation of Resources theory, providing cues for follow-up studies.

5.3 Practical implications

In modern organizations, presenteeism is an important management factor related to the quality of life of employees and the productivity of the organization. According to previous studies, presenteeism leads to a decrease in individual productivity and work ability (66). Also, presenteeism can lead to low job satisfaction and work engagement (67). Regarding the impact of presenteeism on organizations, there is empirical evidence of the hidden costs of lost productivity (68). Our research examines mWork, sleep deprivation, and exchange ideology as antecedent factors of presenteeism and identifies the mechanisms through which each of these variables influences presenteeism. This provides valuable insights for managers and human resource personnel, offering clues to devise practical strategies for reducing presenteeism in the workplace.

The practical implications of this study are as follows. Firstly, by empirically demonstrating that mWork can be a precursor to presenteeism in the context of job resources, this research advises organizations on the efforts needed to reduce presenteeism among their members. High levels of mWork can deplete an employee's work resources, leading to increased presenteeism, which significantly affects organizational performance. This study particularly highlights the mediating role of sleep deprivation in the relationship between mWork and presenteeism. This suggests that sleep deprivation, as a consequence of mWork, is not only an outcome variable but also a factor that leads to the depletion of work resources. Therefore, mWork management that reduces employees' commuting time and ensures adequate sleep, thereby improving individual quality of life and preventing organizational productivity loss, is necessary.

Secondly, this research illustrates how exchange ideology modulates the relationship between mWork, sleep deprivation, and presenteeism, taking into account the characteristics of the younger generation, which is increasingly significant within organizations. This implies that the rise in presenteeism could have a more substantial impact on younger generations, necessitating practical solutions. Specifically, it provides important insights into maintaining the benefits of ICT while minimizing its adverse effects. For example, it is crucial to assess whether mWork is essential for each department and task, and apply policy and technical restrictions outside of necessary work hours.

Finally, the increase in internet and mobile device usage due to advancements in information and communication technology has highlighted issues with night work and sleep deprivation. Continuous work and communication with supervisors and clients based on internet and mobile devices lead to increased night work for employees. The rise in night work makes it difficult for workers to get sufficient sleep (69), which can have severe health implications, such as weakened immune systems, increased stress, memory impairments, and decreased concentration (70). Therefore, businesses and governments should regulate working hours and workloads, and limit connectivity outside work hours. For instance, France introduced the 'Right to Disconnect Law' in 2016 to ensure rest periods for workers (71). Companies can also help balance employees' personal lives and work by considering new methods of working and altering work regulations and environments (72). From this perspective, this study presents important managerial implications for businesses and governments.

5.4 Limitations and directions for future research

Although this study provides meaningful implications for both scholars and practitioners, several points can be addressed in future research. First, this study has some limitations of sampling method and scope. Although the research data obtained through three surveys with a time difference were used, there are limitations as a cross-sectional study because the measurement of each research variable was limited to individual time points. Therefore, future studies should consider a longitudinal study design. Also, this study analyzed the data measured through an online survey. In the future, other research methods, such as experiments and observations, may be employed to prove a more convincing causal relationship between variables.

Second, this study is a survey of Korean employees, it is possible that their perceptions and attitudes are influenced by their cultural background. Therefore, care must be taken when interpreting these findings and applying them to other countries and cultures. Additionally, future research on the impact of mWork on sleep deprivation and presenteeism in countries with cultural differences could enable comparisons and interpretations from new perspectives or generalizations in different cultural contexts. For example, a recent study targeting workers in New Zealand, which is expected to have cultural differences from Korea, showed that mWork increased work–family conflict among employees, consequently leading to higher turnover intention (73). Work–family conflict can cause stress, which may be linked to sleep deprivation and presenteeism. Additionally, the influence of exchange ideology in South Korea, a culture that emphasizes a sense of duty and hierarchical obedience within organizations, may differ from other countries or cultural backgrounds. The level of self-regulatory resources allocated to mitigate the effects of mWork on personal life intrusion and health issues, leading to presenteeism, can vary depending on the cultural context. Investigating how different cultural backgrounds might influence the modulation effects of various factors, including exchange ideology, on the relationship between mWork and outcome variables, also provides opportunities for diverse follow-up studies.

Third, considering the emphasis of our study on individuals either actively engaged in or having the potential for mobile work (mWork), the procurement of a sample from South Korea is deemed highly pertinent. This pertinence is attributed to the prevalent ownership of personal ICT devices among the working populace in this locale, as

demonstrated by a 97% rate of smartphone utilization among adults, which facilitates continuous connectivity for professional purposes. The prevalence of mWork in the Korean workforce is notably significant. However, for subsequent research in diverse environmental or national contexts, employing a more refined methodology in sample selection, focusing particularly on the engagement or prospective engagement in mWork, could enhance the efficacy and relevance of the research findings.

Forth, because the measurements of the research variables covered in this study were made from the same source, they are not free from concerns about the bias of the same method. Though the response time is divided by the time delay, there is a limit in that the source of the response is the same. In this study, as a result of confirmatory factor analysis, it was found that the variables of the research model were classified; however, this issue should be considered in future studies.

Fifth, this study suggests that exchange ideologies are a major moderating variable. However, it can be meaningful to confirm the moderating function of various personal characteristics in the relationship between presenteeism and antecedent variables, along with exchange ideology. Therefore, a more sophisticated research model that can reveal the mechanism of presenteeism can be established if various control variables related to individual characteristics are considered in subsequent studies.

Finally, this study utilized a subjective measurement tool to assess sleep deprivation by relying on participants' self-reported judgment. This method was deemed appropriate since it closely aligns with individual sleep deprivation experiences, considering that each person may have varying effects on their absolute sleep time. However, it has limitations as it may mistake fatigue caused by factors other than sleep for lack of sleep, and the subjective nature of responses hinders comparison with other individuals. Nonetheless, the subjective measurement was considered the most effective approach for this study, supported by previous research that found a correlation between presenteeism and productivity loss among those subjectively experiencing lack of sleep and those diagnosed with a sleep disorder (74, 75).

Other methods for measuring sleep deprivation include semi-subjective approaches that rely on self-report questionnaires to evaluate if an individual's sleep time meets a recommended standard, as well as objective approaches that involve using medical or wearable devices to measure sleep quantity and quality (75, 76). In some cases, study designs may intentionally induce sleep deprivation by requiring participants to stay awake while being measured (77). Although these methods have their advantages, the subjective measurement tool was most appropriate for this study among the three methods.

6 Conclusion

Through this study, the effect of mWork on presenteeism was analyzed from the perspective of the conservation of resources theory. We confirmed the mediating role of sleep deprivation in the relationship between mWork and presenteeism and demonstrated that exchange ideology functions as an important moderating variable in the overall influence process. In particular, the higher the level of exchange ideology, the greater the indirect effect on presenteeism through mWork-mediated sleep deprivation. Presenteeism can cause losses to organizations and individuals and requires efficient management. Therefore, organizations should strive to ensure that members with high exchange ideology can immerse themselves in their work and contribute to the creation of organizational performance through work-life balance. Despite the limitations of this study, its results provide important implications for corporate organizations that need to manage the presenteeism of members and encourage the participation of the younger generation, in particular.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Internal Review Board of Gachon University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

W-SC is the principal researcher and prepared the first draft of the article. S-WK supervised the study and refined the draft into a publishable article. SC added valuable theoretical and methodological insights based on his knowledge and expertise regarding the topic of this study. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Appendix. Measurements

mWork (α = 0.92) (8)

1. How frequently do you use a mobile device to perform your job during non-work hours?
2. To what extent do you use mobile device to perform your job during non-work hours?
3. How frequently do you use a mobile device to handle some of your work demands during non-work hours?

Sleep deprivation (α = 0.83) (52)

1. I have trouble falling asleep.
2. I have trouble staying asleep (including waking up too early).
3. I woke up several times during the night.
4. I woke up after my usual amount of sleep feeling tired and worn out.

Exchange ideology (α = 0.87) (46)

1. A person who is badly treated by a organization should give the organization less support.
2. The effort a person puts into the organization should be related to what the organization does for them.
3. If the organization fails appreciate your contribution, you should do less for the organization.

Presenteeism (α = 0.92) (53)

1. Over the past six months I have gone to work despite feeling that I really should have taken sick leave due to my state of health.
2. I have continued to work when it might have been better to take sick leave.

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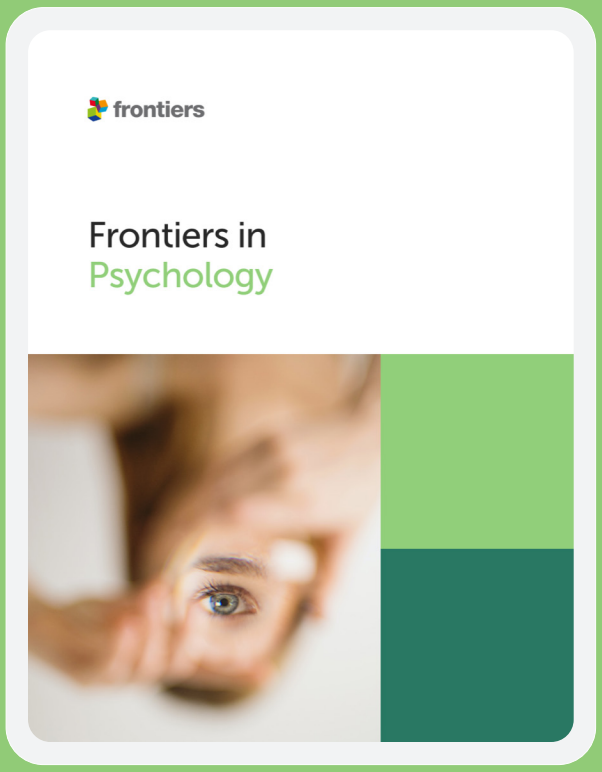

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