OCCUPATIONAL HEALTH PSYCHOLOGY: FROM BURNOUT TO WELL-BEING AT WORK

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Editorial: Occupational health psychology: From burnout to well-being at work

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occupational health psychology, burnout, workplace, wellbeing, individual characteristics, organizational characteristics

Editorial on the Research Topic
Occupational health psychology: From burnout to well-being at work

This Research Topic entitled *Occupational Health Psychology (OHP): From Burnout to Well-being at Work* tried to bring together two applied disciplines within psychology: health psychology and industrial/organizational psychology. OHP applies the psychology principles to protect health, improve the quality of work life and promote the health and wellbeing of workers (Gil-Monte, 2014). The notion of health protection in this definition refers to the analysis and interventions to reduce the toxicity of workplaces and diminish the employees demands that could impact on their health (e.g., burnout). Moreover, health promotion refers to analyses and interventions that focus on providing individuals with diverse resources to deal with different types of environments so as to guarantee their wellbeing, while at the same time encouraging healthy work environments. The workplace is a privileged context of action to promote health (Commission of the European Communities, 2005). The intense transformation of work and employment in the past decades has been contributing to changes in organizational structures and processes that are influencing the health and wellbeing of workers in their work roles, as well as in their personal and families' roles and boundaries (International Labour Organization, 2016).

The challenge of OHP in the future is to explore the positive mechanisms and simultaneously continue to study the illness and distress felt by this cohort. Both approaches are complementary and only jointly can allow a more integrative and complete understanding of the relationships between work, organization, and workers. It was an honor for us to promote such an interesting Research Topic. The number of articles (21 articles published) and the dissemination of the thematic, which includes

TABLE 1 Articles key-words and samples.

Authors	Key-words	Sample
Yin et al.	Total rewards perceptions, kindergarten teachers, organizational identification, work engagement, mediating effect	1,014 kindergarten teachers
Zhang X. et al.	Burnout, COVID-19, healthcare workers, MBI scale, frontline healthcare workers	1,163 healthcare workers
Martínez et al.	Personality, affect, coping strategies, nurses, descriptive of survey study	1,268 nurses
Baka and Prusik	Hindrance and challenge stressors, job burnout, work-family conflict, nurses, mediation effect	516 nurses
Tolonen et al.	Compassion, personality, job demand control, effort-reward imbalance, longitudinal	723 workers ≠ occupations
Makara-Studzinska et al.	Emergency service, self-efficacy, occupational burnout, perceived stress, COVID-19, emergency call-taker and dispatcher	546 call-takers and dispatchers
Zhang F. et al.	Organizational identification, psychological capital, job satisfaction, income level, residents	310 residents
Mishima-Santos et al.	Work design, wellbeing, remote work, teleworker, work from home, work characteristics, multimethod, COVID-19	1,108 teleworkers
Damasceno et al.	Work teams, innovation, emotion, emotional carrying capacity, affective commitment	138 Portuguese work teams ≠ sectors of activity
Cook and Zill	Diabetes mellitus, burnout, job satisfaction, distress, chronic illness	297 participants ≠ occupations
Gulla and Golonka	Sensory processing sensitivity, highly sensitive person, highly sensitive person scale, attention awareness, mindfulness, resilience	273 participants ≠ occupations
Tikkanen et al.	Burnout, drop-out, PhD candidate, research engagement, wellbeing	692 PhD candidates in medicine
Golonka and Gulla	Burnout, sensory processing sensitivity (SPS), highly sensitive person, Oldenburg Burnout Inventory (OLBI), Highly Sensitive Person Scale (HSPS), wellbeing	516 employees ≠ occupations
Xie et al.	Job demands, job resources, burnout, psychological distress, social workers, China	897 social workers
Upadyaya et al.	Stress, latent profile analysis (LPA), school principals, COVID-19, demands and resources	535 school principals
Figueiredo-Ferraz et al.	Burnout, feelings of guilt, psychosomatic disorders, occupational stress, teachers	1,266 teachers
Matsushita and Yamamura	Occupational health, mental health, stress response, overtime work, school teachers, job title	54,772 teachers
Li and Wu	Education, underemployment, health, endogeneity, labor	10,563 participants ≠ occupations
Zhang S. et al.	Medical students, learning passion, self-esteem, psychological capital, professional identity	1,218 medical students
Makowska-Tłomak et al.	Digital transformation stress, digital transformation, online intervention, self-efficacy, burnout, COVID-19	558 participants ≠ occupations
Yin et al.	Burnout, time-to-treatment, social support, type D personality, decision making	1,039 general participants

93 authors from more than ten countries, is the scientific validation of interest in the theoretical and empirical rationale of the current Research Topic.

The simple analysis of key-words and samples allows for the understanding of the diversity and richness of this Research Topic (Table 1), providing important contributions toward the field of occupational health psychology.

The first contribution by Ji and Cui explores the observed relations between rewards perceptions and work engagement of kindergarten teachers, and the mediating role of organizational identification. The main results show that organizational identification partially mediated the relationship between total rewards perception and work engagement.

The second contribution, published by Zhang X. et al., shows that burnout is prevalent among frontline healthcare workers fighting COVID-19. This study also explores the factors associated with burnout.

From Spain, the authors Martínez et al.bring a study that aims to analyze the relationships between the personality, positive and negative affects, and the coping strategies of nurses. Negative affects were a mediator in the relationship between personality and less adaptative strategies, whilst positive affects had a strong impact on the development of positive strategies.

The 1-year cross-lagged Baka and Prusik study investigates the effects of five types of job demands related to challenge and

hindrance stressors on job burnout as well as the mediational role of work family conflict in Polish nurses.

The study *Rewards of compassion: Dispositional compassion predicts lower job strain and effort-reward imbalance over a 11-year follow-up* developed by Tolonen et al. examines (i) whether dispositional compassion predicts job strain and effort-reward imbalance (ERI) or the predictive relationship run from job strain and ERI to dispositional compassion and (ii) the effect of dispositional compassion on the developmental trajectory of job strain and ERI over a 11-year follow-up (2001–2012).

The study by Makara-Studzinska et al. is focused on the relationship between stress, burnout and employee personal resources in a sample of 546 call-takers and dispatchers from 14 public-safety answering point in Poland.

The study published by Zhang F. et al. analyzed the mediating effect of organizational identification on the relationship between psychological capital and job satisfaction.

Mishima-Santos et al. presented a study that analyzed work characteristics in remote work to wellbeing, using a two-stage multi-method approach.

The aim of the research published by Damasceno et al. is centered on the relationship between emotional carrying capacity and group innovation, considering affective commitment as the mediating variable with a sample composed of 625 members and their respective leaders.

Cook and Zill investigated the association between diabetes-related distress and work outcomes (burnout and job satisfaction) among employed people with type 1 diabetes.

The study published by Gulla and Golonka shows significant relationships between sensory processing sensitivity and resilience.

Tikkanen et al.'s study focused on exploring individual variations in medicine doctoral candidates' wellbeing, in terms of experienced research engagement and burnout by using a person-centered approach.

A study with social workers developed by Xie et al. supported a dual process by which JD-R affected both social workers' burnout and psychological distress through health impairment and motivation processes.

Upadyaya et al. study examined three latent profiles of school principals' stress concerning stress concerning the ability of students, teachers, parents and principals to cope during the COVID-19 pandemic: *high stress*, *altered stress* and *low stress*.

The results obtained in the study by Figueiredo-Ferraz et al. provide empirical evidence for the mediator role of guilt in the relationship between the burnout syndrome and psychosomatic disorders in a sample of teachers from Spain and Portugal, and they contribute to the empirical validation of the model of burnout developed by Gil-Monte (Gil-Monte, 2005).

The contribution of Matsushita and Yamamura examines the working hours of junior high school teachers in public schools and investigates the association between overtime work and stress responses across job titles.

Results from Li and Wu show that underemployment is significantly related to the decline of self-rated health, increased depressive tendencies, and the prevalence of illness over a certain period.

The Cross-Sectional Study of Individual Learning Passion in Medical Education developed by Zhang S. et al. demonstrates that self-esteem significantly and positively influenced medical students' PsyCap, which fully mediated the relationship between self-esteem and harmonious learning passion.

Makowska-Tłomak et al. bring a contribution related with a Blended Online Intervention based on cognitive behavioral therapy and social cognitive therapy.

Finally, Yin et al.'s study shows, for instance, that age, job burnout and worrying about expenditure were the three determinants for prehospital decision delay.

The Research Topic "*Occupational health psychology: From burnout to well-being at work*" presents considerable wealth in terms of the heterogeneity of authors and countries with contributions. In addition, the diversity of professional groups covered in the research and thematic areas is significant. We consider, therefore, that we have successfully achieved our objective by providing an opportunity for the sharing of interesting results and future avenues of research and applied implications regarding Occupational Health Psychology. The new avenues of research in this area need the contribution of each one of you for their recognition, not least because the improvement of work environments contributes to the health and wellbeing of workers and the healthy performance of organizations.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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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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Relationship Between Total Rewards Perceptions and Work Engagement Among Chinese Kindergarten Teachers: Organizational Identification as a Mediator

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Kindergarten teachers' engagement in work is influenced by many factors. Total rewards perceptions, as an individual's evaluation of the rewards provided by the organization, may promote work engagement when it can meet their intrinsic and extrinsic work demands. To explore the relationship between kindergarten teachers' total rewards perceptions and work engagement, and the mediating role of organizational identification, a survey was conducted among 1,014 kindergarten teachers applying the Chinese versions of the Total Rewards Perceptions Scale for Kindergarten Teacher, Kindergarten Teacher Organizational Identification Scale, and Kindergarten Teacher Work Engagement Scale. The results showed that kindergarten teachers' total rewards perceptions and its four factors were positively correlated with organizational identification and work engagement. Organizational identification was positively related to work engagement. Organizational identification partially mediated the relationship between total rewards perception and work engagement among kindergarten teachers. We discussed the result of the relationship between total rewards perceptions, organizational identification, and work engagement among Chinese kindergarten teachers.

Keywords: total rewards perceptions, kindergarten teachers, organizational identification, work engagement, mediating effect

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INTRODUCTION

In the past decades, there has been a growing interest in work engagement as research found that engagement is related to meaningful outcomes (Soares and Mosquera, 2019). Work engagement represents a positive, fulfilling, work-related state of mind that is characterized by vigor (high levels of energy and mental resilience), dedication (work involvement, enthusiasm, and inspiration), and absorption (work concentration and immersion) (Schaufeli et al., 2002). Previous studies have shown that levels of teachers' work engagement have a strong influence over job performance, intention to quit teaching, and academic achievement of their students (Roth et al., 2007; Bakker et al., 2008; Duckworth et al., 2009). The teachers' behavior, belief, and emotional dimension are related to the results obtained by the students (Perera et al., 2018). Kindergarten teachers care for

and teach children between the ages of three and six. This requires them to devote more energy to cultivating and supporting children's social, emotional, and academic development (Coplan et al., 2015; Stasio et al., 2020).

Total rewards are considered as the critical way that affects members' motivation to join and stay with the organization, and support organizational effectiveness and members' well-being (Muse et al., 2008; Chiboiwa et al., 2010; Newman and Sheikh, 2012a). Total rewards systems have a greater influence on individuals than the single reward because the total rewards system is more flexible to meet the intrinsic and extrinsic demands of organizational members (Armstrong and Stephens, 2005). Monetary rewards and non-monetary rewards are included in total rewards. Among them, monetary rewards include pay perception, benefits perceptions, etc.; non-monetary rewards include learning and development opportunities, feedback and appreciation for work, etc. (Heneman and Tansky, 2002). Strom et al. (2014) found that engagement levels of organizational members depend on their perceptions of the rewards. Social Exchange Theory also indicates that positive work behaviors and attitude of employees are always directed by work resources (Blau, 1964). From this perspective, when individuals perceive resources from their organization, they feel positive about the organization and its values and are willing to engage in work toward the achievement of the organization's goals (Li and Wu, 2014). A rewarding work environment contributes to employees becoming more engaged in their work (Roberts and Davenport, 2002).

The Conservation of Resource Theory proposed by Hobfoll (1989) has believed that individuals always have the tendency to acquire, occupy, and maintain important resources. Sufficient work resources can enhance employees' work motivation, increase work engagement, and improve work performance (Demerouti and Bakker, 2011; Bakker et al., 2014). Rewards, as a kind of resource that employees can access, significantly affect their work engagement (Gulyani and Sharma, 2018). Previous studies have compared the impact of non-monetary rewards and monetary rewards on work engagement and found that the effect of monetary rewards on work engagement is lower than that of non-monetary rewards (Scott and McMullen, 2010). Rewards represent what the organization can offer its employees (Morgan et al., 2013; Chinyio et al., 2018). Therefore, teachers may be more willing to devote themselves to the work if they perceive a greater amount of benefits (e.g., monetary rewards, non-monetary rewards) offered by the kindergarten.

Organizational identification, as the shared beliefs of members (Stuart and Whetten, 1985), represents employees' sense of belonging to the organization (Ashforth et al., 2008) and delimits a set of cognitive, emotional, and behavioral aspects that are consistent with an identity as a member of the organization (Haslam and Ellemers, 2006). It refers to a connection with the organization, and the expectation to improve the status of organization members (Hogg and Terry, 2000). Organizational identification is significantly affected by total rewards perceptions (Yang and Yang, 2015). Du (2013) indicated that working conditions, rewards, and benefits also have a significant impact on organizational identification. Low organizational identification may be due to the imbalance between effort and rewards in the work environment (Guglielmi et al., 2017). The perception of low rewards from the organization may instill a negative social exchange process so that employees are not encouraged to care about the organization (Cropanzano et al., 2003). From the perspective of social exchange theory, some researchers indicated that individuals' identification with organizations partly stems from individuals' perception of organizational support, and it represents the social exchange between individuals and organizations (Shen, 2007). Some studies have shown that a high level of organizational support perception will prompt individuals to show a higher level of organizational identification (Shen et al., 2014; Edwards and Peccei, 2015; Lam et al., 2016). Organizational identification is an important antecedent of work engagement and has a significant impact on work engagement (Riketta, 2005; Guo and Zhang, 2016). Van Dick et al. (2004) explained that organizational identification can improve employees' job satisfaction, and higher job satisfaction may also increase employees' emotional and cognitive involvement in work. Organizational identification not only is influenced by the perception of total rewards but also significantly influences work engagement.

Little research examined organizational identification of kindergarten teachers and the mechanism through which work resources (total rewards components) affect kindergarten teacher work attitude (i.e., teacher work engagement). This study expects to expand the research on organizational identification and explore the mediating effect of organizational identification with Chinese kindergarten teachers as the object. Thus, the current study aims to examine the relationship between total rewards perceptions and work engagement among kindergarten teachers, surveying the mediating effect of organizational identification in the relationship between total rewards perceptions and work engagement among Chinese kindergarten teachers. Accordingly, the main hypothesis of this study is as follows:

Hypothesis 1: Correlations between total rewards perceptions, organizational identification, and work engagement among kindergarten teachers are positive and significant.

Hypothesis 2: Organizational identification mediates the relations between total rewards perceptions and work engagement among kindergarten teachers.

The proposed integrated model is presented in **Figure 1**.

METHODS

Participants

All participants were kindergarten professional teachers, excluding the nurses. In this study, a convenient sampling method was adopted to manage the survey and collect large sample data (Axinn and Pearce, 2006). After obtaining consent from the kindergarten principal, the investigators enter the kindergarten to distribute and return questionnaires in 2019.

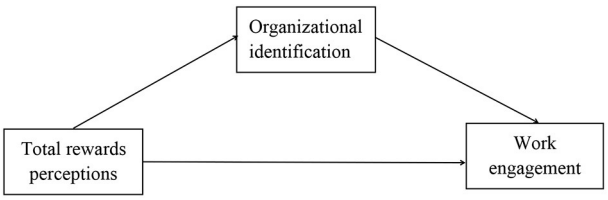

FIGURE 1 | Hypothesized model.

TABLE 1 | Demographic information of kindergarten teacher sample (n = 1,014).

Characteristics	*n* (%)
Area	
Urban	690 (68.0)
Rural	324 (32.0)
Education level	
≤High school	96 (9.5)
Vocational school	429 (42.3)
≥University degree	489 (48.2)
Teaching experience	
≤5 years	614 (60.6)
6–10 years	220 (21.7)
11–15 years	84 (8.3)
16–20 years	39 (3.8)
≥21 years	57 (5.6)

The teachers who participated in this survey were promised that their information and responses would be confidential and anonymous. A total of 1,100 questionnaires were distributed to kindergarten teachers in Henan, Anhui, and Xinjiang, China; 1,030 questionnaires were actually returned, with a response rate of 93.6%. Of these 1,030 questionnaires, 1,014 were valid, with an effectivity rate of 92.2%. These 1,014 valid questionnaires formed the final sample of this study. The demographic characteristics of the samples are shown in **Table 1**.

Measures

Total Rewards Perceptions for Kindergarten Teacher

The Total Rewards Perceptions Scale for Kindergarten Teachers was adapted from the four-factor total rewards perceptions scale that was designed by Chinese researcher Yang and Yang (2015), which was validated on the basis of a total rewards model that includes compensation, benefits, work–life balance, performance and recognition, and development and career opportunities proposed by the WorldatWork (2007). The scale, consisting of 21 items, was used to measure four dimensions of total rewards perceptions: work–life balance perceptions (WLBP; e.g., kindergarten guarantees teachers' rest time), development and career opportunity perceptions (DCOP; e.g., kindergarten provides teachers with a clear path to future advancement), working conditions perceptions (WCP; e.g., kindergarten pays five social insurance and one housing fund for teachers in full and on time), and wage level perceptions (WLP; e.g., the wage level of the kindergarten matches with my professional skills). The 21 items were measured using a five-point Likert-type scale, ranging from 1 (very poor) to 5 (very well). The higher the score on the four dimensions, the better the total rewards perceived by kindergarten teachers. In this study, Cronbach's α was 0.96. Internal consistency was 0.89 for WLBP, 0.92 for DCOP, 0.85 for WCP, and 0.92 for WLP.

Kindergarten Teacher Work Engagement

Kindergarten Teacher Work Engagement was measured using the Utrecht work engagement scale (UWES) developed by Schaufeli et al. (2002). The scale has been used in different samples of Chinese and shows good reliability and validity (Wang et al., 2015; Li and Wu, 2016). This scale included three dimensions: vigor (e.g., I can continue working for very long periods at a time), dedication (e.g., I am proud of the work that I do), and absorption (e.g., I get carried away when I am working). The responses for all of the items were obtained on a five-point Likert scale (1 = strongly disapprove, 5 = strongly approve). In this study, Cronbach's α was 0.96. Internal consistency was 0.89 for vigor, 0.92 for dedication, and 0.90 for absorption.

Kindergarten Teacher Organizational Identification

Kindergarten Teacher Organizational Identification Scale was adopted from the Organizational Identification Scale developed by Mael and Ashforth (Mael and Ashforth, 1992). This scale has illustrated good reliability and validity in Chinese samples (Wang et al., 2016; Song et al., 2019). The scale consisted of six items, which were scored on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A sample item was "I think that the success of my kindergarten is also my success." In this study, Cronbach's α was 0.86.

Control Variables

We controlled the potential effect of demographic variables (area, education level, and teaching experience) on dependent and mediating variables, as all of them may impact employee work engagement.

Procedure

This project was reviewed and approved by the Ethics Committee of Huaibei Normal University and complied with the Declaration of Helsinki involving human subjects. We obtain consent from the kindergarten principal to enter the kindergarten to distribute questionnaires in 2019. Before the test, participants would be given informed consent and were informed about the research content and their rights. We also informed participants that completion of the test was entirely voluntary and that they had the right to decline to complete the test. The test would continue after participants confirm informed consent. If participants refused to participate, the test ended.

Data Analysis

In the current study, we used SPSS 22 software to analyze the relationship between total rewards perceptions, organizational identification, and work engagement among kindergarten teachers. The descriptive statistics (mean and standard deviation) were calculated to measure the level of all variables. Bivariate

TABLE 2 | Descriptive statistics and correlations among variables.

Variable	1	2	3	4	5	6	7	8	9	10
1. Area	—									
2. EL	0.12**	—								
3. TE	−0.94**	0.19**	—							
4. TRP	0.038	0.053	−0.08*	—						
5. WLBP	−0.03	−0.14**	0.07*	0.87**	—					
6. DCOP	−0.02	−0.14**	0.04	0.92**	0.79**	—				
7. WCP	0.14**	0.07*	0.07*	0.83**	0.56**	0.66**	—			
8. WLP	0.04	−0.08**	−0.00	0.91**	0.70**	0.80**	0.72**	—		
9. OI	0.03	0.10**	0.14**	0.30**	0.22**	0.26**	0.28**	0.28**	—	
10. WE	−0.03	−0.08**	0.17**	0.62**	0.59**	0.61**	0.40**	0.58**	0.41**	—
M	—	—	1.72	3.81	3.75	3.79	3.92	3.78	4.14	3.94
SD	—	—	1.13	0.73	0.86	0.79	0.84	0.82	0.72	0.73

*n = 1,014; *p < 0.05, **p < 0.01 (double tails). EL, education level; TE, teaching experience; TRP, total rewards perceptions; WLBP, work–life balance perceptions; DCOP, development and career opportunity perceptions; WCP, working conditions perceptions; WLP, wage level perceptions; OI, organizational identification; WE, work engagement.*

correlations were used to examine correlations between socio-anagraphical variables, kindergarten teachers' total rewards perceptions (including WLBP, DCOP, WCP, and WLP), organizational identification, and work engagement. We used structural equation modeling (SEM) in Mplus 8.0 to investigate the impact of organizational identification on the relationship between total rewards perceptions and work engagement. The comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error approximation (RMSEA), and the standardized root mean square residual (SRMR) were used to estimate the model fit information. Hu and Bentler (1999) suggested that TLI, CFI > 0.90, and RMSEA, SRMR < 0.08 showed the model fitted well. The bootstrapping method of bias correction was used to verify the significance of the mediation effect. No zero between the lower level and higher levels of the confidence interval means that a mediating effect is significant (Hayes, 2009).

RESULTS

Descriptive Statistics and Correlations Among the Variables

Table 2 presents the descriptive statistics and correlations among variables. Among the four factors of total rewards perceptions, WCP (M = 3.92, SD = 0.84) scored higher than WLBP (M = 3.75, SD = 0.86), DCOP (M = 3.79, SD = 0.79), and WLP (M = 3.78, SD = 0.82). The mean score of organizational identification and work engagement were 4.14 (SD = 0.72) and 3.94 (SD = 0.73). Kindergarten teachers' total rewards perceptions were positively associated with work engagement ($r = 0.62$, $p < 0.01$) and organizational identification ($r = 0.30$, $p < 0.01$). Four factors of total rewards perceptions were positively related to work engagement (WLBP, $r = 0.59$, $p < 0.01$; DCOP, $r = 0.61$, $p < 0.01$; WCP, $r = 0.40$, $p < 0.01$; WLP, $r = 0.58$, $p < 0.01$) and organizational identification (WLBP, $r = 0.22$, $p < 0.01$; DCOP, $r = 0.26$, $p < 0.01$; WCP, $r = 0.28$, $p < 0.01$; WLP, $r = 0.28$, $p < 0.01$). The correlation among DCOP and work engagement was higher than that among the other three factors of total rewards perceptions and work engagement. Organizational identification correlated positively with work engagement ($r = 0.41$, $p < 0.01$). H1 was supported. In addition, education level and teaching experience are correlated with TRP, OI, and WE to different degrees. Therefore, education level and teaching experience were controlled in subsequent analysis.

Mediating Effect

A standardized structural equation model was adopted to investigate the mediation effect of organizational identification in the relationship between total rewards perceptions and work engagement. We control the demographic variables (education level and teaching experience) in the structural equation model. The model consisted of total rewards perceptions, organizational identification, and work engagement. The results showed this model had good fitting indices: $\chi^2 = 184.47$ ($p < 0.001$), df = 67, $\chi^2/df = 2.75$, CFI = 0.96, TLI = 0.95, RMSEA = 0.06 [90% CI = (0.05, 0.07)], SRMR = 0.04. Total rewards perceptions positively predicted organizational identification ($\beta = 0.40$, $p < 0.001$). Organizational identification ($\beta = 0.34$, $p < 0.001$) significantly positively predicted work engagement. The direct effect of total rewards perceptions on work engagement was significant ($\beta = 0.51$, $p < 0.001$). Hence, the results of the indirect effects demonstrated that organizational identification ($\beta = 0.14$, $p < 0.001$) mediated the correlation between total rewards perceptions and work engagement. Furthermore, bootstrapping test showed that the mediation effect of organizational identification was significant [95% CI = (0.121, 0.230)] (see **Table 3** and **Figure 2**). Thus, H2 was supported.

DISCUSSION

The present study examined the correlation among total rewards perceptions, organizational identification, and work engagement among Chinese kindergarten teachers. Past studies

TABLE 3 | Mediating effect of organizational identification.

	β	*p*	LLCI	ULCI
TRP → WE (c)	0.51	<0.001	0.436	0.570
TRP → OI (a)	0.40	<0.001	0.332	0.472
OI → WE (b)	0.34	<0.001	0.269	0.422
TRP → OI → WE	0.14	<0.001	0.098	0.180

c, the direct effect of total rewards perceptions on work engagement; a, the effect of total rewards perceptions on organizational identification; b, the effect of organizational identification on work engagement; TRP, total rewards perceptions; OI, organizational identification; WE, work engagement.

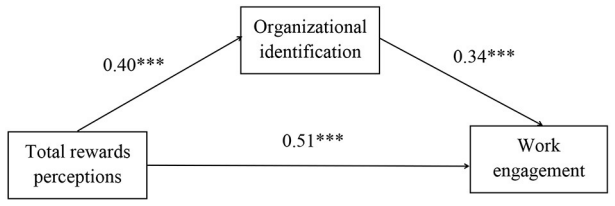

FIGURE 2 | The SEM analysis conducted to examine the pathways among total rewards perceptions, organizational identification, and work engagement. The control variables are not included in the presentation of the model. ***$p < 0.001$.

have explored the correlation between total rewards perceptions and work engagement, or organizational identification and work engagement, but have not presented the correlation among the three variables. This study found that WLBP, DCOP, WCP, and WLP correlated significantly and positively with work engagement. The obtained results corroborate the finding of a previous study (Gulyani and Sharma, 2018), which indicated that a high level of monetary rewards and non-monetary rewards may foster employee engagement in work. Employees who were offered a reward package that is consistent with their personal preferences were more likely to engage in work (Pregnolato et al., 2017). Bakker et al. (2014) indicated that work resources such as training, development opportunities, and additional benefits can motivate employees to involve themselves in work.

This study found that DCOP of total rewards perceptions had a stronger positive relationship with work engagement than WLBP, WCP, and WLP. It was consistent with existing research (Scott and McMullen, 2010), which reported that quality of work career development, organizational culture, and work–life balance all have a greater impact on work engagement than pay. Hulkko-Nyman et al. (2012) estimated that non-monetary rewards have a greater correlation with work engagement than monetary rewards. Kindergarten is perceived as a low-wage unit in China. The level of financial investment in kindergartens in China is much lower than that in OECD countries (Liu and Huang, 2019). The low monetary rewards are considered normal among kindergarten teachers. Moreover, teaching is a helping profession, with a great component of idealist motivation (Xu and Du, 2014). Thus, the impact of monetary rewards on work engagement is not as strong as the impact of non-monetary rewards on work engagement among kindergarten teachers.

This study also found that kindergarten teachers' total rewards perceptions were positively related to organizational identification. The finding was also in agreement with a previous study (Yang and Yang, 2015). Past research has shown that employees develop a positive attitude toward the workplace when they have access to rewards such as benefits, career development opportunities (Abid et al., 2015), and pay rise (Oishi et al., 2011). Other studies have stated that total rewards have a significant positive impact on organizational support, which was closely related to organizational identification (Smit et al., 2015; Zagenczyk et al., 2020). In China's cultural context, people have a strong concept of collectivism. Collectivists are more likely to see themselves as part of the organization, show more attachment to the organization, take pride in their membership, and have good organizational identification in a collectivist climate (Hofstede, 2003; Roth et al., 2011). Therefore, the influence of kindergarten teachers' total rewards perceptions on organizational identification should also be considered in the cultural context of Chinese collectivism.

We also found that the influence of WCP and WLP is greater than that of WLBP and DCOP. This result contradicts the finding from previous research in the Western context (Goulet and Frank, 2002; Steijn and Leisink, 2006), which stated that monetary rewards have limited impact on employees' organizational commitment. However, the result is consistent with research on Chinese organizations (Chiu et al., 2002; Miao et al., 2013), which found that monetary rewards (e.g., pay, fringe benefits) are the main factors that affect organizational commitment.

This study suggested that organizational identification was positively correlated with teachers' work engagement. The finding was in accordance with previous studies (Zhang et al., 2018, 2020; Li et al., 2020), which indicated that the greater organizational identification, the higher level of employee engagement in the work. Organizational identification enables employees to internalize the success of the organization into their success; thus, it has a positive impact on work engagement (Karanika-Murray et al., 2015).

Rewards from the Kindergarten can motivate teachers to focus and engage at work, while teachers' attitudes toward work engagement vary from context to context. Kindergarten teachers have different needs and expectations in terms of rewards. For instance, some employees expect material rewards in return for their hard work, while others expect return in the form of non-monetary rewards (Nazir et al., 2016). Therefore, examining the total rewards will help identify the combinations of rewards that motivate Kindergarten teachers to engage in work.

The present study found that organizational identification partially mediated the relationship between total rewards perceptions and work engagement among kindergarten teachers, which fit the Social Exchange Theory. This theory takes the exchange between organization and employees as the core (Blau, 1964). Organizations provide employees with material and emotional support, employees identify with the organization, and the exchange relationship arises (Blau, 1964; Emerson, 1976). The quality and sustainability of the exchange are affected by the rewards obtained by both parties through the exchange (Homans,

1958). When employees are rewarded for their hard work, they participate in an exchange that increases their work engagement for organization (Gujral and Jain, 2013). Some empirical studies indicated that offering rewards from organization to employees implies that the organization expects to engage in a social exchange with them, and an influential psychological contract is established between organization and employees (Williamson et al., 2009; Newman and Sheikh, 2012b). Meanwhile, Social Identity Theory states that the strong relationship between employees and the organization may motivate employees to give their best for the organization (Brown, 2017; Pan et al., 2019) and increase their level of engagement (Wang and Tseng, 2019). When kindergarten teachers get the expected economic or non-economic rewards from the organization, in return, they will have a stronger sense of identity with kindergarten, form a positive psychological state, and immerse themselves in their work (Blau, 1986; Gulyani and Sharma, 2018). The Conservation of Resources Theory proposes that individuals with more resources not only will try their best to maintain and protect their existing resources but also are more capable of acquiring new resources (Hobfoll, 1989, 2011), thus exhibiting more positive mental states and behaviors (Halbesleben and Wheeler, 2008). Gorgievski and Hobfoll (2008) also indicated that people with ample resources are more likely to approach their work with energy and enthusiasm; thus, they have higher levels of engagement in work. The total rewards system, as an effective job resources program, may achieve the goal of creating positive feelings among teachers (Bakker et al., 2014) and affect employee organizational identification (Hwang and Jang, 2020). Individuals with high levels of organizational identification are more likely to enhance their work engagement (Riketta, 2005). Therefore, kindergarten teachers' total rewards perceptions not only influence work engagement directly but also indirectly affect work engagement by increasing their organizational identification.

Limitations and Future Research Directions

The present study has several limitations that need to be emphasized. First, the data for this study were collected from three provinces in China, which lack diverse national settings. Future studies could expand the scope of data collection as far as possible. Second, a cross-sectional research design was used in this study; thus, it cannot predict to what extent changes in kindergarten teachers' total rewards perceptions and organizational identification will lead to changes in work engagement. A longitudinal approach should be used to validate the causal relationship between kindergarten teachers' total rewards perceptions, organizational identification, and work engagement in future studies. Third, we used the Social Exchange Theory and Conservation of Resources Theory to explain the relationship among study variables and mediating effect of organizational identification, which have certain limitations, and other theoretical perspectives should be further explored. Finally, the mediating effect of organizational identity was small, suggesting that other mediators could explain the relationship between teachers' total rewards perceptions and work engagement. More mediating variables should be examined among total rewards perceptions, organizational identification, and work engagement relationship.

Conclusions

This study contributes to enriching the existing research literature and finds that except for the direct relationship, the relationship between total rewards perceptions and work engagement was partially mediated by organizational identification among Chinese kindergarten teachers. We use Social Exchange Theory and Conservation of Resources Theory to explain the mediating role of organizational identification. Other possible mediators between total rewards perceptions and work engagement and other antecedent variables of work engagement deserve more in-depth research and exploration.

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 College of Education, Huaibei Normal University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

DJ and LC designed the study, reviewed, and revised the article together. DJ wrote the original draft of the manuscript. LC collected and analyzed the survey data. All authors contributed to the article and approved the submitted version.

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Prevalence and Factors Associated With Burnout of Frontline Healthcare Workers in Fighting Against the COVID-19 Pandemic: Evidence From China

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Objectives: The sudden outbreak of the novel coronavirus disease (COVID-19) plunged healthcare workers (HCWs) into warfare. This study aimed to determine the prevalence of burnout and the factors associated with it among frontline HCWs fighting COVID-19.

Methods: A cross-sectional survey was conducted among frontline HCWs fighting against the COVID-19 in Wuhan, Harbin, and Shenzhen during the period from February 18 to March 4. Finally, HCWs were recruited using cluster sampling, 1,163 HCWs were included in the final analysis. Burnout was measured using a 22-item Maslach Burnout Inventory scale (MBI scale).

Results: Of the participants, 48.6% suffered from burnout, and 21.8% showed a high degree of burnout. Doctors (b = 3.954, P = 0.011) and nurses (b = 3.067, P = 0.042) showed higher emotional exhaustion (EE) than administrators. Participants who worked continuously for more than 8 h a day (b = 3.392, P = 0.000), those who were unable to eat three regular daily meals (b = 2.225, P = 0.008), whose daily water intake was no more than 800 ml (b = 3.007, P = 0.000), who slept for no more than 6 h (b = 1.609, P = 0.036), and who were infected or had colleagues who were infected with COVID-19 (b = 4.182, P = 0.000) experienced much higher levels of EE, while those who could adhere to infection control procedures (b = −5.992, P = 0.000), who were satisfied with their hospital's infection control measures(b = −3.709, P = 0.001), and who could receive sufficient psychological crisis intervention (b = −1.588, P = 0.039) reported lower levels of EE.

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Conclusion: The study reveals that burnout is prevalent among frontline HCWs and that the known factors associated with burnout, such as workload, and the factors directly associated with COVID-19, such as having insufficient protection, can affect burnout symptoms in frontline HCWs. Synergized and comprehensive interventions should be targeted at reducing its occurrence among frontline HCWs fighting COVID-19.

Keywords: burnout, COVID-19, healthcare workers, MBI scale, frontline healthcare workers

INTRODUCTION

The novel coronavirus disease (COVID-19) pandemic is a global public health emergency which has greatly impacted health systems and people's lives worldwide. The COVID-19 pandemic has posed unprecedented challenges to the global health system (Lai et al., 2020), public health laboratories (Corman et al., 2020), hospitals, and critical care departments (Arabi et al., 2020). Healthcare systems and personnel were, for a time, overstretched and overwhelmed. Many frontline healthcare workers (HCWs) have experienced the darkest period of their professional lives. To fulfill their commitment to the responsibilities and obligations of the medical profession, frontline HCWs have done their utmost to rescue the dying and heal the wounded, diagnosing, treating, and nursing COVID-19 patients around the clock. Thus, frontline HCWs fighting against the COVID-19 pandemic have faced severe challenges and have experienced more health problems than non-frontline HCWs, including burnout symptoms, depressive symptoms, and insomnia (Şahin et al., 2020; Serrão et al., 2021), mental health of frontline HCWs fighting against the COVID-19 pandemic is a problem which require attention.

Burnout has been a major concern in the fields of both occupational health and mental health (Wu et al., 2013; Arabi et al., 2020). The outbreak of COVID-19 triggered widespread alarm among HCWs about the potential for burnout. In Asia, according to Li D et al., 34.2% of HCWs from Wuhan Jinyintan Hospital experienced COVID-19 related burnout (Li et al., 2021). Another study developed in China showed that during the COVID-19 pandemic 36.5% of Chinese HCWs experienced burnout (Huo et al., 2021). Matsuo et al. found that the prevalence of burnout among HCWs in Japan during the COVID-19 outbreak was 31.4% (Matsuo et al., 2020). According to Khasne RW et al., more than half (52.8%) of HCWs in India experienced COVID-19-related burnout (Khasne et al., 2020). According to Alsulimani LK et al., the prevalence of burnout among HCWs in Saudi Arabia, which has one of the best healthcare systems in the Middle East (AlHumaid et al., 2020),was 75% during the COVID-19 pandemic (Alsulimani et al., 2021). In Europe, Italy was severely impacted by COVID-19, and Italian HCWs reported relevant work-related burnout symptoms (Barello et al., 2020; Lasalvia et al., 2021). According to MD Trani, 56% of HCWs in Italy showed EE (Di Trani et al., 2021). In Portugal, Duarte I et al. concluded that more than half of HCWs had symptoms of personal burnout (Duarte et al., 2020). In Africa, owing to both the COVID-19 pandemic and civil war, 67.1% of Libyan HCWs reported having EE (Elhadi et al., 2020). Although the relationship between burnout symptoms and the COVID-19 pandemic has been proved, further research about the risk factors and how to alleviate burnout symptoms among frontline HCWs fighting against COVID-19 is still needed.

HCWs often work under great pressure and experience negative emotions owing to the nature of their work (Huo et al., 2021).Against the background of the COVID-19 outbreak, HCWs have faced more pressure than usual, every frontline HCW has faced enormous pressure. A recent study has reconfirmed the negative impact of the long-lasting pandemic in Saudi Arabia among healthcare students (Shaikh et al., 2021). HCWs were exposed to increased pressure, excessive workloads, extended work hours (Huo et al., 2021), and sleep deprivation—all of which are well-documented factors leading to burnout (Wang et al., 2005; Németh, 2016). Under the extraordinary conditions of the pandemic, HCWs have had insufficient protection against the disease and an increased risk of nosocomial infection (Centers for Disease Control and Prevention, 2008). Scholars have demonstrated the relationship between insufficient protection and anxiety and depression among HCWs during the COVID-19 pandemic (Pouralizadeh et al., 2020; Cag et al., 2021). The heavy workload, disruption of quotidian routines, and risk of COVID-19 infection experienced by HCWs owing to the pandemic all negatively affect the health of frontline HCWs. Chinese HCWs rose to the challenge, they grappled with the epidemic at the front line across the country, during the pandemic. However, to the best of our knowledge, scant research has specifically focused on both the known factors of burnout, such as excessive workload, and the factors directly associated with COVID-19 among Chinese HCWs. Therefore, the relationship between factors related to COVID-19 and burnout still needs to be explored in China.

Burnout is related to a wide range of harmful health outcomes, such as insomnia (Salvagioni et al., 2017), depression (Lu et al., 2020), loss of enthusiasm for work (Christian, 2015), decreased job satisfaction (Khamisa et al., 2015), resignation and early retirement (Khan et al., 2018), an increased risk of suicide (Johnson et al., 2018), and death by overwork (Yang et al., 2019). Most countries are currently under the double pressure of economic recovery and COVID-19 control, and thus must confront numerous challenges. For example, many governments have been reimposing and subsequently lifting

Abbreviations: COVID-19, Novel coronavirus disease; HCW, Healthcare worker; MBI scale, Maslach Burnout Inventory scale; EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; PPE, personal protective equipment; CR, composite reliability; AVE, average variance extracted.

restrictions according to new developments of the coronavirus disease. At the time of writing, new variants of COVID-19 have caused surges of the disease in the United Kingdom (Kirby, 2021). The Chinese government has implemented strategies for the ongoing prevention and control of COVID-19, as sporadic cases of the disease on the mainland have continued to be reported (The State Council Information Office of the People's Republic of China, 2020). As HCWs worldwide need to not only perform their routine tasks, but also be alert to the danger of COVID-19, they are continually encountering the risk factors for burnout, and thus it is critical to alleviate HCWs' burnout symptoms to maintain their mental and physical health, which Ali, S. et al. posited is a prerequisite for conquering the pandemic (Ali et al., 2020a). HCWs are on the frontline of this battle and are the last line of defence against COVID-19.

In this study, we aim to contribute to the knowledge of health systems worldwide by determining the prevalence and risk factors for burnout syndrome among frontline HCWs battling COVID-19 in China. Our study was conducted during an extraordinary period of the pandemic, in the time periods categorized by the Chinese government as Stage II (Initial Progress in Containing the Virus) and Stage III (Newly Confirmed Domestic Cases on the Chinese Mainland Drop to Single Digits) (The State Council Information Office of the People's Republic of China, 2020). We propose that effective methods for alleviating burnout symptoms could be obtained by exploring the risk factors associated with burnout among frontline HWCs. Our research findings provide healthcare professionals and policy makers implications for the future surges of COVID-19 in a country or region. This study is valuable as we examine not only the known factors of burnout, such as workload, excessive working hours, diet, and sleep deprivation, but also the specific factors associated with COVID-19, such as HCWs' infection protection and infection status.

MATERIALS AND METHODS

A cross-sectional survey was conducted among COVID-19 frontline HCWs in China from 1 February 8 to March 4, 2020, as China was going through Stage II and Stage III of the pandemic (The State Council Information Office of the People's Republic of China, 2020). Our study's participants were selected through cluster sampling. We identified three cities—Wuhan, Harbin, and Shenzhen—representing areas which were severely impacted by COVID-19. We used the formula: $N = 4\mu_{\alpha}{}^{2}S^{2}/\delta^{2}$. The necessary sample size was 246 for each city, and after considering issues related to questionnaire recovery and efficiency, we added 10% to this total sample size. Ultimately, the minimum necessary sample size was 273 for each city. Our survey targeted three hospitals in each city, and we communicated with the hospital deans directly *via* personal contacts or email. We clarified significance and importance of our study to deans, if they indicated the willingness to join our study, deans of hospitals clarified significance and importance of our study to HCWs, frontline HCWs who were working in the departments related to COVID-19 were invited to participate in the survey. Finally, we recruited participants through eight hospitals—three in Wuhan, three in Harbin, and two in Shenzhen.

HCWs answered the questionnaires during their breaks from work. Only completed questionnaires can be submitted. A total of 1,389 subjects completed the questionnaire. As the inclusion criterion was HCWs on the COVID-19 frontlines, the respondents were asked to answer the question, "Are you a frontline healthcare worker who is working for patients with COVID-19, such as diagnosing, treating, or nursing patients with COVID-19?"; 217 respondents were excluded from the survey. The research team reviewed the questionnaires, and excluded questionnaires in which most answers were the same; nine questionnaire respondents were excluded. Finally, 1,163 valid questionnaires were included (effective rate = 83.73%), among them 570 HCWs from Wuhan, 312 HCWs from Harbin, and 281 HCWs from Shenzhen. The participants were all recruited from capital cities and worked in tertiary public hospitals (**Figure 1**).

We received approval from the ethics committee of Harbin Medical University to conduct this study (Harbin, Heilongjiang, China), ID: HMUIRB20200003.

Our instrument comprised items on participants' demographic information, the Maslach Burnout Inventory (MBI) scale, work situation, diet and sleep patterns, status of infection protection, status of COVID-19 infection of themselves and their colleagues, and status of psychological crisis intervention.

The basic socio-demographic information included age, gender, and job category. The job category was grouped into four types: nurses, doctors, technicians, and administrators.

Burnout among participants was assessed using the MBI scale. The MBI scale contains 22 items (Maslach et al., 1996). In this study, we used the Chinese version revised by Li and Liu (2000). The subscales included emotional exhaustion (EE, 9 items), depersonalisation (DP, 5 items), and personal accomplishment (PA, 8 items). All items were scored on a seven-point Likert scale, ranging from 0 (*never*) to 6 (*every day*). As in previous studies and according to convention, burnout was defined as high EE (scores of 27 or greater) and/or high DP (scores of 10 or greater) as opposed to a total score (Maslach and Jackson, 1981; Rotenstein et al., 2018; West et al., 2018). Higher scores on the EE and DP subscales indicate a higher burnout symptom, while PA was inversely associated with burnout (Gan et al., 2019; Brady et al., 2020). The low PA defined as scores of 33 or lower (Bourne et al., 2019). HCWs were categorised as having a high level of burnout if they scored high on EE and DP and low on PA (Gan et al., 2019).

In the reliability and validity analysis of MBI scale, the first point to consider about variables is internal consistency reliability. Cronbach's α for the whole scale was 0.930; 0.936 for the EE subscale; 0.859 for the DP subscale; and 0.877 for the PA subscale; all of which demonstrated a high level of reliability. The second point to consider about variables is validity. The validity check is done in two stages as convergent validity and discriminant validity. The composite reliability (CR) and the explained average variance extracted (AVE) values were considered for convergent validity. The discriminant validity of all constructs met the Fornell and Larcker criteria (Fornell and Larcker, 1981). **Table 1** presents a summary of the factor

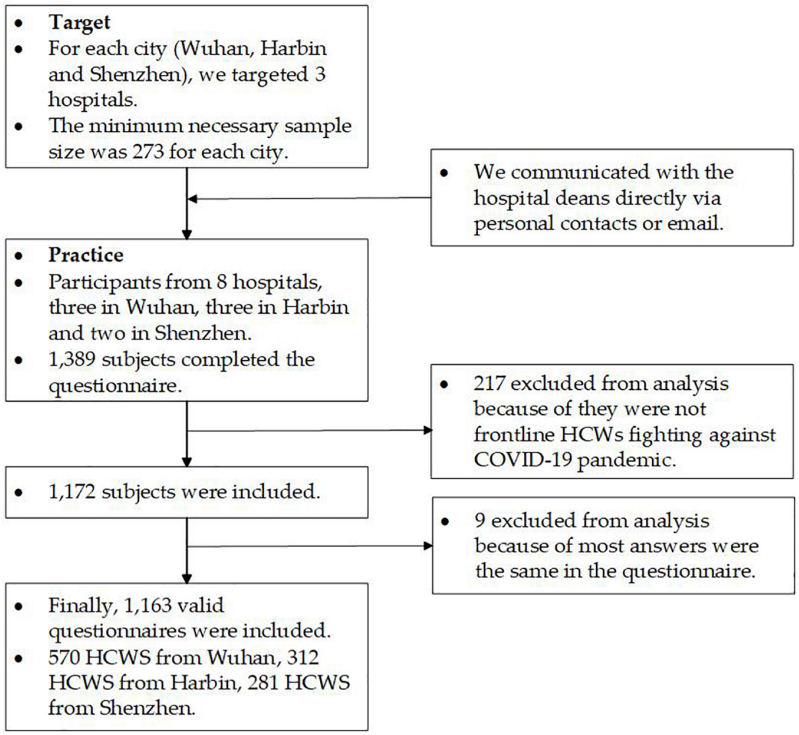

FIGURE 1 | Study flow diagram.

loadings, CR, AVE, and convergence validity. The standardized factor loadings of items are between 0.552 and 0.863, with good item reliability. The CR values of the 3 constructs range from 0.855 to 0.924, exceeding 0.7 (Hair et al., 2011). The AVE value of EE and DP constructs were higher than the threshold of 0.5, and the AVE value of PA constructs was closed to 0.5, which confirms the constructs' convergent validity (Ye et al., 2019). Also, $X^2/df = 7.673$, the comparative fit index = 0.927, the Tucker-Lewis fit index = 0.910, and the root mean square error of approximation = 0.076. The MBI scale showed acceptable reliability and validity (**Table 1**).

Participants' work situations were assessed with one open-ended question: "How many hours do you work every day?".

Participants' diet and sleep patterns were assessed with one item: "Are you able to eat three regular daily meals?" to which they answered yes or no, and two open-ended questions: "How many millilitres (ml) of water do you drink every day?" and "How many hours did you sleep per day in the past week?"

TABLE 1 | Convergent validity and discriminant validity.

	STD	CR	AVE	EE	DP	PA
EE	0.624–0.844	0.924	0.576	0.753		
DP	0.591–0.814	0.855	0.545	0.717	0.738	
PA	0.552–0.863	0.866	0.452	0.102	-0.010	0.672

STD, standardised factor loadings; CR, composite reliability; AVE, average variance extracted.

Participants' status of infection protection were assessed with two items: "Could you adhere to infection control procedures?" and "Are you satisfied with the hospitals' infection control measures?" to which they answered yes or no.

The status of COVID-19 infection of participants and their colleagues were assessed with two items: "Have you ever been infected with COVID-19?" and "Have your colleagues ever been infected with COVID-19?" to which they answered yes or no.

The status of psychological crisis intervention were assessed with one item: "Could you receive sufficient psychological crisis intervention?" to which they answered yes or no.

Statistical Analyses

IBM® SPSS® Statistics 25.0, Mplus Version 7.0 and STATA 16.0 were used for the data analysis in this study. Heterogeneity analysis were computed using STATA 16.0. Heterogeneity were assessed using the I^2 statistic. We explored the heterogeneity of age, gender, EE, DP, and PA among Wuhan, Harbin and Shenzhen, the results showed that there was no statistical significance between age ($I^2 = 0.0\%$, $P = 0.965$), gender ($I^2 = 0.0\%$, $P = 0.990$), EE($I^2 = 0.0\%$, $P = 0.983$), DP($I^2 = 0.0\%$, $P = 0.982$), and PA ($I^2 = 0.0\%$, $P = 0.827$) and location. Validity of MBI scale was tested using MplusVersion 7.0 (Muthén and Muthén, 1998–2012). The *t*-test, ANOVA test, and multiple linear regression were tested using IBM SPSS Statistics 25.0. The *t*-test and ANOVA test were performed to assess whether the independent variables were statistically significant. Stepwise multiple linear regression analysis was used to estimate the predictors of

HCWs' burnout and its three subscales. The significance level was set at 0.05.

RESULTS

Burnout Classifications for Our Sample

The analysis revealed that burnout is widespread. High EE was found in 434 participants (37.3%), 466 participants (40.1%) showed high DP, and 750 participants (64.5%) showed low PA. Of the participants, 565 (48.6%) exhibited burnout. Of these 565 participants, 254 (21.8% of all participants) showed a high degree of burnout.

Participant Characteristics and MBI Score

Participant Demographic Characteristics and MBI Score

The number of missing responses and items that were answered with "not applicable" are shown in **Table 1** and ranged from 0.8 to 2.1%. Characteristics of subjects and distributions of each dimension of burnout in categorical items are also shown in **Table 1**. Among the participants, 72.3% were female and 27.7% were male, and 45.7% were older than or aged 35. Mean PA differed between age groups ($t = -2.030$, $P = 0.043$).Of these, 55.2% were nurses, 27.0% were doctors, 10.7% were technicians, and 7.1% were administrators. Mean EE ($F = 6.741$, $P = 0.000$), mean DP ($F = 7.103$, $P = 0.000$), and mean PA ($F = 4.178$, $P = 0.006$) differed between job category groups. Doctors had higher EE scores and higher DP scores than administrators (**Table 2**).

Work Situations and MBI Score

Of the participants, 25.7% worked more than 8 consecutive hours a day and showed higher EE scores ($t = -5.852$, $P = 0.000$) and higher DP scores ($t = -3.396$, $P = 0.001$). Nearly half of the participants (49.1%) were working in Wuhan when they answered the questionnaire and showed lower EE scores ($t = 1.962$, $P = 0.050$), lower DP scores ($t = 3.055$, $P = 0.002$), and higher PA scores ($t = -3.244$, $P = 0.001$) (**Table 2**).

Diet, Sleep Patterns, and MBI Score

A total of 27.0% of the participants expressed that they were unable to eat three regular daily meals and showed higher EE scores ($t = -3.150$, $P = 0.001$) and higher DP scores ($t = -2.262$, $P = 0.018$). A total of 50.4% of the participants drank no more than 800 ml of water every day and showed higher EE scores ($t = -5.563$, $P = 0.000$), higher DP scores ($t = -3.235$, $P = 0.010$), and lower PA scores ($t = 2.519$, $P = 0.012$). The average amount of sleep obtained by participants was 6–1/2 h per day in the past week while 56.5% slept for no more than 6 h per day and showed higher EE scores ($t = -4.106$, $P = 0.000$) and higher PA scores ($t = -2.375$, $P = 0.018$) (**Table 2**).

Infection Protection and MBI Score

A total of 7.7% of the participants reported that they could not adhere to infection control procedures and showed higher

TABLE 2 | Descriptive statistics and univariate analysis results.

	N(%)	EE Mean (SD)	DP Mean (SD)	PA Mean (SD)
Demographic characteristics and MBI score				
Gender				
female	841 (72.3)	21.3 (13.1)	7.9 (6.5)	29.7(9.9)
male	322 (27.7)	21.0 (13.3)	8.4 (6.9)	29.4 (10.5)
F/t		0.367	1.200	0.470
Age (yr)				
≤34	632 (54.3)	21.3 (13.0)	8.3 (6.7)	29.1 (10.0)
≥35	531 (45.7)	21.1 (13.2)	7.8 (6.6)	30.3 (10.2)
F/t		0.304	1.088	–2.030*
Job category				
Nurse	642 (55.2)	20.4 (12.6)	7.8 (6.4)	30.3 (9.8)
Doctor	314 (27.0)	23.9 (13.4)	9.4 (6.6)	29.6 (9.3)
Technician	125 (10.7)	20.3 (14.0)	6.7 (6.9)	28.5 (11.9)
Administrator	82 (7.1)	18.5 (13.3)	7.0 (7.3)	26.4 (11.2)
F/t		6.741***	7.103***	4.178**
Work characteristics and MBI score				
Work more than 8 consecutive hours a day				
No	840 (72.2)	19.8 (12.8)	7.7 (6.5)	29.7 (10.3)
Yes	299 (25.7)	25.0 (13.1)	9.2 (6.9)	29.5 (9.4)
Missing	24 (2.1)			
F/t		5.852***	–3.396***	0.312
Working in Wuhan when they answered the questionnaire				
No	593 (51.0)	22.0 (13.8)	8.6 (6.9)	28.7 (10.6)
Yes	570 (49.1)	20.4 (12.4)	7.5 (6.3)	30.6 (9.5)
F/t		1.962*	3.055**	–3.244***
Diet, sleep pattern, and MBI score				
Three regular meals a day				
Be able to eat	849 (73.0)	20.4 (12.7)	7.8 (6.4)	29.8 (10.0)
Unable to eat	314 (27.0)	23.3 (14.1)	8.8 (7.1)	29.2 (10.2)
F/t		–3.150***	–2.262*	0.828
Daily water intake				
≤800ml	586 (50.4)	23.2 (13.4)	8.6 (6.8)	29.0 (10.0)
>800ml	552 (47.5)	19.0 (12.4)	7.4 (6.3)	30.5 (10.1)
Missing	25 (2.1)			
F/t		–5.563***	–3.235**	2.519*
Daily sleep hours				
≤6 h	657 (56.5)	22.6 (13.3)	8.2 (6.8)	30.3 (10.0)
>6 h	497 (42.7)	19.4 (12.7)	7.8 (6.4)	28.9 (10.2)
Missing	9 (0.8)			
F/t		–4.106***	1.054	–2.375*
Infection protection and MBI score				
Adhering to infection control procedures				
No	89 (7.7)	30.1 (12.9)	11.4 (6.7)	26.0 (7.5)
Yes	1074 (92.3)	20.5 (12.9)	7.8 (6.6)	29.9 (10.2)
F/t		6.811***	4.953***	–4.634***
Hospital's infection control measures				

(Continued)

TABLE 2 | Continued

	N(%)	EE Mean (SD)	DP Mean (SD)	PA Mean (SD)
Dissatisfied	195 (16.8)	26.8 (14.7)	9.9 (7.0)	29.2 (10.2)
Satisfied	968 (83.2)	20.1 (12.5)	7.7 (6.5)	29.7 (10.1)
F/t		5.962***	4.232***	–0.583
Infection status and MBI score				
Who were infected or had colleagues who were infected with COVID-19				
No	946 (81.3)	20.2 (13.0)	7.7 (6.5)	29.6 (10.3)
Yes	217 (18.7)	25.5 (12.7)	9.7 (7.0)	29.7 (9.2)
F/t		–5.356***	–4.054***	–0.159
Psychological crisis intervention and MBI score				
Receive sufficient psychological crisis intervention				
No	632 (54.3)	22.9 (13.3)	8.6 (6.6)	28.6 (10.0)
Yes	531 (45.7)	19.2 (12.6)	7.4 (6.6)	30.8 (10.1)
F/t		4.938***	3.265***	–3.639***

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

EE scores (t = 6.811, P = 0.000), higher DP scores (t = 4.953, P = 0.000), and lower PA scores (t = −4.634, P = 0.000) than those who could adhere to infection control procedures. Among the participants, 16.8% were "dissatisfied" and 83.2% were "satisfied" with their hospital's infection control measures. Participants who reported "dissatisfied" showed higher EE scores (t = 5.962, P = 0.000) and higher DP scores (t = 4.232, P = 0.000).

Status of COVID-19 Infection and MBI Score

A total of 946 participants (81.3%) reported that neither themselves nor their colleagues were infected while 217 participants (18.7%) reported that they or their colleagues were infected. Among the 217 participants, 65 (5.6%) reported that they were infected, 213 (18.3%) reported that their colleagues were infected, and 61 (5.2%) reported that both themselves and their colleagues were infected. Participants who reported that they or their colleagues were infected showed higher EE scores (t = −5.356, P = 0.000) and higher DP scores (t = −4.054, P = 0.000) (**Table 2**).

Psychological Crisis Intervention and MBI Score

Of the participants, 54.3% reported that they did not receive sufficient psychological crisis intervention and showed higher EE scores (t = 4.938, P = 0.000), higher DP scores (3.265, P = 0.001), and lower PA scores (t = −3.639, P = 0.000) than those who expressed that they did receive sufficient psychological crisis intervention (**Table 2**).

Workload of Participants

Participants worked an average of 8.1 ± 4.2 h per day. The average working hours for nurses, doctors, technicians, and administrators were 6.7, 9.9, 9.6, and 9.6 h per day, respectively (F = 57.249, P = 0.000) (**Table 3**).

TABLE 3 | Average working hours for participants with different characteristics.

	N (%)	Work hours (SD)
Job category		F = 57.249, P = 0.000
Nurse	627 (55.0)	6.7 (3.5)
Doctor	308 (27.0)	9.9 (4.5)
Technician	122 (10.7)	9.6 (4.5)
Administrator	82 (2.1)	9.6 (3.5)
Missing (daily work time)	24 (2.1)	

Factors Associated With Burnout in the Multiple Linear Regression Model

Participants who were nurses (b = 3.067, P = 0.042), who were doctors (b = 3.954, P = 0.011), who were working continuously for more than 8 h a day (b = 3.392, P = 0.000), who were unable to eat three regular daily meals (b = 2.225, P = 0.008), whose daily water intake was no more than 800 ml (b = 3.007, P = 0.000), who obtained no more than 6 h of sleep a day (b = 1.609, P = 0.036), and who were infected or had colleagues who were infected with COVID-19 (b = 4.182, P = 0.000) were more likely to experience high EE. Participants who could adhere to infection control procedures (b = −5.992, P = 0.000), who were satisfied with their hospital's infection control measures (b = −3.709, P = 0.001), and who could receive sufficient psychological crisis intervention (b = −1.588, P = 0.039) were more likely to experience lower EE (**Table 4**).

Participants who were doctors (b = 1.990, P = 0.014), who were unable to eat three regular daily meals (b = 0.987, P = 0.024), and who were infected or had colleagues who were infected with COVID-19 (b = 1.974, P = 0.000) were more likely to experience higher DP. Participants who were working in Wuhan (b = −1.247, P = 0.005) and who could adhere to infection control procedures (b = −2.288, P = 0.003) were more likely to experience lower DP (**Table 4**).

Participants who were aged ≥35 (b = 1.859, P = 0.005), who were nurses (b = 3.529, P = 0.005), who were doctors (b = 4.147, P = 0.001), who were working in Wuhan (b = 1.377, P = 0.033), who got no more than 6 h of sleep a day (b = 1.848, P = 0.003), who could adhere to infection control procedures (b = 3.210, P = 0.005), and who could receive sufficient psychological crisis intervention (b = 1.569, P = 0.011) were more likely to experience higher PA (**Table 4**).

DISCUSSION

Frontline HCWs battling COVID-19 exhibited a high level of burnout in China. According various studies, the prevalence of burnout in HCWs in Asia during the COVID-19 pandemic varies from 31.4 to 75% (Khasne et al., 2020; Matsuo et al., 2020; Alsulimani et al., 2021; Huo et al., 2021). The large differences across these studies may result from regional disparities and

TABLE 4 | Multiple linear regression analysis results for EE, DP, and PA.

Variable	EE				DP				PA			
	B	SE	Beta standardized	p	B	SE	Beta standardized	p	B	SE	Beta standardized	p
Age(<34-ref)									1.859	0.655	0.092	0.005**
Job category (Administrator-ref)												
Nurse	3.067	1.508	0.117	0.042*	1.390	0.786	0.105	0.077	3.529	1.249	0.155	0.005**
Doctor	3.954	1.547	0.134	0.011*	1.990	0.807	0.134	0.014*	4.147	1.245	0.204	0.001***
Technician	0.398	1.784	0.009	0.823	−1.228	0.930	−0.057	0.187	2.652	1.446	0.080	0.067
Working in Wuhan (No-ref)	−0.198	0.846	−0.008	0.815	−1.247	0.440	−0.094	0.005**	1.377	0.643	0.068	0.033*
Work continuously >8 h a day (No-ref)	3.392	0.928	0.114	0.000***	0.775	0.475	0.051	0.104	0.151	0.747	0.007	0.840
Unable to eat three regular daily meals (Able to eat three regular daily meals-ref)	2.225	0.841	0.075	0.008**	0.987	0.437	0.066	0.024*				
Daily water intake ≤ 800ml (> 800ml-ref)	3.007	0.754	0.115	0.000***	0.713	0.392	0.054	0.069	−1.145	0.606	-0.057	0.059
Daily sleep hours ≤6 h (> 6h-ref)	1.609	0.767	0.061	0.036*					1.848	0.621	0.091	0.003**
Adhering to infection control procedures (No-ref)	−5.992	1.461	−0.123	0.000***	−2.288	0.762	−0.093	0.003**	3.210	1.140	0.085	0.005***
Satisfied with hospitals' infectious control measures (Dissatisfied-ref)	−3.709	1.062	−0.105	0.001***	−0.908	0.554	−0.051	0.101				
Who were infected or had colleagues who were infected with COVID-19 (No-ref)	4.182	1.000	0.125	0.000***	1.974	0.520	0.117	0.000***				
Receive sufficient psychological crisis intervention (No-ref)	−1.588	0.767	−0.061	0.039*	−0.572	0.399	−0.043	0.152	1.569	0.616	0.077	0.011*
Constant coefficient	23.016	2.123		0.000	9.373	1.081		0.000	20.435	1.687		0.000
	R^2 = 0.137, Adjust R^2 = 0.128				R^2 = 0.080, Adjust R^2 = 0.070				R^2 = 0.051, Adjust R^2 = 0.043			

*B = unstandardised regression coefficient; SE = standard error. *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001.*

variations in burnout definitions and assessment methods (Rotenstein et al., 2018). In our study, 48.6% of frontline HCWs were suffering from burnout, higher than the figure (36.5%) reported in a previous study conducted among Chinese HCWs during the pandemic (Huo et al., 2021). The prevalence of EE symptom (37.3%) is higher than that (34.2%) reported in another study conducted in Wuhan Jinyintan Hospital (Li et al., 2021).

The most important findings of the present study are the following: infection of HCWs, long continuous working hours, inability to eat three regular daily meals, insufficient water intake, and insufficient sleep increase burnout. Conversely, adherence to infection control procedures, satisfaction with their hospital's infection control measures, and sufficient psychological crisis intervention could decrease burnout.

In this study, nurses and doctors who were working in Wuhan when they answered the questionnaire showed a lower level of DP and a higher level of PA in the multiple linear regression analysis. In other words, they showed less negative attitudes toward their job and workplace and higher personal accomplishment (Mealer et al., 2016; Bridgeman et al., 2018). During the Stage I (Swift Response to the Public Health Emergency), HCWs in Wuhan worked under great pressure, which attracted much attention of Chinese government and members of society. Later, from 23 January to 08 March 2020, more than 42,600 HCWs across China were dispatched to Hubei Province, especially Wuhan. The workload of HCWs in Hubei Province was alleviated by 346 medical teams from around the country (The State Council Information Office of the People's Republic of China, 2020), as these additional human resources facilitated better work

schedules and shorter work shifts. Local HCWs of Wuhan formed support groups with other HCWs from around the country, which provided HCWs further relief in terms of moral support. In addition to this psychological support, hospitals in Wuhan received material support from across China, such as rice, vegetables, meals, and personal protective equipment (PPE). Recent studies revealed that having resources such as social support, sufficient material, and adequate human resources (staff) correlate negatively with burnout (Algunmeeyn et al., 2020; Manzano García and Ayala Calvo, 2021). These measures could explain why HCWs in Wuhan had lower levels of DP and higher levels of PA.

People most at risk of infection are those who are in close contact with a COVID-19 patient or who care for COVID-19 patients (World Health Organization, 2020). Participants who indicated that they could adhere to infection control procedures showed lower levels of EE, lower levels of DP and higher levels of PA. Participants who indicated that they were satisfied with their hospital's infection control measures showed lower levels of EE. Participants who reported that they or their colleagues were infected showed higher levels of EE and DP. Due to the suddenness of the outbreak, many HCWs did not have what they need to treat patients and they could not adhere to infection control procedures, which would lead to a risk of infection for HCWs (Ali et al., 2020b; Wang et al., 2020). Together with the fear of passing the virus on to their families and friends (Adams and Walls, 2020; Chen et al., 2020; Dong et al., 2020), HCWs' concerns about having insufficient protection against COVID-19 causes negative emotional reactions. Recent studies found that having insufficient protection inflicts considerable mental damage on HCWs, such as anxiety and depression (Pouralizadeh et al., 2020; Cag et al., 2021). The results of our study showed that insufficient protection is one of the predictor variables of burnout symptoms among HCWs.

To protect HCWs, Chinese healthcare professionals and policymakers took various measures. First, the Chinese government stipulated comprehensive incentive plans to encourage production enterprises to accelerate production. Second, more stringent and comprehensive hospital infection control measures were implemented. On February 19, 2020, the National Health Commission issued a directive on strengthening the protection of HCWs (National Health Commission of the People's Republic of China, 2020), and national, provincial, municipal, and local levels of expert committees on hospital infection control and treatment were established, resulting in the formulation and implementation of various protocols and procedures.

Due to the COVID-19 outbreak, the normal routine of HCWs was severely disrupted. First, they had to face increased workloads and insufficient rest. During the early stages of the outbreak, there were Chinese news reported that HCWs worked continuously for long time, sometimes exceeding 14 h (SINA Corporation, 2020). In our study, 25.7% of the participants worked for more than 8 consecutive hours a day. The average working hours for doctors were 9.9 h a day and for technicians, such as medical imaging doctors, were 9.6 h a day. Nurses had the shortest daily working hours (6.7 h) which was due to the fact that they provided direct care for COVID-19 patients and their occupational protective clothing could only maintain effective protection for 4–6 h. HCWs experienced higher levels of EE when they worked continuously for more than 8 h a day, which is consistent with previous research that found that HCWs' long working hours were associated with higher levels of anxiety, despair, and burnout (Elmore et al., 2016; Çelmeçe and Menekay, 2020). Previous studies have reported that as workload increases, HCWs have less time to recover from stressful situations, which will lead to increased rates of EE (Bridgeman et al., 2018). Our study found that during the COVID-19 outbreak, frontline HCWs' heavy workload and lack of rest breaks may lead to burnout symptoms (Bridgeman et al., 2018). To reduce the continuous work periods of frontline HCWs, Chinese hospital administrators attempted to establish a more rational work shift system that would allow frontline HCWs to have rest breaks and to regularly alternate high-pressure roles with other HCWs, and strictly implemented the new work shift system to reduce job intensity and workload (Kang et al., 2020).

Second, irregular meals are a risk factor for burnout symptoms. Of the participants, 27.0% indicated that they were unable to eat three regular daily meals and they showed higher EE and DP, which was consistent with a previous study in which nurses believed they experienced burnout because of skipped or shortened lunches (Russell, 2016). Many Chinese HCWs were unable to eat three regular daily meals, owing to excess work, limited access to food, and other reasons during the pandemic. In the earlier stages of the pandemic in Wuhan, food resources were limited, and three regular daily meals could not be guaranteed to HCWs. In Wuhan, to meet the dietary needs of HCWs and patients, governments worked together with enterprises, social groups, and volunteers. They purchased ingredients, recruited transport vehicles, and transported free meals and edible to hospital canteens. Providing nutritious and regular meals to HCWs to ensure that they have sufficient energy to prevent burnout is an important intervention to alleviate burnout—and should be considered the responsibility of governments, hospitals, and society.

Third, many HCWs' daily water intake was insufficient. Of the participants, 50.4% drank no more than 800 ml a day and showed higher EE. According to Atay S et al., in Turkey, nurses cared for patients with COVID-19 reported the most severe problem was perspiration when wearing overalls/gowns (84.1%) (Atay and Cura, 2020). Another study developed North India showed that extreme sweating (59.6%) was a serious problem among frontline nurses (Jose et al., 2021). Heavy work with insufficient water intake, water loss, and mild levels of dehydration can produce disruptions in mood and cognitive functioning, which can easily cause physical fatigue (Popkin et al., 2010). Hospital administrators should install more water dispensers in the right places, keep water safe, and encourage HCWs to drink more water during their breaks.

Forth, sleep deprivation and circadian disorders are inherent occupational risks for burnout of HCWs (Stewart and Arora, 2019). The results of our study showed that the risks of sleep deprivation were noticeable among Chinese HCWs during the pandemic. Of the participants, 56.5% slept for no more than 6 h a

day and experienced higher levels of EE. In Wuhan, to ensure that HCWs had more time to rest, hospitals arranged for HCWs to stay in hotels or hospital dormitories as close to their workplaces as possible. This practice gave HCWs some time to have rest and reduced HCWs' concerns that they would pass the virus to their families and friends.

Psychological status plays a major role in physicians' mental well-being (Elhadi et al., 2021). Given the sweeping mental health impact of COVID-19, protecting HCWs from the adverse psychological effects of the pandemic is critical (Albott et al., 2020). In our study, 45.7% of the participants reported that they received sufficient psychological crisis intervention and they showed lower EE and higher PA. Previous study has warned that psychological interventions targeting HCWs are urgently needed (Luo et al., 2020). Comprehensive psychological intervention should be carried out in the pandemic. First, at the national level, psychological crisis intervention should occupy a pivotal place in the overall deployment of COVID-19 controls (Li et al., 2020). For example, following The National Health Commission of China call for psychological crisis intervention programs, expert teams were established to compile guidelines, and mental health professionals were stationed in designated isolation hospitals to provide on-site services. Second, at the organizational level, effective psychological crisis interventions that could contribute to the reduction of burnout, such as short-term counselling (Rø et al., 2008), Balint groups which is a group training method (Huang et al., 2020), and psychological screening should be employed during the workday in the disease outbreak period (Liu Z. et al., 2020). Third, at the personal level, HCWs should attend to their physiological health and practice self-care for nutrition, rest, and sleep.

The relationship between gender and burnout is also somewhat controversial (Sanfilippo et al., 2017; Low et al., 2019), in our study, the gender variable was not an influencing factor of burnout in multiple linear regression analysis, which is similar to the results of studies developed in China during the COVID-19 outbreak (Liu X. et al., 2020; Li et al., 2021). In our study, HCWs who were older showed higher PA, which was similarity to a study conducted among HCWs in China (Huo et al., 2021). That may be because during the pandemic, compared to power factors such as infection control, the influence of the gender variable and age variable was masked.

Our research showed that the overwhelming demand for the care of COVID-19 patients placed unprecedented burdens on HCWs, resulting in burnout. Our study identified the following risks for burnout. First, a heavy workload will increase the prevalence of burnout among HCWs. Second, insufficient protection against COVID-19 and the infection status of HCWs are risk factors for burnout. Third, the disruption of normal daily routines is harmful to HCWs, including working for more than 8 continuous hours; obtaining no more than 6 h of sleep; irregular meals; and limited water intake. Fourth, the lack of timely psychological crisis intervention is a risk factor for burnout. Therefore, a synergized and comprehensive interventions should be developed by the government and hospital administrators to address the burnout of frontline HCWs and to fight the COVID-19 pandemic. First, government should re-route critical resources such as workforces and PPE to hospitals that were hit the hardest, as the Chinese government did when it sent additional medical teams to Wuhan. Second, forceful interventions should be developed by government and hospital administrators to protect HCWs from infection. Third, structural or organizational interventions, such as workload or work shift rotation should be performed to allow frontline HCWs to alternate high-pressure roles with other HCWs, and also guarantee them to receive three regular daily meals, sufficient water, and sufficient sleep. Last, psychological interventions targeting HCWs are urgently needed.

This study has several limitations. First, the data are cross-sectional, a causal relationship could not be confirmed. Second, we were limited to an online anonymous questionnaire, which may provide an over- or under-estimation of the responses. However, the online questionnaire was the safest method of data collection as face-to-face communication was risky during this period. Third, the study covered the period, February 18 to March 04, 2020, which was over a year ago. However, since the study was conducted during a pivotal period of the fight against COVID-19 in China and the period is unrepeatable, our research results are valuable to understanding the alleviation of burnout symptoms of HCWs against the background of the surge of unknown infectious diseases. Forth, data were collected from participants' self-reports; thus, inherent bias was unavoidable. Fifth, in order to not consume too much of HCWs' time, our study did not involve other psychological evaluations. Sixth, the survey did not cover all the related factors for burnout in health professionals. We designed the questionnaire according to practical situation of China, and due to the period we designed the questionnaire, literatures related to burnout of HCWs among COVID-19 pandemic were lacking, maybe there were some factors that affect the results didn't included in our study. Last, there were some innate recall bias in our study.

CONCLUSION

In this study, we determined the prevalence of and risk factors for burnout syndrome among frontline HCWs fighting COVID-19. The results indicate that burnout—which is extremely harmful—is prevalent among frontline HCWs in the battle against COVID-19 in China. We found that infection of HCWs, long continuous working hours, inability to eat three regular daily meals, insufficient water intake, and insufficient sleep increase burnout. Conversely, adherence to infection control procedures, satisfaction with their hospital's infection control measures, and sufficient psychological crisis intervention could decrease burnout. To alleviate the burnout symptoms of frontline HCWs, synergized and comprehensive interventions should be developed by governments and hospital administrators to address burnout. First, critical resource allocation should be prioritised in hospitals and workforces that are hit the hardest. Second, working in an unprotected environment, a lack of desperately needed PPE resources and infection status of HCWs may lead to burnout. Thus, governments and hospitals must protect

HCWs from infection. Third, regarding hospital managers, a more rational workshift schedule should be strictly implemented to reduce the workload of those on the frontline. Fourth, hospital management measures, including the provision of nutritious and regular meals, sufficient drinking water, opportunity to sleep for more than 6 h, and more psychological interventions to counter burnout should be integrated into the coping strategy. In addition, psychological interventions targeting HCWs should be adopted at the national, organizational, and personal levels.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

XZ, KW, and QW: conceptualization. XZ, MJ, NN, and ZK: formal analysis. KW, LS, WH, WY, and YW: investigation. XZ, LL, and LG: data curation. XZ, JW, and YH: writing—original draft preparation. WY and QW: writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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Role of Personality and Positive and Negative Affects in Coping Strategies of Nurses: A Cross-Sectional Study

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Nurses are exposed to many highly stressful events. Individual variables, such as personality and affective state, have been related to vulnerability to maladaptive coping. Therefore, the objectives of this study were to analyze the relationships between the personality, positive and negative affects, and coping strategies of nurses and to establish the mediating role of affective state in the relationship between personality and coping. The sample was made up of 1,268 Spanish nurses aged 22–63 years who completed the Coping Strategies Inventory, the Positive and Negative Affect Schedule, and the 10-item Big Five Inventory. Descriptive analyses, correlations, and mediation models were estimated. The results showed relationships between the Big Five personality factors, positive and negative affects, and coping strategies. Negative affect was confirmed as a mediator between personality and less adaptive strategies and positive affect was confirmed on positive strategies. This study emphasizes the need to develop actions directed at teaching nurses adequate problem-solving strategies and training them in the ability to assign a different emotional value to complex situations.

Keywords: personality, affect, coping strategies, nurses, descriptive of survey study

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INTRODUCTION

In spite of the importance of wellbeing of healthcare professionals in ensuring quality care and patient safety (Hall et al., 2016), this group is habitually exposed to highly stressful situations (Pérez-Fuentes et al., 2019a; Tirado et al., 2019; Wijn and van der Doef, 2020). This generates special vulnerability in nurses to develop burnout (Molero et al., 2018a,b), depression, and negative moods (Schürmann and Magraf, 2018; Veiga et al., 2019).

Coping Strategies in Nursing

Coping refers to cognitive and behavioral responses of an individual in confronting and managing stressful situations (Folkman, 2013). Not all forms of coping are considered beneficial. Adopting strategies, such as self-blame, or problem avoidance as a way of struggling with stressors lead to maladaptive results (Mark and Smith, 2012; Morales, 2020). Thus, coping responses may be divided into positive and negative. Positive coping refers to direct rational problem-solving, while negative coping refers to avoiding, withdrawing, or denying the problem (Jia et al., 2004). The professionals who use dysfunctional coping strategies show more emotional exhaustion and anxiety, which in

turn can lead to severe consequences, such as substance abuse, negligence, or changing profession (Bamonti et al., 2019). Similarly, Voskou et al. (2020) showed that nurses who use strategies related to imagining and wishing for alternative scenarios or for escape and problem avoidance have a worse quality of life due to deterioration of their physical and mental health. In this regard, in addition to poor general health, passive coping has also been related to low control and scant job support (Schreuder et al., 2012).

While strategies, such as self-criticism, social withdrawal, and problem avoidance, generate a risk for moral disconnection in the nursing practice, the development of successful strategies enables nurses to advance in their professional labor (Forozeiya et al., 2019). Positive coping skills, such as the use of problem-focused strategies, are related to high standards in resolving complicated situations, better capacity for recovery and resilience, and a healthier work environment (Schreuder et al., 2012; Teismann et al., 2018; Yu et al., 2019). Likewise, employing a positive focus in solving problems and seeking social and emotional support are related to better physical and psychological health of nurses (Voskou et al., 2020).

Personality and Affect in Nursing

Along with the strategies deployed for facing stressful situations, there are other individual characteristics that affect the job performance and quality of life, such as personality and affective state, of a professional (Barr, 2018). Personality particularly influences a variety of important results in different areas of life of a person, among which is work (Serrano-Fernández et al., 2019). In this line, following the Big Five model, three personality profiles were found in nurses: one group with high scores in extraversion traits, agreeableness, openness to experience and conscientiousness, and low in neuroticism; a second group with high scores in conscientiousness, openness to experience, and neuroticism, but low in agreeableness and extraversion; and a third group with very high scores in neuroticism and low in the rest of the variables. The two last profiles, but especially the one marked by high neuroticism, have been associated with stronger affects by stressful work situations, resulting in a higher prevalence of burnout (Pérez-Fuentes et al., 2019b).

Following Davis and Panksepp (2011), personality and affective states are closely related, and to know the human personality, affective forces and emotional impulses must be understood. With regard to personality and its link with affect, neuroticism has been associated with negative affective state, while conscientiousness, agreeableness, openness, and, especially, extraversion have been linked with positive affect (Hengartner et al., 2017).

Coping Strategies and Personality: Mediation of Positive and Negative Affects

According to Sahler and Carr (2009), personality characteristics, along with attributional style, form the coping style of an individual. Specifically, the relationship between personality and certain coping styles is due to the personality being able to moderate physiological excitation caused by stress, altering evaluation of the situation, and, therefore, the choice and effectiveness of coping (Wiebe et al., 2018). It, therefore, seems evident that personality traits influence coping (Anisman et al., 2018). So, for example, highly conscientious people tend to use proactive, problem-focused strategies (Straud et al., 2015), and at the same time, they usually feel less anxious and more positive affect than individuals with lower scores in this trait (Korotkov, 2008). Moreover, professionals with a personality marked by neuroticism may try to solve everyday problems with emotional strategies because of their high emotional reactiveness, instead of choosing more effective strategies, such as those focused on the problem (Fornés-Vives et al., 2019). Individuals with high levels of this trait choose more or less regulating responses depending on the affective burden of the situation (Augustine and Larsen, 2011).

Interaction between coping strategies and affect must therefore be considered to understand the regulation dynamics in addition to individual personality differences (Pavani et al., 2017; De la Barrera et al., 2019). It seems that people who feel negative affect at a certain time focus on negative stimuli and restrict their behavior to meditation on past or future problems to overestimate and then avoid the risk, which, in turn, can generate new negative affective experiences (Teismann et al., 2019). Along this line, a negative coping style avoiding the problem has been related to negative affect, while a problem-focused coping is related to positive affect (Dunkley et al., 2017). But further, within this relationship between affect and regulation strategies, personality has a very relevant role. Extraversion and neuroticism are the specific personality traits most involved. Extraversion provokes an initially positive affect in a stressful situation, which, in turn, leads to adaptive coping, while those more neurotic tend to experience negative affect more intensely, which involves the use of rumination and avoidance strategies (Pavani et al., 2017).

As research should concentrate on optimizing the performance and wellbeing of nurses (Dykstra et al., 2016), and nurses must frequently face stressful situations, coping is an important health process which must be included in this collective study (Kellog et al., 2018). Even though personality is relatively stable, coping strategies may be modeled (Wechler et al., 2018). The acquisition and development of effective coping strategies could therefore alleviate anxiety and increase the wellbeing of healthcare professionals (Huang et al., 2018; Molero et al., 2019). Thus, the objective of this study was to analyze the relationships between Big Five personality characteristics, affect (positive and negative), and coping strategies in a sample of nurses and to find out the mediator role of affect in the relationship between personality and coping strategies. The main hypothesis was that positive affect mediates the relationship between personality and more adaptive coping strategies, while, on the contrary, the negative affect mediates the relationship between personality and dysfunctional coping strategies.

METHOD

Participants

The original sample was made up of a total of 1,383 nurses in Andalusia (Spain). Those who were unemployed at the time of data collection were excluded (−68). Then, random

or incongruent answers detected by control questions (CQ) were discarded. After filtering, the final sample was therefore comprised of 1,268 nurses. The mean participant age was 32.02 ($SD = 6.91$) in a range of 22–63 years. The sex distribution of the sample was 85.3% ($n = 1{,}081$) women and 14.7% ($n = 187$) men, with a mean age of 32.24 ($SD = 6.68$) and 32.79 ($SD = 6.27$), respectively.

Instruments

The sociodemographic characteristics were evaluated with an *ad hoc* questionnaire including items on participant gender, marital status, and age.

How stressful events are coped with was evaluated using the *Inventario de Estrategias de Afrontamiento* [Coping Strategies Inventory] (CSI; Cano-García et al., 2007). This instrument consists of 40 items with a five-point Likert-type response scale. It has eight subscales grouped in two secondary scales: adequate management (e.g., *I fought to solve the problem*), well-focused on the problem (Problem-Solving and Cognitive Restructuring subscales) and well-concentrated on the emotion (Social Support and Emotion Expression subscales); and inadequate management (e.g., *I blamed myself*), problem focused (Problem Avoidance and Wishful Thinking) and emotion focused (Social Withdrawal and Self-Criticism subscales). The reliability indices were: $\omega = 0.883$, the greatest lower bound (GLB) = 0.869 in problem-solving; $\omega = 0.866$, GLB = 0.866 in self-criticism; $\omega = 0.823$, GLB = 0.843 in emotion expression; $\omega = 0.869$, GLB = 0.881 for wishful thinking; $\omega = 0.904$, GLB = 0.930 for social support; $\omega = 0.818$, GLB = 0.828 for the cognitive restructuring subscale; $\omega = 0.749$, GLB = 0.787 on problem avoidance; and $\omega = 0.784$, GLB = 0.824 for social withdrawal.

The Spanish version (Joiner et al., 1997) of the *Positive and Negative Affect Schedule* (PANAS Scale; Watson et al., 1988) was used for evaluating the positive and negative affects. This test is comprised of 20 items organized into two groups, 10 on positive affect (e.g., *Interested in things*) and 10 on negative affect (e.g., *Aggressive*). The answers are rated on a Likert-type scale in a range of 1–5 points. Reliability was $\omega = 0.753$, GLB = 0.798 for positive affect and $\omega = 0.736$, GLB = 0.822 for negative affect.

The 10-item Big Five Inventory (BFI-10; Rammstedt and John, 2007) was used to evaluate the personality traits. This provides information on the Big Five personality factors (extraversion, conscientiousness, agreeableness, neuroticism, and openness) (e.g., *I look like someone who is reserved*). Findings support the factorial validity, construct validity, and criterion validity of the BFI-10 (Rammstedt and John, 2007; Rammstedt et al., 2014).

Procedure

The sample for this cross-sectional study was found by snowball sampling, by publishing it on social networks and texting. A computer-aided web interviewing (CAWI) survey was used to collect the data.

Before data were collected, the participants were assured that data processing in the study would comply with the applicable standards of data security, confidentiality, and ethics. The study was approved by the University of Almería Bioethics Committee, Spain (Ref: UALBIO2017/011). The questionnaire was administered in 2017 on a Web platform that enabled the participants to fill it in online. A series of control questions were inserted to control for random or incongruent answers, which were then eliminated from the study.

Data Analysis

The study was quantitative, observational, and cross-sectional. First, Pearson's correlation analyses were performed. A Bayesian analysis was done of the pairs in which significance was from 0.01 to 0.05 for a more accurate statistic in the comparison of hypotheses. This evaluates the predictive adequacy of the null hypothesis, H_0: $\rho = 0$, which stipulates that the correlation is absent, and compares it with the predictive adequacy of an alternative hypothesis H_1, which stipulates that the correlation exists (Wagenmakers et al., 2016).

Mediation models were proposed based on the results found from the correlation matrices. Two mediation analyses were performed with multiple predictors, one mediator and four result variables, using JASP version 0.11.1 (JASP Team, 2019), based on the lavaan software (Rosseel, 2012). To test whether there was an indirect effect, the bias-corrected bootstrap confidence interval was applied (Biesanz et al., 2010). To examine the reliability of the instruments used for collecting data, the McDonald's Omega coefficient was estimated, following the proposal and instructions of McDonald (1999), Ventura-León and Caycho (2017). The GLB was also estimated.

RESULTS

Preliminary Analyses

The mean scores and standard deviations of each of the study variables were as follows: Positive affect ($M = 2.99$, $SD = 0.43$), negative affect ($M = 2.09$, $SD = 0.39$), extraversion ($M = 3.50$, $SD = 0.80$), agreeableness ($M = 4.01$, $SD = 0.58$), conscientiousness ($M = 3.87$, $SD = 0.67$), neuroticism ($M = 2.67$, $SD = 0.81$), openness to experience ($M = 3.51$, $SD = 0.74$), problem solving ($M = 13.59$, $SD = 3.96$), self-criticism ($M = 6.05$, $SD = 4.16$), emotion expression ($M = 10.31$, $SD = 3.83$), wishful thinking ($M = 10.67$, $SD = 4.73$), social support ($M = 13.27$, $SD = 4.40$), cognitive restructuring ($M = 11.75$, $SD = 3.91$), problem avoidance ($M = 6.98$, $SD = 3.74$), and social withdrawal ($M = 4.76$, $SD = 3.49$).

Table 1 shows the pairwise correlation matrix for the affect and personality factors. Positive affect correlated positively with extraversion, agreeableness, conscientiousness, and openness to experience and had a negative relationship with neuroticism. Negative affect correlated positively with neuroticism and negatively with the rest of personality factors.

The Bayes factor for negative affect-extroversion was ($BF_{-0} = 1.802$, 95% CI = −0.126, −0.019), which indicates that the data are 1.8 times more likely under the alternative hypothesis that expresses the existence of a negative correlation than under the null hypothesis. In line with Jeffreys (1961), a Bayes factor from 1 to 3 is considered weak or inconclusive evidence, a Bayes factor from 3 to 10 is considered moderate evidence, and a Bayes factor above 10 is considered strong evidence.

TABLE 1 | Affect and personality—Pearson's pairwise correlations.

Affect	Personality	Pearson's *r*	*p*	Below 95% CI	Above 95% CI
Positive	Extraversion	0.126	<0.001	0.071	0.179
	Agreeableness	0.106	<0.001	0.051	0.160
	Conscientiousness	0.202	<0.001	0.149	0.255
	Neuroticism	−0.146	<0.001	−0.200	−0.092
	Openness	0.177	<0.001	0.123	0.230
Negative	Extraversion	−0.072	0.011	−0.126	−0.017
	Agreeableness	−0.108	<0.001	−0.162	−0.053
	Conscientiousness	−0.143	<0.001	−0.197	−0.089
	Neuroticism	0.256	<0.001	0.203	0.306
	Openness	−0.060	0.032	−0.115	−0.005

In the negative affect-openness to experience pair, the Bayes factor was (BF_{-0} = 0.684, 95% CI = −0.115, −0.011), which shows that the data are 1.46 times more likely under the null hypothesis than under the alternative hypothesis.

Table 2 presents the pairwise correlations between the affects and coping strategies. In the first place, problem-solving coping strategies and seeking social support were positively related with positive affect, while the other strategies based on self-criticism, wishful thinking, and social withdrawal showed positive correlations with negative affect.

Furthermore, other coping strategies were identified that were positively related with both affects: emotion expression, cognitive restructuring, and problem avoidance.

Regarding the pairwise correlations between personality factors and coping strategies, coping strategies based on problem-solving correlated positively with extraversion, agreeableness, conscientiousness, and openness to experience, while the correlation with neuroticism was negative.

The self-criticism strategy was positively related to neuroticism and negatively to the rest of the personality factors.

Emotion expression showed positive correlations with all the personality factors except neuroticism with which it was not correlated.

Coping directed at wishful thinking correlated positively with neuroticism and, to a lesser extent, with agreeableness. Seeking social support correlated positively with all the personality factors and negatively with neuroticism, as did the cognitive restructuring strategy.

In addition, problem-avoidance coping was negatively related with agreeableness and conscientiousness.

Finally, social withdrawal was a coping strategy associated positively with neuroticism and negatively with the four remaining personality factors.

Mediation Models

Two mediation models were proposed as follows (**Figure 1**):

Model 1, which proposes positive affect as a mediator in the relationship between the personality dimensions and positive coping strategies (considered as such based on the preliminary results of positive relationships of affect and the personality dimensions that could be beneficial, in this case, for professional practice).

Model 2 hypothesized the existence of a mediating effect of negative affect in the relationship established between the personality factors and the use of negative coping strategies.

As observed in **Table 3**, the extraversion and agreeableness factors showed direct positive effects on the "positive" coping strategies (problem-solving, cognitive restructuring, social support, and emotion expression). The conscientiousness factor had a direct positive effect on the problem-solving strategy and, to a lesser extent, on cognitive restructuring. On these two strategies, although negatively, a direct effect of neuroticism was observed, whereas the openness to experience factor exerted a direct positive effect on problem-solving and social support.

As indirect effects, positive affect mediated in the relationship of extraversion with problem-solving, social support, and emotion expression. Positive affect also mediated in the relationships of the agreeableness factor with problem-solving, cognitive restructuring, and emotion expression.

Furthermore, positive affect was a mediator in the relationship of conscientiousness with the problem-solving, cognitive restructuring, and social support coping strategies. Finally, positive affect was observed to mediate in the relationships between openness to experience and cognitive restructuring, social support, and emotion expression.

Finally, the proportion of variance explained for each of the endogenous variables in Mediation Model 1 is the following: R^2 = 0.237 for problem-solving, R^2 = 0.116 for cognitive restructuring, R^2 = 0.157 for social support, R^2 = 0.096 for emotion expression, and R^2 = 0.070 for the positive affect mediator.

Table 4 shows that the extraversion factor exerted a direct negative effect on the self-criticism and social withdrawal coping strategies. The agreeableness factor had a direct positive effect on wishful thinking and a negative effect on social withdrawal. The conscientiousness factor had a direct negative effect on the problem avoidance, social withdrawal, and self-criticism strategies, while the neuroticism factor exerted a direct positive effect on wishful thinking, social withdrawal, and self-criticism strategies.

As to the indirect effects, negative affect was observed to exert a mediating role in the relationship of extraversion with social

TABLE 2 | Affect, personality, and coping strategies—Pearson's pairwise correlations.

	Coping strategies	Pearson's *r*	*p*	Below 95% CI	Above 95% CI
Affect					
Positive	- Problem-solving	0.300	<0.001	0.249	0.349
	- Self-criticism	0.034	0.221	−0.021	0.089
	- Emotion expression	0.211	<0.001	0.158	0.263
	- Wishful thinking	0.052	0.065	−0.003	0.107
	- Social support	0.254	<0.001	0.202	0.305
	- Cognitive restructuring	0.274	<0.001	0.223	0.324
	- Problem avoidance	0.094	<0.001	0.039	0.148
	- Social withdrawal	−0.013	0.635	−0.068	0.042
Negative	- Problem-solving	−0.035	0.211	−0.090	0.020
	- Self-criticism	0.292	<0.001	0.240	0.341
	- Emotion expression	0.125	<0.001	0.071	0.179
	- Wishful thinking	0.111	<0.001	0.056	0.165
	- Social support	0.021	0.457	−0.034	0.076
	- Cognitive restructuring	0.077	0.006	0.022	0.131
	- Problem avoidance	0.163	<0.001	0.109	0.216
	- Social withdrawal	0.254	<0.001	0.202	0.305
Personality					
Extraversion	- Problem-solving	0.212	<0.001	0.159	0.264
	- Self-criticism	−0.165	<0.001	−0.218	−0.110
	- Emotion expression	0.215	<0.001	0.161	0.267
	- Wishful thinking	−0.035	0.218	−0.089	0.020
	- Social support	0.267	<0.001	0.215	0.318
	- Cognitive restructuring	0.140	<0.001	0.085	0.193
	- Problem avoidance	−0.028	0.321	−0.083	0.027
	- Social withdrawal	−0.257	<0.001	−0.308	−0.205
Agreeableness	- Problem-solving	0.262	<0.001	0.210	0.313
	- Self-criticism	−0.090	0.001	−0.144	−0.035
	- Emotion expression	0.165	<0.001	0.111	0.218
	- Wishful thinking	0.088	0.002	0.034	0.143
	- Social support	0.239	<0.001	0.186	0.290
	- Cognitive restructuring	0.173	<0.001	0.119	0.226
	- Problem avoidance	−0.060	0.034	−0.114	−0.005
	- Social withdrawal	−0.201	<0.001	−0.253	−0.148
Conscientiousness	- Problem-solving	0.343	<0.001	0.293	0.391
	- Self-criticism	−0.211	<0.001	−0.263	−0.158
	- Emotion expression	0.081	0.004	0.026	0.135
	- Wishful thinking	−0.010	0.709	−0.066	0.045
	- Social support	0.162	<0.001	0.108	0.215
	- Cognitive restructuring	0.172	<0.001	0.118	0.225
	- Problem avoidance	−0.074	0.008	−0.129	−0.019
	- Social withdrawal	−0.203	<0.001	−0.256	−0.150
Neuroticism	- Problem-solving	−0.244	<0.001	−0.295	−0.192
	- Self-criticism	0.279	<0.001	0.228	0.329
	- Emotion expression	−0.027	0.340	−0.082	0.028
	- Wishful thinking	0.189	<0.001	0.135	0.241
	- Social support	−0.129	<0.001	−0.183	−0.075
	- Cognitive restructuring	−0.152	<0.001	−0.205	−0.097
	- Problem avoidance	0.011	0.688	−0.044	0.066
	- Social withdrawal	0210	<0.001	0.156	0.262

(Continued)

TABLE 2 | Continued

	Coping strategies	Pearson's *r*	*p*	Below 95% CI	Above 95% CI
Openness to experience	- Problem-solving	0.249	<0.001	0.197	0.300
	- Self-criticism	−0.114	<0.001	−0.168	−0.059
	- Emotion expression	0.101	<0.001	0.047	0.156
	- Wishful thinking	0.004	0.881	−0.051	0.059
	- Social support	0.168	<0.001	0.114	0.221
	- Cognitive restructuring	0.143	<0.001	0.088	0.196
	- Problem avoidance	−0.005	0.846	−0.060	0.050
	- Social withdrawal	−0.100	<0.001	−0.154	−0.045

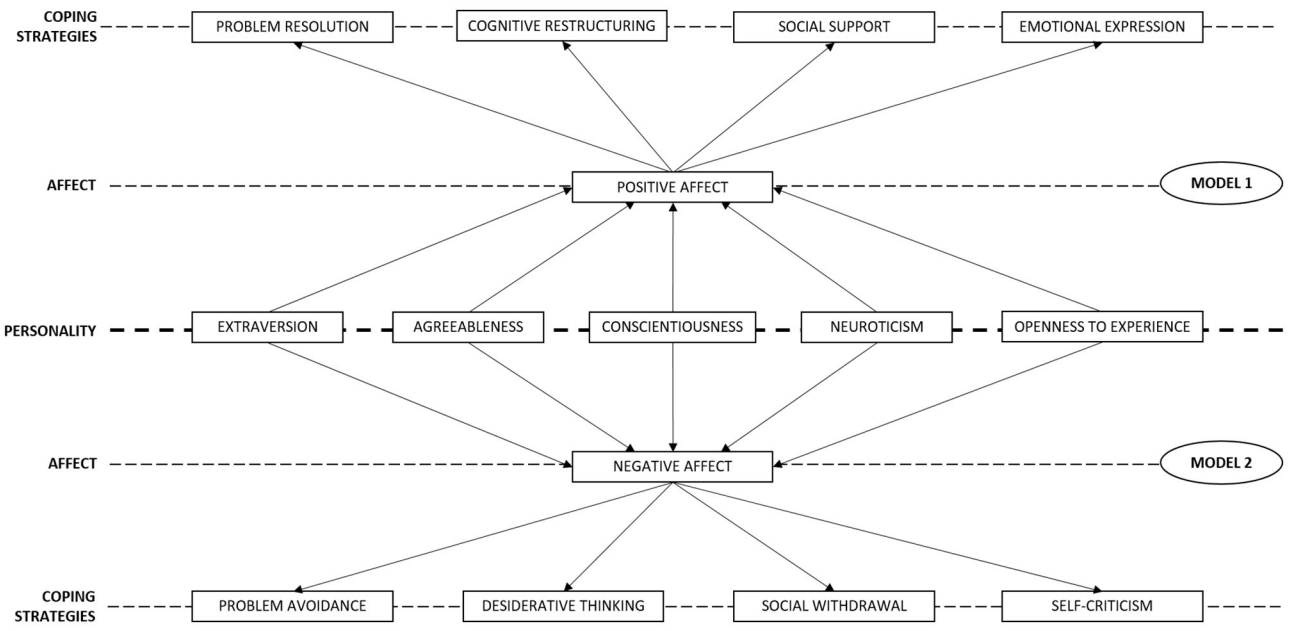

FIGURE 1 | Hypothetical mediation models.

withdrawal and self-criticism. Negative affect further mediated in the relationship of the conscientiousness factor with the problem avoidance and self-criticism coping strategies. For neuroticism, negative affect intervened as a mediator in its relationships with the problem avoidance and wishful thinking strategies. Finally, the mediator effect of negative affect was present in the relationships between the openness and problem avoidance, wishful thinking, and social withdrawal coping strategies.

Finally, the proportion of variance explained for each of the endogenous variables in Mediation Model 1 was the following: $R^2 = 0.033$ for problem avoidance, $R^2 = 0.056$ for wishful thinking, $R^2 = 0.156$ for social withdrawal, $R^2 = 0.155$ for self-criticism, and $R^2 = 0.075$ for the negative affect mediator.

DISCUSSION

The objective of this study was to analyze the relationship of the coping strategies with affect and individual personality. In the first place, and in agreement with the literature (Hall et al., 2016; Hengartner et al., 2017), positive relationships were found between positive affect and all the Big Five Model traits except neuroticism, with which it shows a negative association, while the relationship of negative affect with the personality factors was the contrary.

In addition, concerning the relationships between affect and the coping strategies, a positive association was found between positive affect and adequate problem management or emotion, while negative affect showed a positive relationship mostly with strategies considered inadequate. Thus, while positive affect was especially related to active effort for compensating a stressful situation, negative affect would be linked to maladaptive coping with stress, showing a passive attitude by avoiding the problem. Previous studies have shown the negative role in harmful interpretation of the stressful situation, which could lead to overestimation of risk, and therefore avoiding confrontation with it or avoiding the distress associated with it (Dunkley et al., 2017). On the contrary, a positive affective state in stressful events means that one is active, lively, and alert, and so feels more confident of

TABLE 3 | Direct and indirect effects (Model 1).

	Estimated	Standard error	*z*-value	*p*	95% CI	
					Below	Above
Direct effects						
EXT → PRS	0.107	0.032	3.361	<0.001	0.049	0.170
AGR → PRS	0.251	0.044	5.691	<0.001	0.169	0.343
CON → PRS	0.286	0.040	7.109	<0.001	0.202	0.372
NEU → PRS	−0.137	0.032	−4.315	<0.001	−0.196	−0.072
OPE → PRS	0.149	0.035	4.261	<0.001	0.084	0.226
EXT → COR	0.073	0.034	2.112	0.035	0.007	0.139
AGR → COR	0.182	0.047	3.834	<0.001	0.080	0.278
CON → COR	0.086	0.043	1.988	0.047	−2.043e−4	0.174
NEU → COR	−0.085	0.034	−2.499	0.012	−0.155	−0.014
OPE → COR	0.073	0.038	1.932	0.053	0.003	0.149
EXT → SOS	0.236	0.034	7.040	<0.001	0.169	0.306
AGR → SOS	0.271	0.046	5.849	<0.001	0.181	0.362
CON → SOS	0.037	0.042	0.866	0.387	−0.053	0.128
NEU → SOS	−0.030	0.033	−0.904	0.366	−0.096	0.037
OPE → SOS	0.103	0.037	2.814	0.005	0.025	0.182
EXT → EME	0.216	0.035	6.223	<0.001	0.145	0.288
AGR → EME	0.195	0.048	4.051	<0.001	0.101	0.287
CON → EME	−0.015	0.044	−0.348	0.728	−0.110	0.070
NEU → EME	0.064	0.034	1.864	0.062	−0.011	0.135
OPE → EME	0.056	0.038	1.465	0.143	−0.027	0.134
Indirect effects						
EXT → PA → PRS	0.016	0.007	2.202	0.028	0.002	0.034
EXT → PA → COR	0.012	0.010	1.196	0.232	−0.008	0.034
EXT → PA → SOS	0.038	0.010	3.806	<0.001	0.021	0.064
EXT → PA → EME	−0.019	0.007	−2.600	0.009	−0.037	−0.005
AGR → PA → PRS	0.031	0.009	3.581	<0.001	0.014	0.056
AGR → PA → COR	0.018	0.008	2.211	0.027	0.002	0.038
AGR → PA → SOS	0.013	0.011	1.198	0.231	−0.009	0.037
AGR → PA → EME	0.043	0.011	3.846	<0.001	0.024	0.071
CON → PA → PRS	−0.022	0.008	−2.609	0.009	−0.041	−0.006
CON → PA → COR	0.035	0.010	3.613	<0.001	0.016	0.061
CON → PA → SOS	0.015	0.007	2.185	0.029	0.003	0.033
CON → PA → EME	0.011	0.009	1.194	0.233	−0.008	0.032
NEU → PA → PRS	0.037	0.010	3.722	<0.001	0.021	0.062
NEU → PA → COR	−0.018	0.007	−2.572	0.010	−0.037	−0.005
NEU → PA → SOS	0.030	0.008	3.510	<0.001	0.014	0.054
NEU → PA → EME	0.015	0.007	2.162	0.031	0.002	0.030
OPE → PA → PRS	0.011	0.009	1.190	0.234	−0.008	0.030
OPE → PA → COR	0.035	0.010	3.618	<0.001	0.018	0.059
OPE → PA → SOS	−0.017	0.007	−2.538	0.011	−0.034	−0.004
OPE → PA → EME	0.028	0.008	3.422	<0.001	0.012	0.049

EXT, extraversion; AGR, agreeableness; CON, conscientiousness; NEU, neuroticism; OPE, openness to experience; PRS, problem-solving; COR, cognitive restructuring; SOS, social support; EME, emotion expression; PA, positive affect.
Delta method standard error, bias-corrected percentile bootstrap confidence interval.

the ability of an individual to deal with the problem successfully, mainly by choosing active strategies (Cano-García et al., 2007).

The relationship between the Big Five factors and coping strategies was also confirmed, finding that the most prevalent personality traits considered more adaptive (extraversion, agreeableness, conscientiousness, and openness to experience) showed positive relationships with the more well-adjusted coping strategies and negative relationships with the

TABLE 4 | Direct and indirect effects (Model 2).

	Estimated	Standard error	*z*-value	*p*	95% CI	
					Below	Above
Direct effects						
EXT → PRA	−0.013	0.036	−0.374	0.709	−0.091	0.057
AGR → PRA	−0.061	0.050	−1.219	0.223	−0.168	0.045
CON → PRA	−0.089	0.045	−1.967	0.049	−0.192	0.008
NEU → PRA	−0.062	0.036	−1.691	0.091	−0.137	0.009
OPE → PRA	0.028	0.039	0.711	0.477	−0.056	0.111
EXT → DES	−0.030	0.035	−0.858	0.391	−0.104	0.048
AGR → DES	0.209	0.049	4.254	<0.001	0.105	0.286
CON → DES	0.030	0.045	0.672	0.502	−0.058	0.124
NEU → DES	0.231	0.036	6.430	<0.001	0.159	0.310
OPE → DES	0.023	0.039	0.606	0.544	−0.057	0.096
EXT → SOW	−0.233	0.033	−6.953	<0.001	−0.306	−0.168
AGR → SOW	−0.179	0.046	−3.850	<0.001	−0.283	−0.084
CON → SOW	−0.141	0.042	−3.337	<0.001	−0.239	−0.053
NEU → SOW	0.102	0.034	2.993	0.003	0.029	0.168
OPE → SOW	−0.013	0.036	−0.353	0.724	−0.090	0.060
EXT → SEC	−0.117	0.033	−3.484	<0.001	−0.188	−0.037
AGR → SEC	0.017	0.046	0.361	0.718	−0.080	0.102
CON → SEC	−0.166	0.042	−3.941	<0.001	−0.258	−0.085
NEU → SEC	0.210	0.034	6.174	<0.001	0.145	0.291
OPE → SEC	−0.043	0.037	−1.176	0.239	−0.122	0.033
Indirect effects						
EXT → NA → PRA	−7.537e−4	0.006	−0.131	0.896	−0.014	0.010
EXT → NA → DES	−0.016	0.008	−1.934	0.053	−0.037	9.077e−5
EXT → NA → SOW	−0.017	0.008	−2.183	0.029	−0.038	−0.003
EXT → NA → SEC	0.046	0.010	4.664	<0.001	0.030	0.071
AGR → NA → PRA	2.623e−4	0.006	0.042	0.967	−0.013	0.013
AGR → NA → DES	−3.589e−4	0.003	−0.131	0.896	−0.008	0.006
AGR → NA → SOW	−0.008	0.005	−1.647	0.099	−0.020	−3.567e−4
AGR → NA → SEC	−0.008	0.005	−1.794	0.073	−0.021	−0.001
CON → NA → PRA	0.022	0.008	2.608	0.009	0.007	0.039
CON → NA → DES	1.249e−4	0.003	0.042	0.967	−0.006	0.008
CON → NA → SOW	−8.896e−4	0.007	−0.131	0.896	−0.016	0.012
CON → NA → SEC	−0.019	0.010	−1.977	0.048	−0.042	−1.782e−4
NEU → NA → PRA	−0.020	0.009	−2.245	0.025	−0.042	−0.003
NEU → NA → DES	0.054	0.010	5.379	<0.001	0.034	0.081
NEU → NA → SOW	3.096e−4	0.007	0.042	0.967	−0.016	0.015
NEU → NA → SEC	−0.001	0.008	−0.131	0.896	−0.018	0.014
OPE → NA → PRA	−0.022	0.011	−1.995	0.046	−0.045	9.475e−4
OPE → NA → DES	−0.023	0.010	−2.273	0.023	−0.048	−0.003
OPE → NA → SOW	0.063	0.011	5.795	<0.001	0.043	0.089
OPE → NA → SEC	3.579e−4	0.009	0.042	0.967	−0.018	0.018

EXT, extraversion; AGR, agreeableness; CON, conscientiousness; NEU, neuroticism; OPE, openness to experience; PRA, problem avoidance; DES, desiderative thinking; SOW, social withdrawal; SEC, self-criticism; NA, negative affect.
Delta method standard error, bias-corrected percentile bootstrap confidence interval.

negative coping strategies. Meanwhile, the neuroticism factor showed the opposite relationship with coping strategies, such that it associated positively with strategies typical of a negative approach and negatively with more adequate ways of managing the stressful event (Cano-García et al., 2007).

Then, the two mediation models were estimated. In the first model, it was observed that positive affect acted as

a mediator in the relationship between neuroticism and all the positive strategies. Although this result may at first seem surprising, according to previous literature, this trait is especially linked to affect and regulation strategies (Pavani et al., 2017). In particular, individuals with high levels of neuroticism may select adaptive coping strategies when the affective burden of the situation is positive (Augustine and Larsen, 2011). Thus, even though emotional instability typical of the neuroticism factor usually leads to negative evaluation of the situation, and therefore a greater tendency to select negative solution strategies (Fornés-Vives et al., 2019), a person with high neuroticism may prefer strategies that promote adequate management in the presence of an enthusiastic, alive affective state. Similarly, those with personality traits considered positive select proactive problem-solving strategies and relieve the emotional distress through positive affect which means dealing with the situation actively and optimistically (Korotkov, 2008; Straud et al., 2015; Pavani et al., 2017).

The second model shows how negative affect mediated the effect of extraversion on inadequate emotion-focused management, wishful thinking, conscientiousness, problem avoidance, and self-criticism strategies; the neuroticism factor and inadequate problem-focusing management strategies; and the openness to experience trait and problem avoidance strategies, social withdrawal, and wishful thinking. Thus, when the affective state is marked by negative feelings, such as fear or guilt, coping strategies considered maladaptive may end up being employed, regardless of personality traits. Therefore, acquisition and development of effective coping strategies to solve the frequent stressful situations in the healthcare job context (Huang et al., 2018) goes through training in adequate problem management strategies as well as intervention on the affect generated by such events. This means undertaking the regulation dynamics between employee coping, affect, and personality together (De la Barrera et al., 2019).

It is important to state some limitations. In the first place, the characteristics of the stressful situation were not taken into account. The CSI asks the subject in the instructions to think of a situation experienced in the last month and evaluate the coping strategies used for it. As the situation remembered may have an affective load and different intensity in each case, and therefore be related to the type of coping selected, in future studies, the nature of the stressful event selected should be taken into consideration. We should also mention the short length of the instrument used to assess personality. Even though it is so short, it can be beneficial because it is easy to apply, although it may also reduce the measurement efficacy. Variables such as age, years of experience, or the department where they were working were not taken into account either. In future studies, these factors should be controlled for, given their connection with coping strategies.

CONCLUSIONS

Since the exposure of nurses to stress is so high, inadequate management can cause more vulnerability to the development of physical and psychological affects, while adaptive coping promotes wellbeing and effective solution. This study showed that personality can be closely linked to the way worker stress is handled. However, the affective state mediates in this relationship, such that when negative affect is experienced, stressful events are managed less adaptively, and when positive affect is present, it acts as a mediator between personality factors and positive coping strategies.

Therefore, this study shows the need to continue inquiry into factors involved in effective coping with stressful situations in the nursing work environment and variables related with their appearance. Their in-depth knowledge would make it possible to develop actions teaching adequate problem-solving strategies and training in the ability to assign a different emotional value to complicated situations.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Bioethics Committee of the University of Almería (Ref: UALBIO2017/011). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MCP-F, MMMJ, ÁMM, ABBM, and MMSM contributed to the conception and design of the review. JJGL and ABBM applied the search strategy. MCP-F, MMMJ, and ÁMM wrote this manuscript. MCP-F and JJGL edited this manuscript. All authors applied the selection criteria, completed the assessment of the risk of bias, analyzed the data and interpreted data, and read and agreed to the published version of the manuscript.

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Towards Better Understanding of the Harmful Impact of Hindrance and Challenge Stressors on Job Burnout of Nurses. A One-Year Cross-Lagged Study on Mediation Role of Work-Family Conflict

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The mediation role of work–family conflict (WFC) in job demands – job burnout link is well documented, also in group of nurses. It is still unclear, however, which job demands are particularly conducive to WFC and job burnout. Moreover the mediational effect of WFC was tested mainly in cross-sectional studies that were conducted in countries of North America and Western Europe. Drawing on the Job Demands-Resources and the Effort-Recovery models, this one-year cross-lagged study investigates the effects of five types of job demands related to challenge and hindrance stressors on job burnout (measured with exhaustion and disengagement from work) as well as the mediational role of WFC in Polish nurses. Job demands included emotional, cognitive demands, and demands for hiding emotions (as challenge stressors) as well as quantitative demands and work pace (as hindrance stressors). Data were collected among 516 nurses. Structural equation modelling (SEM) showed that hindrance stressors (T1) are predictor of higher job burnout (T2). The positive role of challenge stressors (T1) were not supported. Only emotional demands were associated with exhaustion but the direction of the relation was opposite than expected. WFC (T1) mediated the harmful effect of the two hindrance stressors and emotional demands on disengagement from work (but not on exhaustion). Cognitive demands and demands for hiding emotions were not related to negative outcomes. The obtained results shed light on the role of the challenge-hindrance stressors and WFI in development of job burnout. The implications for theory and research on the mental health of nurses are discussed.

Keywords: hindrance and challenge stressors, job burnout, work-family conflict, nurses, mediation effect

INTRODUCTION

As representatives of social service, nurses are especially vulnerable to job burnout (Maslach et al., 2001). According to the Job Demands-Resources model (Bakker and Demerouti, 2017), job burnout is a response to a prolonged state of imbalance between job demands and job resources. The direct relation between job demands and job burnout is very well documented

(e.g., Schaufeli and Bakker, 2004; Alarcon, 2011), also in groups of nurses (Hansen et al., 2009; Jourdain and Chênevert, 2010; Garrosa et al., 2011; Adriaenssens et al., 2015; Dall'Ora et al., 2020); therefore, researchers are looking for potential mediational variables that would deepen the understanding of mechanisms regulating this relationship. Considering the irregular work hours of nurses, the regular night shifts and the fact that nursing is an occupation dominated by women, who tend to have greater family responsibilities than men (Mayrhofer et al., 2008; Maher, 2013), the work-family conflict (WFC) is pointed out as a key mediator of the job demands –burnout link in this profession (Unruh et al., 2016; Gonnelli and Raffagnino, 2017). The mediation effect of WFC is confirmed in groups of nurses but mainly in cross-sectional (not cross-lagged) studies that were conducted in countries of North America and Western Europe (Janssen et al., 2004; Leineweber et al., 2014), but not Eastern Europe, where working conditions in the nursing field are highly demanding (Hasselhorn et al., 2008; Koff, 2016; OECD/European Union, 2020). The purpose of the current research is to test the mediational effect of WFC in the job demands – job burnout link in a one-year cross-lagged design in Poland. Five different types of job demands (categorised as hindrance or challenge) were taken into account, including quantitative demands, work pace, emotional demands, cognitive demands, and demands for hiding emotions.

Nurses in Poland

Currently, working conditions for Polish nurses are very burdensome. According to the report *Health at a Glance Europe 2020* prepared by the OECD, Poland has one of the lowest numbers of employed nurses per 1,000 inhabitants in Europe (5.1 compared to an average of 8.2 for EU countries and 17.7 for Norway, which is in the lead). The Polish Main Chamber of Nurses and Midwives (2017) forecast that by 2030 this ratio will have dropped to 3.81. The average age of Polish nurses, which is 52.2 years, is also worrying. Nearly 52% of all nurses are aged over 51 years old, while people up to 30 years old constitute only 5.5% of the workforce. Such a high average age is largely due to the emigration of younger, well-educated Polish nurses to Western European countries and little interest in studying nursing in Poland in recent years (Wyrozebska and Wyrozebski, 2014). The research shows that 53% of the surveyed nursing students declared their willingness to go abroad after completing their education, in order to work in the profession (Radosz and Paplaczyk, 2017). The motives they mention are higher earnings, better working conditions and higher prestige of the profession.

The most common system of shift work of nurses in Polish hospitals is a two-shift system including on-call time lasting 12 h, most often starting at 7.00 am or 7.00 pm (Wyrozebska and Wyrozebski, 2014). Long and irregular working hours, as well as challenging working conditions and job stress make nurses particularly prone to experiencing WFC and job burnout. A study confirms the experience of chronic work-family conflicts among 50% of nurses and episodes of conflict among another 41% (Grzywacz et al., 2006), as well as a high level of job burnout in this profession (Lloyd et al., 2002; Adriaenssens et al., 2015), also in Poland (Van der Schoot et al., 2003; Dåderman and Basinska, 2016).

THEORETICAL FRAMEWORK AND HYPOTHESES

The Effects of Challenge and Hindrance Stressors on WFC Among Nurses

Both studies on large samples of nurses (e.g., Simon et al., 2004; Leineweber et al., 2014; Unruh et al., 2016) and meta-analyses (Gonnelli and Raffagnino, 2017) confirm that prolonged high job demands lead to WFC. It is not clear, however, what types of job demands affect WFC in this professional group and how strongly (Wood and Mechaelides, 2016). A given type of job demand may or may not be aggravating and stressful, depending on whether it is perceived as challenging or hindering (Cavanaugh et al., 2000). Challenge stressors refer to those job demands that are perceived by the employee as creating opportunities for personal growth (e.g., gaining new skills, experiences, broadening horizons, reinforcing self-efficacy) and through improvement of one's job performance give a chance for promotion or a pay rise. Hence, they can be a source of positive emotions, motivation and well-being (LePine et al., 2005; Podsakoff et al., 2007; Van den Broeck et al., 2010). In contrast, hindrance stressors concern job demands which are viewed as barriers to goal accomplishment. Handling them, at best improves the efficiency of the employee and makes them meet the imposed obligations, but is not a source of satisfaction or fulfilment *per se* (Cavanaugh et al., 2000). This typology of stressors seems to be particularly important for the nursing profession, whose scope of professional duties is very wide and contains numerous and diverse tasks (Aiken et al., 2001; Hasselhorn et al., 2008; Koff, 2016) related to quantitative demands (e.g., overtime hours, weekend work, and irregular work schedules), work pace (e.g., during medical treatment, dressings, or basic measurements), cognitive demands (e.g., acquiring new skills and qualifications, operation of medical equipment and devices, conducting education for healthy lifestyle), emotional demands (e.g., patient care, close relations with colleagues, patients and their families), demands for hiding emotions (e.g., contact with potentially infectious material, including blood, secretions, excreta, contact with chronic diseases, and death). It has been shown that the type of occupation is an important criterion for qualifying a stressor as a challenge or a hindrance. For example, nurses perceive emotional demands more as a challenge than as a hindrance. The reverse applies to quantitative demands and work pressure (Bakker and Sanz-Vergel, 2013).

Gonnelli and Raffagnino (2017) reviewed 1,180 studies on WFC, published in English and Italian in the years 2005–2017. Of these, they selected 28, which strictly concerned antecedents (and outcomes) of the conflict between work and family in groups of nurses. They found that the negative role of quantitative demands in the development of WFC is strongly supported and evident. For example, in one cross-cultural study conducted in a group of 27,603 nurses from eight countries, it was shown

that quantitative demands (including intensity of work, regularity of working time, and being pressured to work overtime) are the dominating risk factors in all participating countries and they explain 13–23% of the observed variance for WFC (Simon et al., 2004). Other studies also showed that quantitative demands operationalised in different way - e.g., workload, overtime hours, weekend work and irregular work schedules – are hindering and all associated with WFC in nurses (Yildirim and Aycan, 2008; Hansen et al., 2009; Leineweber et al., 2014; Lembrechts et al., 2014; Sugawara et al., 2017).

The results of studies on the impact of emotional demands are more confused (Gonnelli and Raffagnino, 2017). In social service, there are references to two kinds of demands (Soderfeldt et al., 1996): emotionally burdensome relations with other people (e.g., in the context of long-term care, interpersonal conflicts, aggressive behaviour), and demands to observe the emotional display rules consisting in showing positive emotions and hiding the negative ones during social interactions (e.g., with a co-worker, supervisor, patient), traumatic events (e.g., emergency, patient death) and daily routines (e.g., dressings change, medical treatment). A few investigations confirm the positive relationship of WFC with emotional charge (Cortese et al., 2010), emotional dissonance (Bakker and Heuven, 2006; Ghislieri et al., 2017), aggression of patients' experience (Peeters et al., 2004) and confrontation with death, illness, and other human suffering (Van der Heijden et al., 2008) but the correlation coefficients for emotional demands are lower than the ones for quantitative demands (Van der Heijden et al., 2008). Moreover, the results of several studies suggest that nurses are especially predisposed to perceiving emotional demands as challenge stressors (LePine et al., 2005; Bakker and Sanz-Vergel, 2013). For example, Bakker and Sanz-Vergel (2013) compared to which group of stressors (challenge or hindrance) emotional demands and work pressure are ascribed by nurses and journalists (non-social service staff). Tight deadlines are a recurring problem for journalists because newspapers and news programmes are usually distributed and broadcast daily. Hence, journalists consider time pressure as a challenge. In the case of nurses, time pressure is a hindrance because it means that there is not enough time to provide proper care to patients, which is conducive to professional fatigue and frustration. Conversely, emotional demands in nursing work (i.e., frequency of interactions with patients, and handling patient emotions and those of their family) represent "the heart of the work" and are considered a challenge (Bakker and Sanz-Vergel, 2013).

The nursing profession usually attracts people who are driven by a sense of mission and a desire to do good. McCabe et al. (2005) indicate that the most important reasons for choosing this profession are helping others, doing interesting and challenging work, and working closely with people in need. Indeed, caring for others, engaging in their problems and changing their lives can be a source of positive emotions for nurses (McQueen, 2004). Moreover, according to a qualitative survey, nurses are able to resist emotional demands and "are aware that they must actively work on their emotions" (Bolton, 2001, p. 92); therefore, we assume that emotional demands (contrary to work pace) may not necessarily be stressful, but may instead be rewarding and act as challenges for nurses. In a diary study lasting for three consecutive working weeks it was found that emotional job demands strengthened the effect of personal resources on weekly well-being, whereas work pressure undermined this effect (Bakker and Sanz-Vergel, 2013).

Cognitive demands involve confrontation with new tasks, unpredictable developments and the resolution of routine problems (Glaser et al., 2015), as well as processing multiple pieces of information at the same time, generating new ideas and making difficult decisions (Pejtersen et al., 2010). In agreement with the challenge-hindrance occupational stress model (Cavanaugh et al., 2000), they are categorised as challenge stressors. Empirical studies on cognitive demands are scarce and so far little is known about how these demands relate to the well-being of employees (Meyer and Hünefeld, 2018). To the best of our knowledge, no study has investigated the relationship between cognitive demands and WFC among nurses. Several new studies do show that cognitive demands are related positively to employee well-being – e.g., personal development (Prem et al., 2017), self-rated health and job satisfaction (Meyer and Hünefeld, 2018) – although the relation to some extent depends on the type of cognitive demand considered.

Based on the presented research reports, we expect that job demands related to hindrance (including quantitative demands and work pace) will be conducive to experiencing a conflict between work and family. In contrast, job demands related to challenge (including emotional and cognitive demands) will not lead to negative outcomes.

***H1**: Hindrance stressors (T1) including quantitative demands and work pace are related to high WFC (T1).*

***H2**: Challenge stressors (T1) including emotional demands, demands for hiding emotions and cognitive demands are related to low WFC (T1).*

The Effect of WFC on Job Burnout

According to the JD-R model (Bakker and Demerouti, 2017), job burnout is a long-term effect of stress caused by prolonged excessive job demands and insufficient resources to deal with these job demands effectively. Job burnout consists of exhaustion and disengagement from work. Exhaustion is a response to intensive physical, affective and cognitive strain, and manifests in fatigue, weariness and a depletion of energy. Disengagement from work is expressed by distancing oneself from one's work, and experiencing negative attitudes towards the work object, work content or one's work in general (Demerouti et al., 2001). Maslach et al. (2001) emphasises that the risk of burnout is particularly high in the group of social service workers. Although some studies have shown that this syndrome can also affect representatives of other professions (Bakker et al., 2003), a review of studies indicates that the risk of its occurrence in employees working in direct contact with another person is particularly high (Lloyd et al., 2002).

The idea that work and family demands interfere with each other and cause strain is grounded in the Effort-Recovery model (Meijman and Mulder, 1998). Accordingly, each load involves an effort to deal with this load. The mobilisation of human

strength and energy, however, is associated with high psycho-physiological costs – activation of the sympathetic nervous system, irritability, fatigue (Hockey, 1997). Therefore, the period of effort should be followed by a sufficiently long recovery. Maintaining good health and effective functioning in various spheres of life is possible when the periods of effort and recovery are balanced. Although daily work usually involves loads that are not necessarily harmful, their day after day recurrence may consequently function as a permanent source of strain. If opportunities for recovery after being exposed to a high workload are insufficient, work-related tension is transferred to non-professional fields of functioning and the employees experience conflict (Van der Heijden et al., 2008). In the long run, this conflict gradually depletes the employee's resources required to cope with work and family demands (e.g., time, energy, mental and physical strength, abilities, equipment, social support) and job burnout occurs (Geurts and Demerouti, 2003).

The mediation effect of WFC in the job demands – burnout link was demonstrated in several studies (Geurts et al., 2003; Peeters et al., 2005), including in the nursing profession (Janssen et al., 2004; Leineweber et al., 2014; Sugawara et al., 2017). A certain limitation of these studies is their cross-sectional nature. A point is currently being raised that on the basis of a single measurement of variables at one time point, it is not possible to determine unequivocally the existence of a mediation effect (Maxwell et al., 2011). The classical method of mediation by Baron and Kenny (1986) and the Sobel (1982) test have also been long criticised, as newer and more effective methods are being used (Williams and MacKinnon, 2008; Rucker et al., 2011). We know of two cross-lagged studies on nurses confirming that the WFC mediates the negative effect of job demands on job burnout (Peeters et al., 2004) and general health (Van der Heijden et al., 2008). Both of them, however, were carried out in Western (not Eastern) European countries, where the nurses are better paid and their working conditions seem to be more comfortable (Simon et al., 2004; Koff, 2016; OECD/European Union, 2020). In addition, only one component of job burnout (exhaustion) was taken into consideration in the studies. Finally, a limited number of job demands was analysed. In the next hypothesis, we expect that:

H3: *WFC (T1) mediates the effect of hindrance and challenge stressors (T1) on job burnout (T2; including exhaustion and disengagement from work).*

MATERIALS AND METHODS

Participants

The participants *(N* = 516) were nurses employed in hospitals or clinics, in psychiatric and addiction treatment wards for children and youth (*n* = 219), as well as in social welfare homes for the chronically mentally ill, mentally disabled children, and youth (*n* = 297) in Poland. All participants were treated in accordance with the ethical guidelines of the Helsinki Declaration, and received a hard copy of the questionnaires along with a letter explaining the purpose of the study. Full confidentiality of data and anonymity were secured. Participants were asked to fill out the questionnaires and seal them in envelopes, which were subsequently collected by research assistants. Out of 750 distributed questionnaires, 591 (79%) were completed in the first step of the study (T1) and 516 (68% of the original pool) in the second stage (T2). The analysed group consisted of 431 (83.5%) women and 85 men (16.3%), between 20 and 70 years of age (*M* = 42.11, *SD* = 9.52). Work experience ranged from 1 to 45 years (*M* = 14.49, *SD* = 10.12). There were no significant differences in the distribution of *age* between the analysed occupational groups, $t(497) = -0.48$, $p = 0.633$; however, there were small but significant differences in the length of service, $t(424.95) = -3.18$, $p = 0.002$, $d = 0.29$. Nurses from social welfare homes (*M* = 13.22, *SD* = 9.46) on average had less seniority in comparison to nurses from psychiatric and addiction treatment wards of hospitals or clinics (*M* = 16.16, *SD* = 10.71).

Measures

Challenge and hindrance stressors were measured with the COPSOQ II subscales (Pejtersen et al., 2010). The challenge stressors consisted of three COPSOQ II subscales measuring cognitive demands (e.g., *Does your work demand that you are good at coming up with new ideas?*), emotional demands (e.g., *Do you have to relate to other people's personal problems as part of your work?*), and demands hiding emotions (e.g., *Are you required to treat everyone equally, even if you do not feel like it?*). Each subscale contained four items, with possible answers from 1 (Always) to 5 (Never/Hardly ever). Hindrance stressors consisted of two COPSOQ II subscales, measuring quantitative demands (four items; e.g., *How often do you not have time to complete all your work tasks?*) and work pace (three items; e.g., *Do you have to work very fast?*). Each subscale contained answers from 1 (Always or To a very large extent) to 5 (Never/Hardly ever or To a very small extent).

Work-Family Conflict was measured with the 5-item "work to family conflict" subscale (e.g., *The amount of time my job takes makes it difficult to fulfil family responsibilities*) developed by Netemeyer et al. (1996). It comprises answers from 1 (*I do not agree at all*) to 5 (*I fully agree*).

Job burnout was measured with the Oldenburg Burnout Inventory (Demerouti et al., 2001). This 16-item scale consists of two subscales for exhaustion (eight items) and disengagement from work (eight items). A 5-point response scale ranged from 1 (I completely disagree) to 5 (I completely agree).

Analytical Procedures

Prior to the verification of the hypotheses, descriptive statistics were calculated and a correlation analysis was carried out. In order to determine the factor accuracy and to estimate the parameters of fit, a confirmatory factor analysis (CFA, first and second order) of the tools used in the structure proposed by its authors was also carried out. The structure of the tools was confirmed as judge by the models' fit indices (**Supplementary Table 1A**). By good model fit we understood the values between 1.00 and 3.00 for CMIN (χ^2/df), values above 0.95 for CFI, values below 0.06–0.08 for RMSEA, values for SMRM less than 0.06–0.08, and PClose above 0.05 (Hu and Bentler, 1999). As an acceptable fit we assumed CMIN values between 3 and 5, RMSEA

below 0.08–0.10, PClose between 0.01 and 0.05, for SMRM it was a range of 0.08 and 0.10, and for CFI values between 0.90 and 0.95 (Sharma, 1996; Kline, 2005; Byrne, 2010). We did not expect, however, the non-significant coefficient for χ^2 test which indicates a good fit of the data to the model but in general is very difficult to achieve especially for the larger sample sizes, as in here.

For the main part of the analysis, structural equation modelling (SEM) was applied. Challenge stressors and hindrance stressors (T1), work-family conflict (T1) and job burnout (related to exhaustion and disengagement from work; T2) were introduced into the model. The following were tested: (1) the direct effects of challenge stressors (**CS**) and hindrance stressors (**HS**) on job burnout (**JB**); (2) the indirect effects of work-family conflict (**WFC**) on CS/HS – JB links.

RESULTS

Preliminary Analysis Including Descriptive Statistics

We began the analytical work with calculations of descriptive statistics for the main study constructs (**Table 1**) and also for the main study constructs and sociodemographics (**Supplementary Table 2A**). Then, we continued with SEM using SPSS ver. 26 and Amos ver. 26. Prior to conducting any analysis, all data was prechecked in order to detect potential violations of necessary preconditions (e.g., normality of distributions, linearity, but also lack of outlying cases, analysis of patterns of missing data including their randomness) to run particular statistical tests. We did not detect any significant departures. According to the results of basic correlational analysis, our main study constructs were significantly intercorrelated, mostly in postulated directions (**Table 1**), thus setting up a good baseline for more advanced hypotheses testing.

Structural Equation Modelling

We started the main analysis with the first model (M1) including mediational effects as postulated in hypotheses H1–H3. M1 was a model with zero degrees of freedom so we could not judge its overall fit. We were able, however, to test the significance of particular paths and mediational effects. Upon inspecting the regression paths, we trimmed M1 in a step-by-step procedure by removing non-significant paths. The final Model (M2) is presented in **Figure 1**. M2's quality of fit was judged based on before mentioned criteria. M2 had an excellent fit according to the values of the indices: $\chi^2(10) = 16.08$, $p = 0.098$, $\chi^2/df = 1.61$, RMSEA = 0.03 [0.00, 0.06], PClose = 0.780, CFI = 0.99, TLI = 0.99, SMRM = 0.03. All regression paths were significant (at least at $p < 0.05$). None of the correlations within particular constructs were exceeding a value of $r = 0.85$, which would suggest potential discriminative issues (Kline, 2005). Also, no re-specifications based on error covariances were added since M2 had already an excellent fit. The first set of hypotheses (H1 and H2), which was tested by examining regression paths was partly confirmed. As seen in **Figure 1**, quantitative demands ($\beta = 0.39$, $B = 0.58$, $p < 0.001$) and work pace ($\beta = 0.15$, $B = 0.26$, $p < 0.001$), which together constitute HS, were related to higher WFC. The results for H1 allied with the outcomes of correlational analysis (**Table 1**). CS, however, was only partly related to WFC (H2). The paths from demands for hiding emotions and cognitive demands were excluded from the final M2 (as M2 is based on M1), since they were not significant predictors of WFC ($B = 0.08$, $p = 0.106$ and $B = 0.02$; $p = 0.814$, respectively; based on M1). Emotional demands were significantly related to WFC, but the direction of the relation was positive in M2 ($\beta = 0.17$, $B = 0.23$, $p < 0.001$), and therefore opposite to that predicted in H2. Both the results of the SEM and correlational analysis do not support H2.

The mediational hypothesis was tested in the next step using just identified model (M1). The results confirmed that WFC plays the role of mediator in job demands – job burnout link, depending on the type of job demands, as well as components of job burnout. In the case of HS, WFC mediated the effect of quantitative demands [$ab = 0.001$, BCa 95% CI (0.000, 0.002), $p = 0.023$][1] and work pace [$ab = 0.001$, BCa 95% CI (0.000, 0.001), $p = 0.019$] on disengagement from work but not on exhaustion [$ab = 0.001$, BCa 95% CI (0.000, 0.002), $p = 0.176$ and $ab = 0.000$, BCa 95% CI (0.000, 0.001), $p = 0.112$, respectively]. Thus, for hindrance stressors, H3 was partly confirmed. In the case of CS, the role of WFC as mediator was confirmed only for the relationship between emotional demands and disengagement from work [$ab = 0.000$, BCa 95% CI (0.000, 0.001), $p = 0.017$], but not for the exhaustion [$ab = 0.000$, BCa 95% CI (0.001, 0.001), $p = 0.146$]. There were no significant mediational effects for the link between cognitive demands, demands for hiding emotions and two components of job burnout (as analysed in M1, which included all possible paths). Thus, overall H3 was only partly confirmed (only for mediational effects related to disengagement from work).

DISCUSSION

The article discusses the longitudinal relationship between various types of job demands occurring in nursing work environments and two components of job burnout (i.e., exhaustion and disengagement from work), with the mediating effect of WFC. Five different job-related risks factors (i.e., quantitative demands, work pace, emotional demands, cognitive demands, and demands for hiding emotions) were taken into account and classified into two groups of stressors: challenge and hindrance. Based on theoretical premises (McQueen, 2004; McCabe et al., 2005) and research results (LePine et al., 2005; Bakker and Sanz-Vergel, 2013; Gonnelli and Raffagnino, 2017), it was assumed that emotional demands, cognitive demands and demands for hiding emotions can be considered as challenges in the nursing profession and, therefore, should not lead to negative outcomes. Contrary to them, quantitative demands and work pace usually mean that nurses do not have time to provide patients with the appropriate care, lead to role conflicts, and are therefore perceived by nurses as hindering.

The hypotheses regarding the different impact of challenge and hindrance stressors on WFC (H1, H2) were only partially

[1]ab — the coefficient of indirect effect; BCa 95% CI - bias corrected and accelerated bootstrapp confidence intervals of 95 percent.

TABLE 1 | Pearson's r correlational coefficients for main study constructs, *N* = 516.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Quantitative demands	–							
2. Work pace	**0.37*** **	–						
3. Cognitive demands	**0.19*** **	**0.55*** **	–					
4. Emotional demands	**0.25*** **	**0.46*** **	**0.70*** **	–				
5. Demands for hiding emotions	**0.26*** **	**0.38*** **	**0.31*** **	**0.32*** **	–			
6. Work - family conflict	**0.49*** **	**0.38*** **	**0.28*** **	**0.34*** **	**0.27*** **	–		
7. Exhaustion (time 2)	**0.23*** **	**0.16*** **	0.05	**0.12** **	**0.17*** **	**0.19*** **	–	
8. Disengagement (time 2)	**0.19*** **	**0.13** **	0.02	0.03	**0.12** **	**0.19*** **	**0.66*** **	–

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

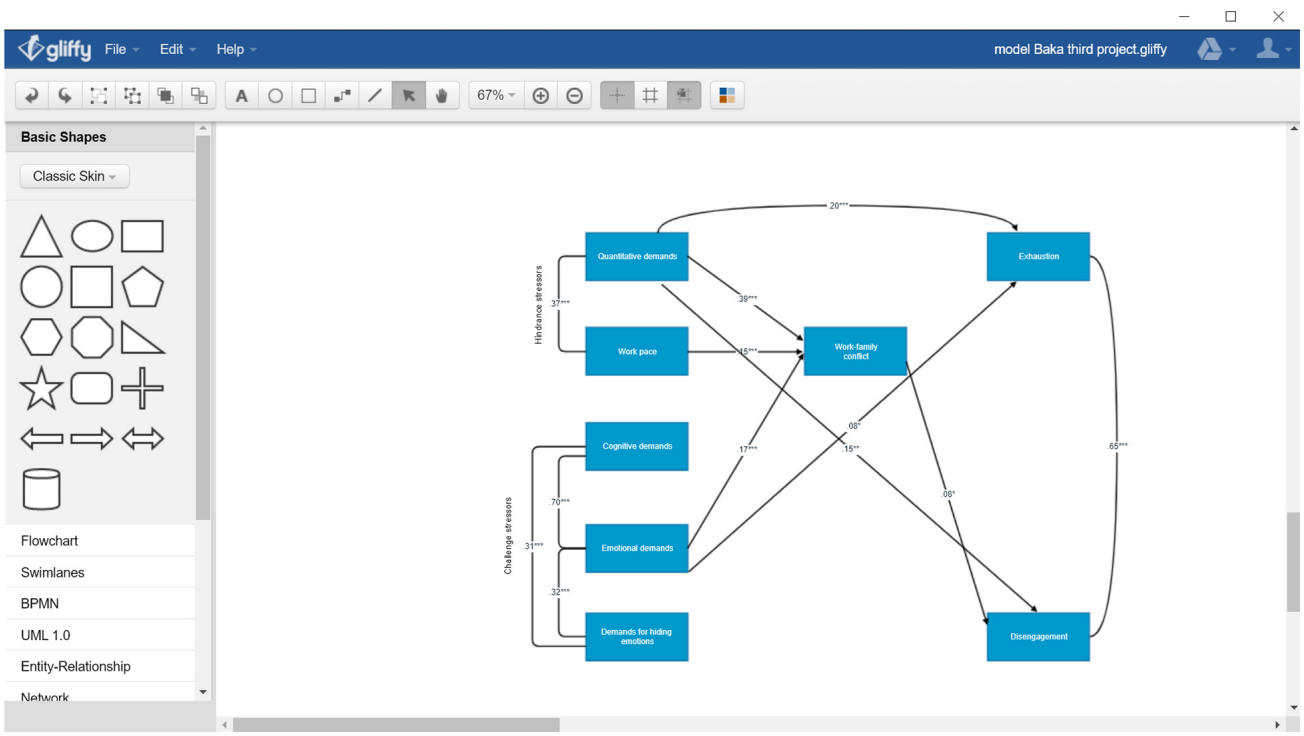

FIGURE 1 | Hypothesised model for the link between various job demands and job burnout in two forms including additional mediational effects. Non-significant paths are not included. Standardised coefficients are presented. Some coefficients of covariance were omitted for clarity. The magnitude of intercorrelations between constructs could be found in **Table 1**.

confirmed. As predicted (H1), hindrance stressors (T1, especially quantitative demands) were related to high work-family conflict (T1) and job burnout (T2). It turned out, however, that challenge stressor related to emotional demands also lead to negative outcomes (higher WFC and job burnout). This result (inconsistent with H2) shows that the provision of long-term care for other people can be perceived as burdensome and limiting, even among medical staff, where help is included in the "nature" of the profession. The remaining challenge stressors related to cognitive demands and demands for hiding emotions were not associated with negative outcomes. Unexpected relationship of emotional demand with WFC and job burnout can be explained in several ways. First, although the authors emphasise that challenge stressors can be a source of positive outcomes (e.g., LePine et al., 2005; Podsakoff et al., 2007), it does not mean that they are not cognitively and emotionally aggravating. In a more recent meta-analysis of 31 studies, Mazzola and Diheltorst (2019) showed that both hindrance and challenge stressors are positively correlated with psychological strain (the mean correlations were $\rho = 0.29$ for CS and $\rho = 0.36$ for HS) and physical strain ($\rho = 0.24$ for CS and $\rho = 0.38$ for HS). This strain can be the result of experiencing a role conflict. Some previous studies have shown that emotional demands in groups of nurses, measured by means of various indicators including emotional charge (Cortese et al., 2010), emotional dissonance (Bakker and Heuven, 2006), and confrontation with traumatic events (Van der Heijden et al., 2008), were associated with high work-family conflict. It may be that individual differences (Wilson, 2012),

appraisals (Li et al., 2020), access to high job resources (Dawson et al., 2016), and the level of professional competences (Horan et al., 2020), play a greater role in classifying a given stressor to the challenge or hindrance group, than occupation-related specificity. Perhaps not without significance is also the fact that the studied sample was dominated by women who, according to the results of the research, experienced lower levels of challenge stressors (Mazzola and Diheltorst, 2019).

Thus, individuals can appraise stressors differently, based on any number of internal and external variables. Moreover, perceptions of stressors tend to have considerable within-person variability. This means that employees can be very positive about their work one day and much less positive the next day. Thus, it is entirely possible that an employee may perceive certain tasks in their job as a challenge on one day and feel that the same tasks are hindering on another day (Horan et al., 2020). Some researchers emphasise that stability during challenge and hindrance stressor appraisals is also important (Rosen et al., 2020). For example, when challenge stressors were stable week-to-week, individuals were better able to anticipate them, relative to when they fluctuated. As a result of anticipating stressors, individuals appraised them as challenging and ultimately experienced less overall stress. Individuals who experienced more fluctuations in challenge stressors, however, assessed them as more hindering, exhibited worse task performance and reported greater subjective stress due to lower stressor anticipation (Rosen et al., 2020).

Regarding the mediational effect, the results confirmed that WFC mediates the harmful impact of job-related risk factors on job burnout, but mainly in relation to hindrance stressors (H3) and one of job burnout' component. HS (included quantitative workload and work pace, T1) led to high disengagement from work (T2) via increased work-family conflict (T1). In the case of challenge stressors (T1), WFC (T1) mediated only the effect of emotional demands (not cognitive demands and demands for hiding emotions) on disengagement from work (T2). WFC did not related to exhaustion (T2). In general, the results are consistent with the JD-R model, but only partially. According to the JD-R model, different kinds of job demands result in high job burnout, however, their negative effect should be stronger for exhaustion than for disengagement from work. Based on the results obtained in initial study on the JD-R model, Demerouti et al. (2001) postulated even, that job demands are related to exhaustion component of job burnout, whereas low job resources are related to disengagement from work. The findings of our study indicate, however, that after including WFC as a mediator in the model, job demands affect disengagement from work, not exhaustion. Such distancing from work may be a way of coping with highly burdensome demands (e.g., entering into close and emotionally exhausting relationships with patients) and chronic work-family interference. In other words, by avoiding work commitments and emotional withdrawal, overworked nurses can save stress-depleted resources and preserve "good" health (Hobfoll, 2011).

It is worth mentioning a few contributions of our study. First of them, it found that not all types of job demands have the same negative consequences for nurses over a one-year time frame. While the detrimental function of job-related factors classified as hindrance was confirmed, it turned out that the impact of challenge stressors is more complex. Although high emotional demands resulted in an impairment of nurses mental health after one year, cognitive demands and demands for hiding emotions are not associated with negative outcomes. It is possible that these types of demands are less burdensome for nurses, or they may have other beneficial effects that neutralise the harmful ones. The next contribution refers to the confirmation of the mediational effect of WFC in one-year cross-lagged study. This effect was mainly related to hindrance stressors and was observed only in the case of disengagement from work. And last but not least, our study supported validity of the Job Demands-Resources and the Effort-Recovery models also in Eastern Europe.

Limitations and Future Research Direction

This research is not without limitations. Although the cross-lagged study with a year interval design can clarify the direction between job demands, job resources and mental health, it is not justified to draw valid causal inferences (Taris and Kompier, 2003). Conducting a quasi-experimental study that manipulates job demands and job resources, however, would be difficult to perform and would raise serious ethical issues. Another limitation is the number of measurements. In this two-wave study, hindrance/challenge stressors and WFC were checked at the same point of measurement. It would be optimal to conduct a three-wave study, with a separate measurement for the mediator and dependent variable (Hakanen et al., 2008). When considering generalisability, it should be noted that the results of this study were obtained from a sample of nurses. The observed regularities relate to this profession only and should not be generalised to other occupations and market sectors. A final issue is the gender disproportion in the research sample. Women were overrepresented, because the number of women in the nursing field is significantly greater. For the male population, in traditionally typical male occupations, the results would be perhaps different.

Another issue is that the research was conducted during the COVID-19 pandemic; hence, some responses (e.g., related to workload and exhaustion) may be biassed by the specificity of the current situation. During a pandemic, the organisation of work and the level of job demands are different from traditional ones. For example, nurses face a great amount of unusual job-related stressors, including staff shortages, insufficient equipment, inadequate protection from contamination, risk of infection, work overload, social stigmatisation, isolation, lack of contact with their families, as well as lack of consistent information about the spread of the virus, its contagiousness and the effectiveness of ways of prevention (Fiorillo and Gorwood, 2020). These unusual job conditions may have a significant impact on the results obtained. Additionally, no moderation effects were controlled in the study, both with respect to job characteristics and to personality variables. It seems that rich job resources (such as leadership, social support, or job control), as well as personality traits (such as hardiness or self-efficacy)

may buffer the detrimental effects of job stressor and WFC on health of nurses.

Apart from some limitations, the study adds to knowledge by the detailed investigation of the links between various types of stressors and two forms of job burnout throughout work-family interference with focus on potentially moderating effects of personal and leadership resources in an important context of nursing profession in Eastern Europe. In future studies, it would be worth investigating the role of other types of job and personal resources in coping with strain, e.g., meaning of work (Jourdain and Chênevert, 2010) or optimism (Garrosa et al., 2011). Those that relate to specific personal resources in a professional context would be particularly useful (e.g., occupational hardiness, occupational resilience). As suggested by some authors, this kinds of specific resources are particularly effective in reducing stress (de Jonge et al., 2000).

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 research committee at the Cardinal Stefan Wyszyński University in Warsaw on June 2020 (number: KEiB 31/2020). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ŁB: conception and design of the study and organisation of the database. MP: statistical analysis. ŁB and MP: first draft of the manuscript and preparation of the manuscript. Both authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.696891/full#supplementary-material

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Rewards of Compassion: Dispositional Compassion Predicts Lower Job Strain and Effort-Reward Imbalance Over a 11-Year Follow-Up

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Dispositional compassion has been shown to predict higher well-being and to be associated with lower perceived stress and higher social support. Thus, compassion may be a potential individual factor protecting from job strain. The current study examines (i) whether dispositional compassion predicts job strain and effort-reward imbalance (ERI) or does the predictive relationship run from job strain and ERI to dispositional compassion and (ii) the effect of dispositional compassion on the developmental trajectory of job strain and ERI over a 11-year follow-up. We used data from the Young Finns study ($n = 723$) between 2001 and 2012. The direction of the predictive relationships was analyzed with cross-lagged panel models. Compassion's effect on the trajectories of job strain, ERI, and their components was examined with multilevel models. First, the cross-lagged panel models demonstrated there was no evidence for the predictive pathways between compassion and job strain or its components. However, the predictive pathways from high dispositional compassion to low ERI and high rewards had better fit to the data than the predictive pathways in the opposite direction. In addition, multilevel models showed that high compassion predicted various job characteristics from early adulthood to middle age (lower job strain and higher job control as well as lower ERI and higher reward). Compassion did not predict job demand/effort. The findings were obtained independently of age, gender, and socioeconomic factors in childhood and adulthood. These findings indicate that compassion may be beneficial in work context. Further, compassion might be useful in the management or prevention of some aspects of strain. Our study provides new insight about the role of compassion in work life.

Keywords: compassion, personality, job demand control, effort-reward imbalance, longitudinal

INTRODUCTION

Dispositional compassion can be defined as a disposition to experience concern for others' suffering and a subsequent desire to alleviate the perceived suffering (Goetz et al., 2010). For the past 20 years, an increasing body of literature has emerged on the benefits of compassion. For instance, compassion has been shown to increase prosocial behaviors while also being

associated with lower anxiety and greater positive affect in the workplace (Lilius et al., 2008; Dutton et al., 2014; Luberto et al., 2018). Recently, compassion has been found to be beneficial for the compassionate individuals themselves, for example, in reducing depressive and anxiety symptoms (Kirby et al., 2017; Saarinen et al., 2019). Yet, in the current state, the literature provides no knowledge on the relationship between dispositional compassion and job strain, a common source of psychological distress (Rigó et al., 2020). Hence, the aim of the present study is to examine the association of compassion with strain indicated by the demand-control model and effort-reward imbalance (ERI) model. We will examine this from two perspectives: whether dispositional compassion predicts strain or vice versa and whether dispositional compassion can predict strain over a 11-year follow-up.

As much as a quarter of people in Europe have reported experiencing job strain and the prevalence appears to be increasing (EU-OSHA, 2009; Eurofound and EU-OSHA, 2014; Rigó et al., 2020). Job strain is associated with a variety of health risks and indicators of ill-being, including lower quality of life (Pekkarinen et al., 2004), psychopathology (Mahan et al., 2010; Stansfeld et al., 2012), and an increased risk for a cardiovascular disease (Kuper and Marmot, 2003). The consequences of job strain also include extensive economic costs. Companies may experience financial losses, as job strain is associated with increased absenteeism and turnover intentions (Wang et al., 2014; Liu et al., 2019). Further, it has been estimated that, for instance in the United States, job strain annually costs $180 billion through the healthcare system (Goh et al., 2016).

Job characteristics, such as high work intensity, lack of autonomy, and job uncertainty, are some of the antecedents of job strain (Karasek, 1979; Siegrist, 1996; Demerouti et al., 2001). Job demand-control model (Karasek, 1979) and ERI model (Siegrist, 1996) are two of the prominent models in job strain research. The job demand-control model postulates that together high job demand and low job control are a source of job strain. If prolonged or frequent, job strain can transform into physiological and psychological arousal and finally into pervasive distress, if not addressed appropriately (Karasek, 1979). While job demand refers to the amount of time, energy, and effort put into job tasks, job control stands for one's freedom to apply one's professional skills, to control work pace, and to practice autonomy (Karasek, 1979). On the other hand, ERI model proposes that high efforts in relation to disproportionally low rewards cause stress at work (Siegrist, 1996). The imbalance is stressful as it goes against the core assumption of reciprocity and equal exchange of social and material commodities (Siegrist et al., 2004). As an employee confronts a variety of challenges, obligations, and situations requiring coping skills at work (i.e., effort), the expectation is to be compensated in the form of, for example, increased professional esteem, promotion opportunities, or job security (i.e., reward; Siegrist et al., 2004).

One of the major milestones in adulthood is inclusion in the work life, whereas in some degree, job strain is inevitable part of work life. Individual differences are determining factors in the experience of stress and strain, as they influence perception, interpretation, and coping mechanisms (e.g., Lazarus and Folkman, 1984). Further, the occupational stress research has highlighted the importance of personal resources in dealing with job strain (Xanthopoulou et al., 2007). Indeed, in a recent study, it was found that the use maladaptive coping strategies increased as job strain increased, an indicative of the need for personal resources aiding in self-regulation (Bakker and de Vries, 2021).

Previously, it has been shown that dispositional traits like high neuroticism, high negative emotionality, and low sociability are associated with higher job strain and ERI (Hintsanen et al., 2011; Törnroos et al., 2012, 2013). On the other hand, dispositional mindfulness has been shown to protect against job strain (Bostock et al., 2019). Another protective disposition may be high compassion. To demonstrate, it has been suggested that training compassion can decrease perceived stress (Matos et al., 2017; Brito-Pons et al., 2018), alleviate burnout symptoms, and increase resilience and job satisfaction (Kok et al., 2013; Scarlet et al., 2017; Orellana-Rios et al., 2018). However, in the current state of the literature, it is unknown if compassion serves as a protective factor against job strain or if, instead, job strain reduces compassion. Consequently, longitudinal research is also absent concerning compassion and job strain.

However, there are several reasons why dispositional compassion may predict job strain, rather than vice versa. First, compassion may be strain-buffering through the heightened affiliative experiences, which have repeatedly been found to predict lesser stress (for a review, see Taylor, 2011). Compassion has been tightly linked with higher social support and connectedness (Crocker and Canevello, 2008), shown to predict higher social support in a longitudinal manner (Saarinen et al., 2020b), and to moderate the effectiveness of social support in stressful situations (Cosley et al., 2010). Second, the highly compassionate individuals may perceive and cope with job strain in a specific manner. Already in compassion's definition "desire to alleviate the perceived suffering," it is implicated that compassion entails distress tolerance (Goetz et al., 2010). However, it is noteworthy that such emotional engagement may also predispose to job strain through increased demands. Nevertheless, past compassion research has shown that compassionate individuals have higher acceptance when faced with psychosocial stressors (Jazaieri et al., 2018) and compassionate individuals tend to create an upward spiral of positive emotions in stressful situations (Kok et al., 2013; Weng et al., 2013). Third, greater physical well-being may serve as protective element against stress, as compassion is related to greater physical well-being. For instance, compassion has been found to be linked with an increase in the activity in the parasympathetic nervous system (Kim et al., 2020), whereas high ERI has been associated with a decrease in such activity (Hintsanen et al., 2007). Further, compassion has been linked with physical well-being markers, such as lower blood pressure (Saarinen et al., 2020a), while job strain is known to cause hypertension (Kuper and Marmot, 2003).

However, the predictive relationship may also operate in the opposite direction: lesser job strain may help foster

compassion. A work environment including supportive colleagues, professional progression, and autonomy (i.e., less job strain) may encourage compassion as they are suggested to build up resources (Xanthopoulou et al., 2007). The already cooperative work environments may inspire the individual to be more compassionate, as prosocial behaviors are found to be contagious while also associated with lower stress (Fowler and Christakis, 2010; Raposa et al., 2016). In addition, it is possible that the association between high compassion and low job strain may emerge due to collective compassion among employees, rather than due to intrapersonal compassion (Lilius et al., 2008).

Hence, as the temporal and longitudinal relationships of compassion and job strain have not yet been studied, the aims of the current study are (i) to investigate the predictive relationships of dispositional compassion with job strain and ERI and their components (i.e., does dispositional compassion predict job strain and ERI, or vice versa) and (ii) to investigate the longitudinal effect of dispositional compassion on the developmental trajectory of job strain and ERI and their components from early adulthood to middle age. Compassion has been linked with greater psychological well-being as well as mechanisms supporting better stress management, such as good emotion regulation and social support (Cosley et al., 2010; Jazaieri et al., 2014; Saarinen et al., 2020b). Hence, we hypothesize that the direction of the relationship proceeds from high compassion to lower job strain and ERI, and high compassion predicts lower job strain and ERI in a longitudinal manner.

MATERIALS AND METHODS

Participants

We used population-based data from the prospective Young Finns study that investigates the risk factors and determinants of cardiovascular disease. The participants were randomly selected from the national population register and at the time lived in five Finnish medical school cities or their rural surroundings (Helsinki, Turku, Tampere, Kuopio, Oulu). The study includes participants from six age cohorts (born in 1962, 1965, 1968, 1971, 1974, and 1977). The baseline assessment was conducted in 1980 when the participants were aged from 3 to 18 years ($N = 3{,}596$). Eight follow-ups have been carried out since then. The current study used the follow-ups of 2001 and 2012 (when participants were aged from 35 to 50) for dispositional compassion, and the follow-ups of 2001, 2007, and 2012 for job strain and ERI. Childhood socioeconomic factors were assessed in 1980 and participants' adulthood socioeconomic factors in 2011. The study received ethical approval from all the Ethical Committees of the Finnish Medical Schools involved in the study. Current research was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all the participants, or from their parents in case participants were under 18 years old.

In the current study, we included only participants who were working full time during the follow-ups (2001, 2007, and 2011; $n = 918$). Of these, we included only participants who had full data on the covariates (age, gender, childhood, and adulthood socioeconomic factors; $n = 792$). Lastly, we included in the analyses only participants who had data available on compassion at least in one of the follow-ups ($n = 724$) and data on job strain and ERI in at least one of the follow-ups ($n = 723$). Hence, the final number of participants in our analyses was 723.

Measures

Dispositional Compassion

Dispositional compassion for others was assessed with a subscale from Cloninger's Temperament and Character Inventory ("compassion vs. revengefulness"; Cloninger et al., 1994). The scale includes 10 items, including "I hate to see anyone suffer" and "It gives me pleasure to see my enemies suffer" (a reversed item). Participants provided their responses using a 5-point Likert scale, ranging from 1 ("Completely disagree") to 5 ("Completely agree"). The internal consistency of the scale in the current study was high (Cronbach's $\alpha = 0.86$ in 2001; Cronbach's $\alpha = 0.85$ in 2012). Further, the test-retest correlation between 2001 and 2012 was high ($r = 0.687$, $p < 0.001$). The construct validity and reliability of the compassion scale have been found to be good in the past and are described in more detail elsewhere (Saarinen et al., 2020b). The mean score of the scale was calculated for all the participants who had responded to at least 50% of the items.

Job Strain

Job strain was measured by using three items from the Occupational Stress Questionnaire (OSQ) developed at the Finnish Institute of Occupational Health (Elo et al., 1992) and nine items from the Job Content Questionnaire (JCQ; Karasek, 1985). The job demand items were comparable to the Karasek's Job Content Questionnaire and were the following: (1) "Do you have to hurry to get your work done?," (2) "Does your work have phases that are too difficult?," and (3) "Is your work mentally strenuous?." Job control was assessed with nine items from the JCQ. The items of job demand and job control were responded on a 5-point Likert scale ranging from 1 ("Completely disagree") to 5 ("Completely agree").

Job demand and control were measured in 2001 (job demand Cronbach's $\alpha = 0.56$; job control $\alpha = 0.86$), 2007 (job demand $\alpha = 0.60$; job control $\alpha = 0.86$), and 2012 (job demand $\alpha = 0.61$; job control $\alpha = 0.84$). The inter-item correlation values for job demand were 0.23 (2001), 0.24 (2007), and 0.23 (2012), while the corrected item-total correlations were 0.68–0.78 (2001), 0.69–0.78 (2007), and 0.70–0.78 (2012). The inter-item correlation values for job control were 0.42 (2001), 0.38 (2007), and 0.34 (2012) and the corrected item-total correlations were 0.51–0.75 (2001), 0.52–0.79 (2007), and 0.48–0.79 (2012). The mean scores of job demand and control were calculated for those participants who had at least 50% of the data available on each of these scales.

The total job strain was calculated as the subtraction of the mean score of job control from the mean score of job demand (job strain = job demand-job control). The calculation

captures the potential additive effects of job demand and job control (i.e., job strain increases as job demand increases and job control decreases). Previous research has recommended to use the continuous measure and to equally weigh the contribution of job demand and job control for job strain (Landsbergis et al., 1994; MacCallum et al., 2002).

Effort-Reward Imbalance

The effort items were taken from the OSQ (Elo et al., 1992) and were the same as the job demand items. The three reward items were also from the OSQ (Elo et al., 1992) and were the following: (1) "Do you get help and support from your superior if needed?" ("1 = Very little"; "5 = Very much"), (2) "How do your co-workers get along with each other at the workplace?" (Their relationship is: "1 = Bad, tense, resentful, etc."; "5 = Very good"), and (3) "How satisfied are you with your current employment?" ("1 = Very unsatisfied"; "5 = Very satisfied"). The reward items came from 2001 ($\alpha = 0.58$), 2007 ($\alpha = 0.52$), and 2012 ($\alpha = 0.54$). The mean scores of reward were calculated for those participants who had at least 50% of the data available. Inter-item correlations for reward were 0.25 (2001), 0.26 (2007), and 0.28 (2012). The corrected item-total correlations were 0.71–0.79 (2001), 0.67–0.75 (2007), and 0.69–0.77 (2012) for reward.

The ERI was calculated by dividing the mean score of effort by the mean score of reward (ERI = effort/reward) as recommended in past research (Siegrist et al., 2004). The currently employed ERI items have been used in previous research (Hintsanen et al., 2007, 2011). Further, the currently used proxy effort and reward correlate with the original effort and reward ($r = 0.631$, $r = 0.587$, $p < 0.001$, respectively; Hintsanen et al., 2011).

Covariates

Childhood socioeconomic status was assessed by parents' self-reports, including parental occupational status, parental educational level, and family income in 1980. Participants' adulthood socioeconomic status was measured by participants' self-reported occupational status, educational level, and level of income in 2011. The occupational status of the participants and their parents was coded as "1 = Manual," "2 = Lower grade non-manual," or "3 = Upper grade non-manual." Educational level of the participants and their parents included three categories ("1 = Comprehensive school," "2 = High school or vocational school," and "3 = Academic level, i.e., university or college"). If the parental educational level or occupational status differed between the parents, the higher level or status was selected. Level of family income (1980) was reported with an 8-point scale ("1 = Less than 15000 Finnish marks per year"; "8 = More than 100000 Finnish marks per year"). Participants' adulthood income in 2011 was reported with a 13-point scale ("1 = Less than 5000€"; "13 = More than 60000€"). Each socioeconomic factor was entered as a separate variable in the analyses. Educational level and occupational status were treated as categorical variables and income as a continuous variable.

Statistical Analyses

The data were analyzed with the statistical software Stata SE 16.1. Attrition analysis was conducted by comparing the included ($n = 723$) and excluded ($n = 2873$) participants regarding the study variables using independent t-tests and chi-square independence tests.

First, cross-lagged panel models were used to examine the predictive relationship of compassion with job strain and ERI as well as their components in 2001 and 2012. Four models were estimated as: (1) no predictive pathways between compassion and job characteristics (i.e., only autoregressive paths), (2) a predictive regression path from compassion to job characteristics, (3) a predictive regression path from job characteristics to compassion (i.e., in the opposite direction), and (4) bidirectional predictive regression paths in both directions between compassion and job characteristics. All the models were adjusted for age, gender, and socioeconomic factors in childhood and adulthood. In all the models, we included covariances between compassion and job characteristics at each measurement year. The Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Bayesian Information Criterion (BIC) scores, and $\chi 2$ test difference value were used to evaluate the statistical fit of the models. Past research has suggested that values of RMSEA that are below 0.06, the values of CFI above 0.95, and lower scores of BIC and $\chi 2$ indicate a good statistical fit of the model (Hu and Bentler, 1999; Schreiber et al., 2006).

Second, we investigated the longitudinal relationships of compassion (measured in 2001) with job strain and ERI as well as their components (measured in 2001, 2007, and 2012). To do this, we used multilevel models with maximum likelihood estimation. The developmental curve of job characteristics was predicted by compassion in 2001. Intercept, compassion in 2001, age, age squared, gender, and socioeconomic factors in childhood and adulthood were set as fixed effects (i.e., the constant variables across individuals estimated with maximum likelihood). Random effects (i.e., the source of random variation) included within-individual variation over the follow-up (i.e., residual variance). Participants' age ranged between 24 and 50 years over the follow-up of job strain, ERI, and their components. Participants' age was centered to the age of the youngest age cohort in the first measurement year of the outcome variable (2001; i.e., 24 years). This was done to reduce potential multicollinearity.

RESULTS

Descriptive statistics are shown in **Table 1**. Attrition analyses showed that there were no differences in compassion (2001) between included and excluded participants ($p > 0.05$). Furthermore, there were no differences in gender, job demand (2001), adulthood occupational status (2011), family income in childhood (1980), parental occupational status (1980), or parental education level (1980) between included and excluded participants ($p > 0.05$). Included participants were older compared to excluded participants ($M = 32.7$ vs. $M = 31.1$, $p < 0.001$).

TABLE 1 | The means, standard deviations (*SD*), and frequencies of the study variables.

Variable (Measurement year)	Mean/ Frequency(%)	*SD*	Range
Compassion (2001)	3.694	0.617	1–5
Job strain[a] (2001)	–0.978	0.874	–3.333–2.889
Job demand[b] (2001)	2.879	0.638	1–5
Job control (2001)	3.857	0.702	1–5
Effort-Reward Imbalance (ERI)[c] (2001)	0.779	0.275	0.230–3.333
Reward (2001)	3.864	0.666	1–5
Gender (Female)	344 (47.6%)		
Age (2001)	32.7	4.9	24–39
Family income (1980)	4.881	1.884	1–8
Participants' level of income (2011)	8.349	2.728	1–13
Parental educational level (1980)			
Comprehensive school	250 (34.6%)		
High school or occupational school	305 (42.2%)		
Academic level (university or college)	168 (23.2%)		
Parental occupational status (1980)			
Manual	289 (40.0%)		
Lower grade non-manual	313 (43.3%)		
Upper grade non-manual	121 (16.7%)		
Participants' educational level (2011)			
Comprehensive school	14 (1.9%)		
High school or occupational school	417 (57.7%)		
Academic level (university or college)	292 (40.4%)		
Participants' occupational status (2011)			
Manual	360 (49.8%)		
Lower grade non-manual	148 (20.5%)		
Upper grade non-manual	215 (29.7%)		

[a]*Job strain = job demand-job control.*
[b]*Job demand and effort were measured with the same items.*
[c]*ERI = effort/reward.*

Included participants also had lower job strain (2001; $M = -0.98$ vs. $M = -0.89$, $p < 0.05$), higher job control (2001; $M = 3.86$ vs. $M = 3.74$, $p < 0.001$), lower ERI (2001; $M = 0.78$ vs. $M = 0.82$, $p < 0.01$), and higher reward (2001; $M = 3.86$ vs. $M = 3.70$, $p < 0.001$) compared to the excluded participants. Included participants had higher income (2011; $M = 8.35$ vs. $M = 6.79$, $p < 0.001$) and were more likely to have an academic education (2011; 40.4% vs. 25.9%, $p < 0.001$) than excluded participants.

The Predictive Pathways of Compassion With Job Strain and ERI

Table 2 presents the results of cross-lagged panel models for the predictive relationships of compassion with job strain and its components job demand and job control. All the models were adjusted for age, gender, and socioeconomic factors in childhood and adulthood. First, the results of compassion and job strain indicated that all the models had good statistical fit indices (RMSEA ≤ 0.039, CFI ≥ 0.977). There was no evidence for statistical fit differences between Models 1, 2, 3, and 4 in the χ^2 difference test ($p > 0.05$). Altogether, the results indicated that there were no predictive relationships between compassion and job strain. Second, we conducted cross-lagged panel models using the components of job strain: job demand and job control (instead of job strain). When examining the relationships of compassion with job demand and job control, the models had good and adequate statistical fits, respectively. Further, there was no evidence that the models differed from one another in the χ^2 difference tests ($p > 0.05$). Hence, the results indicated that there were no predictive relationships of compassion with job demand or job control.

Table 3 presents the results of cross-lagged panel models for the predictive relationships of compassion with ERI and its component reward. All the models were adjusted for age, gender, and socioeconomic factors in childhood and adulthood. Regarding the predictive relationships between compassion and ERI, it was found that all the models had good statistical fit indices (RMSEA ≤ 0.035, CFI ≥ 0.976). The χ^2 difference tests, CFI values, RMSEA values, and BIC-values showed that Model 2 (a predictive relationship from compassion to ERI) was better than Model 1 (no predictive pathways; $p < 0.05$ in the χ^2 difference test) and Model 3 (predictive pathway from ERI to compassion). Model 4 (bidirectional predictive pathways) and Model 2 did not differ from one another in the χ^2 difference test ($p > 0.05$ in the χ^2 difference test). Taken together, the predictive pathways are more likely to run from compassion to ERI than in the opposite direction. Depiction of the pathway is presented in **Figure 1**.

We also investigated the predictive relationship of compassion with reward (a component of ERI). The goodness-of-fit indices showed that all models had good statistical fit indices (RMSEA ≤ 0.047, CFI ≥ 0.959). Further, Model 2 (a predictive relationship from compassion to reward) had better statistical fit than Model 1 (no predictive pathways) in the χ^2 difference test ($p < 0.001$) or Model 3 (a predictive pathway from reward to compassion). Model 4 (bidirectional predictive paths) and Model 2 did not differ from one another in the χ^2 difference test ($p > 0.05$). Taken together, the results indicated that the predictive pathways are more likely to run from compassion to reward than in the opposite direction. Depiction of the pathway is presented in **Figure 2**.

The Longitudinal Relationship of Compassion With Job Strain and ERI

We examined the longitudinal association of compassion on the trajectories of job strain and its components. The results of the multilevel models are presented in **Table 4**. All the findings were adjusted for gender and participants' childhood and adulthood socioeconomic factors. The results indicated that compassion predicted lower job strain ($B = -0.292$, $p < 0.01$). High compassion also predicted higher job control ($B = 0.282$, $p < 0.001$). There was no evidence for the compassion-age interaction in the analyses of job strain or its components ($p > 0.05$), indicating the effect was evident over the 11-year follow-up (see **Figures 3, 4**, for job strain

TABLE 2 | The goodness-of-fit statistics for the cross-lagged panel models on the predictive relationships of compassion with job strain and its components (adjusted for age, gender, and socioeconomic factors in childhood and adulthood).

							Model comparisons		
	χ^2 value	*df*	*p*	RMSEA	CFI	BIC	χ^2 difference test	*df*	*p*
Job strain									
Model 1	29.799	18	0.039	0.035	0.979	16466.617			
Model 2	28.801	17	0.036	0.036	0.979	16471.906	χ^2(2 vs. 1) = 1.00	1	0.318
Model 3	29.770	17	0.028	0.037	0.977	16472.875	χ^2(3 vs. 1) = 0.03	1	0.886
Model 4	28.758	16	0.026	0.039	0.977	16478.149	χ^2(4 vs. 1) = 1.04	2	0.594
Job demand									
Model 1	39.293	18	0.003	0.047	0.959	15965.732			
Model 2	38.793	17	0.002	0.049	0.958	15971.522	χ^2(2 vs. 1) = 0.50	1	0.479
Model 3	39.231	17	0.002	0.049	0.957	15971.960	χ^2(3 vs. 1) = 0.06	1	0.803
Model 4	38.732	16	0.001	0.051	0.956	15977.751	χ^2(4 vs. 1) = 0.56	2	0.755
Job control									
Model 1	69.374	18	<0.001	0.073	0.930	15791.427			
Model 2	66.704	17	<0.001	0.074	0.933	15795.042	χ^2(2 vs. 1) = 2.67	1	0.102
Model 3	69.373	17	<0.001	0.076	0.929	15797.711	χ^2(3 vs. 1) = 0.00	1	0.971
Model 4	66.703	16	<0.001	0.077	0.931	15801.327	χ^2(4 vs. 1) = 2.67	2	0.263

Model 1: No cross-lagged predictive paths. Model 2: Predictive path from compassion to job characteristics. Model 3: Predictive path from job characteristics to compassion. Model 4: Bidirectional predictive paths.

TABLE 3 | The goodness-of-fit statistics for the cross-lagged panel models on the predictive relationships of compassion with ERI and its component (adjusted for age, gender, and socioeconomic factors in childhood and adulthood).

							Model comparisons		
	χ^2 value	*df*	*p*	RMSEA	CFI	BIC	χ^2 difference test	*df*	*p*
ERI									
Model 1	28.356	18	0.057	0.033	0.977	14238.794			
Model 2	24.359	17	0.110	0.028	0.984	14241.079	χ^2(2 vs. 1) = 4.00	1	0.046
Model 3	28.171	17	0.043	0.035	0.976	14244.892	χ^2(3 vs. 1) = 0.18	1	0.668
Model 4	24.214	16	0.085	0.031	0.982	14247.217	χ^2(4 vs. 1) = 4.14	2	0.126
							χ^2(4 vs. 2) = 0.14	1	0.704
Reward									
Model 1	37.327	18	0.005	0.045	0.959	16063.770			
Model 2	24.077	17	0.117	0.028	0.985	16056.802	χ^2(2 vs. 1) = 13.25	1	<0.001
Model 3	36.755	17	0.004	0.047	0.959	16060.480	χ^2(3 vs. 1) = 0.57	1	0.450
Model 4	23.685	16	0.097	0.030	0.984	16062.692	χ^2(4 vs. 1) = 13.64	2	0.001
							χ^2(4 vs. 2) = 0.39	1	0.531

Model 1: No cross-lagged predictive paths. Model 2: Predictive path from compassion to job characteristics. Model 3: Predictive path from job characteristics to compassion. Model 4: Bidirectional predictive paths.

and job control, respectively). Compassion did not predict job demand ($p > 0.05$).

Lastly, we examined the longitudinal association of compassion on the trajectories of ERI and its component reward. The results of the multilevel models are presented in **Table 5**. All the findings were adjusted for gender and participants' childhood and adulthood socioeconomic factors. High compassion predicted lower ERI ($B = -0.056$, $p < 0.05$). In addition, compassion predicted higher rewards ($B = 0.237$, $p < 0.01$) over the follow-up. There was no evidence for the compassion-age interaction in either of these analyses ($p > 0.05$), indicating that the effect of compassion on ERI and reward was evident between the years 2001 and 2012 (see **Figures 5, 6**, for ERI and reward, respectively).

DISCUSSION

The current study is the first to investigate the association between dispositional compassion, job strain, and ERI. Our results with a population-based sample and a 11-year follow-up

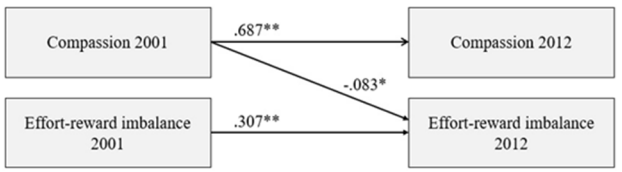

FIGURE 1 | The illustration of the predictive pathways from compassion to ERI. Covariates (age, gender, and socioeconomic factors in childhood and adulthood) and the covariances between the study variables at each measurement year have been omitted from the figure for clarity. $^{*}p<0.05$, $^{**}p<0.001$.

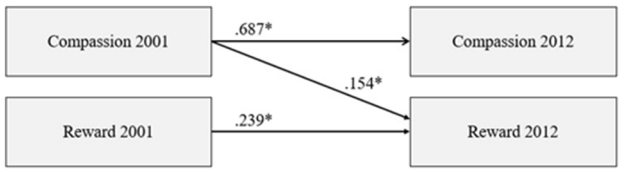

FIGURE 2 | The illustration of the predictive pathways from compassion to reward (a component of ERI). Covariates (age, gender, and socioeconomic factors in childhood and adulthood) and the covariances between the study variables at each measurement year have been omitted from the figure for clarity. $^{*}p<0.001$.

design showed that high dispositional compassion predicted lower job strain and ERI. More specifically, the results from cross-lagged panel models indicated that predictive pathways from high compassion to lower ERI and higher reward had better fit to the data than the predictive pathways in the opposite direction. We did not find evidence for the predictive relationships between dispositional compassion and job strain, job demand/effort, or job control. Second, multilevel models showed that dispositional compassion predicted the developmental trajectory of several job characteristics. High compassion predicted lower job strain and higher job control from early adulthood into middle age. Similarly, we found that high compassion predicted lower ERI and higher reward throughout the follow-up (2001–2012). Compassion was not related to job demand/effort. Age, gender, and socioeconomic factors in childhood and adulthood were taken into account in all the analyses.

Past research has suggested that compassion training can decrease perceived stress (Matos et al., 2017; Brito-Pons et al., 2018) as well as improve burnout symptoms and job satisfaction (Scarlet et al., 2017; Orellana-Rios et al., 2018). The current results align with these findings and further contribute to the existing literature by showing that dispositional compassion is a relevant, individual factor in job strain, ERI, and their components. Furthermore, our results indicated that high compassion may function as a protective factor against ERI, perhaps, through high reward.

One form of reward is socio-emotional reward, such as social support, and the measured rewards strongly reflect such type of a reward. The role socio-emotional reward in buffering stress is well established (Siegrist et al., 2004; for a review, see Taylor, 2011). Furthermore, past research has found that compassion does not only predict higher social support but also moderates the effectiveness of social support (Cosley et al., 2010; Saarinen et al., 2020b), whereas the core of ERI is within the assumption of social reciprocity (Siegrist, 1996). Highly compassionate individuals may be able to mobilize more social support and/or are more proficient in capitalizing it, resulting in both psychological and physiological stress relief. Compassionate individuals may perceive greater baseline social connectedness, are more capable in creating supportive environments for themselves, or have a lower threshold to seek social support. Thus, compassion's protective effect against stress may emanate from higher, real or perceived, social connectedness. Indeed, the interrelationship of compassion, social connectedness, and biological stress-relieving mechanisms, such as the dampening of the HPA-axis reactivity, has received empirical evidence (Cosley et al., 2010; Abelson et al., 2014; Erickson et al., 2017).

In addition, we also found that high compassion predicted higher reward over the period of 11 years. A relatively recent review highlighted that compassion is connected to and, more importantly, may be partly responsible for the activation of the neural reward circuitry (Klimecki, 2015). The act of imagining being compassionate (i.e., compassion meditation) has been shown to activate brain regions associated with reward as well as to reduce stress and cortisol levels (Abelson et al., 2014; Klimecki et al., 2014; Brito-Pons et al., 2018). The activation of reward pathways induces a variety of outcomes including dopamine production and feelings of pleasure and positive affect, leading to endogenous stress relief and resilience (for a review, see Dutcher and Creswell, 2018). Past studies have found that compassionate individuals do not attempt to suppress their negative affect, but rather elevate their positive affect and show greater acceptance in a stressful situation (Kok et al., 2013; Weng et al., 2013; Engen and Singer, 2015; Jazaieri et al., 2018). Altogether, the findings of the past research indicate that compassion may be associated with a specific pattern of emotion regulation strategy, which may aid in the management of and buffering against stress and strain (Abelson et al., 2014; Jazaieri et al., 2014).

The broaden-and-build theory corroborates with the above-mentioned and current findings, as positive emotions have been found to broaden cognitive repertoire, build up resources, and thus, support resilience (Fredrickson, 2001; Fredrickson et al., 2008). In contrast, negative emotions appear to narrow one's attentional capacity and motivate to escape, potentially leading to maladaptive coping strategies (Fredrickson, 2001; Bakker and de Vries, 2021). Consequently, maladaptive coping strategies increase job strain while negative emotionality has been found to be associated with lower job control and lower rewards (Hintsanen et al., 2011; Bakker and de Vries, 2021). In contrast, we found the opposite results with compassion in the current study. Thus, compassion's positive bias may support strain-buffering and emotion regulation skills in the compassionate individuals (e.g., Jazaieri et al., 2014; Engen and Singer, 2015).

TABLE 4 | Results of multilevel models with a longitudinal design. Estimates (B) with 95% confidence intervals (CI) of compassion and age, when predicting job strain and its components (adjusted for gender and socioeconomic factors in childhood and adulthood).

	Job strain		Job demand		Job control	
	B	**95% CI**	***B***	**95% CI**	***B***	**95% CI**
Fixed effects						
Intercept	0.589	−0.214; 1.391	2.566***	1.960; 3.171	1.974***	1.374; 2.575
Age	−0.026	−0.138; 0.087	0.042	−0.043; 0.127	0.068	−0.016; 0.153
Compassion × Age	0.010	−0.020; 0.040	−0.006	−0.028; 0.017	−0.016	−0.038; 0.007
Compassion × Age × Age	−0.0002	−0.001; 0.001	0.0003	−0.001; 0.001	0.001	−0.0003; 0.001
Compassion	−0.292**	−0.481; −0.104	−0.012	−0.155; 0.130	0.282***	0.140; 0.423
Random effects						
Residual variance	0.651*	0.624; 0.679	0.492*	0.472; 0.512	0.490*	0.469; 0.511

*n = 723; *p < 0.05, **p < 0.01, ***p < 0.001.*

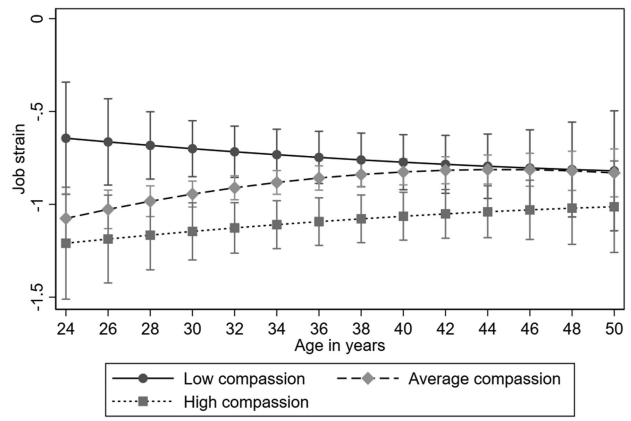

FIGURE 3 | Model-predicted values with 95% confidence intervals of job strain over age separately for participants with low (−1 *SD*), average, and high (+1 *SD*) levels of compassion (adjusted for gender and childhood and adulthood socioeconomic factors).

We found somewhat discrepant findings concerning the associations of compassion with job strain as compared to those with ERI. However, past research has suggested that job strain and ERI should not be perceived as competing models, but as complementing ones as they appear to contribute differently to the literature (de Jonge et al., 2000; Calnan et al., 2004). For instance, the current results showed that job strain appeared to attenuate among the least compassionate individuals from young adulthood to middle age. On the other hand, the least compassionate individuals showed increasing amounts of ERI over the 11 years. Depending on the occupational characteristics, psychosocial stressors may also vary greatly, which may be captured by the apparent discrepant results of job strain and ERI. Furthermore, over time, people may accumulate their professional skills, find efficient coping strategies, and build other means to deal with job strain and ERI. Thus, compassion is likely to be just one of the many contributors to stress management.

As already mentioned above, it was also found that higher compassion predicted higher job control throughout the follow-up (2001–2012). Compassion is known to have a motivational component, suggesting that compassion entails having an optimistic belief in controlling and influencing a distressing situation (Goetz et al., 2010). Moreover, it has been found that compassion predicts work engagement (De Stasio et al., 2019) while it has also been argued that training compassion increases self-efficacy through increasing calmness and reducing anxiety, although this finding needs more empirical evidence as the specific study did not employ a control group (Jazaieri et al., 2018). Nevertheless, together with the current findings, there appears to be an indication of compassionate individuals having a certain control disposition that could also translate into, for example, good job control (or at least, a perception of having opportunities at control), when facing a stressful situation at work.

It is also noteworthy that compassionate individuals may seek and/or are selected for occupations which have more favorable work environments in terms of job strain and ERI. Individual differences in motivation, cognition, and personality have been found to be factors in career decision-making process but they are also associated with varying likelihood of exposing oneself to stressors (Code and Langan-Fox, 2001; Berings et al., 2004; Mullola et al., 2018). Compassionate individuals are often characterized as kind, warm, and helpful, which can be attractive qualities from the employer's perspective when considering, for example, teamwork skills. Moreover, compassionate individuals might gravitate toward professions and work environments which present greater amounts of rewards from the beginning. The current findings showed that the most compassionate individuals had comparatively stable perceptions of (high) reward, whereas the least compassionate individuals perceived decreasing amounts of reward over the period of 11 years. While the junior employees may accept that the rewards are not as extensive in the beginning of their careers, more senior employees most likely expect increasing rewards as their careers progress. If the rewards do not increase along with the expectations, the actualized/perceived rewards do not feel adequate. Compassionate employees may obtain rewards more in quantity and quality (e.g., promotions and social support) as they have the potential to exert positive influence at work, and such behaviors are often rewarded in

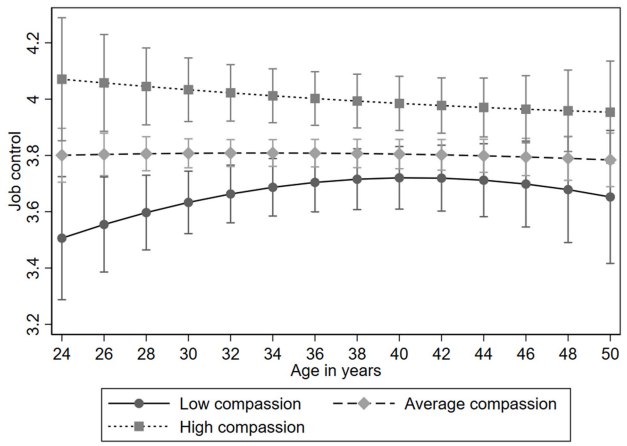

FIGURE 4 | Model-predicted values with 95% confidence intervals of job control (component of job strain) over age separately for participants with low (−1 *SD*), average, and high (+1 *SD*) levels of compassion (adjusted for gender, and socioeconomic factors in childhood and adulthood).

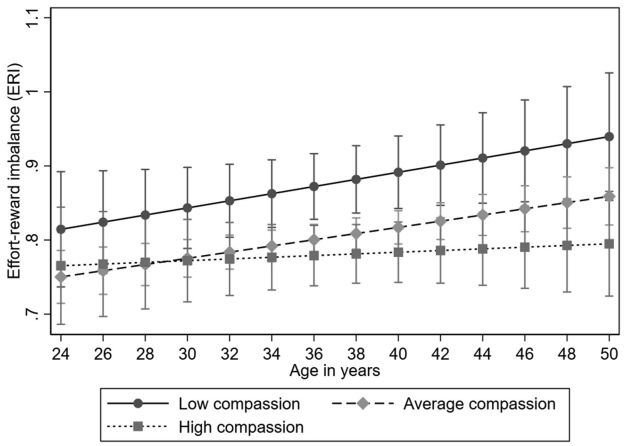

FIGURE 5 | Model-predicted values with 95% confidence intervals of ERI over age separately for participants with low (−1 *SD*), average, and high (+1 *SD*) levels of compassion (adjusted for gender, and socioeconomic factors in childhood and adulthood).

TABLE 5 | Results of multilevel models with longitudinal design. Estimates (B) with 95% confidence intervals (CI) of compassion and age, when predicting ERI and its component reward (adjusted for gender and socioeconomic factors in childhood and adulthood).

	ERI		Reward	
	B	**95% CI**	***B***	**95% CI**
Fixed effects				
Intercept	1.004*	0.787; 1.220	2.626***	1.926; 3.326
Age	0.007	−0.006; −0.010	0.006	−0.094; 0.105
Compassion × Age	−0.001	−0.004; 0.003	−0.008	−0.035; 0.018
Compassion × Age × Age[d]			0.0003	−0.001; 0.001
Compassion	−0.056*	−0.102; −0.010	0.237**	0.070; 0.413
Random effects				
Residual variance	0.236*	0.226; 0.246	0.582*	0.559; 0.606

*[d]When predicting ERI, there was no evidence for the compassion × age squared interaction and thus, excluded from the model, n = 723. *p < 0.05, **p < 0.01, ***p < 0.001.*

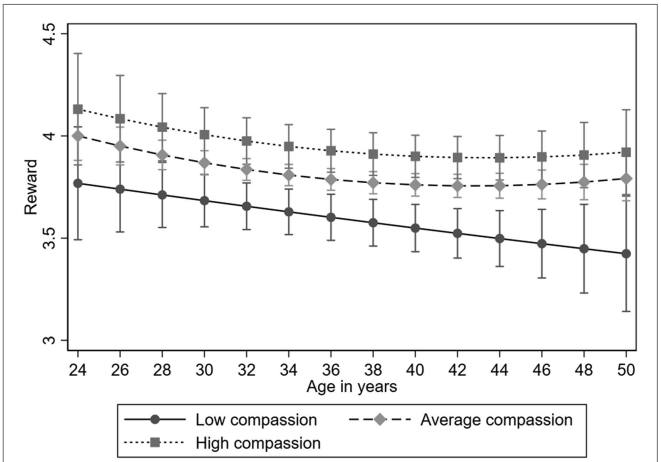

FIGURE 6 | Model-predicted values with 95% confidence intervals of reward (component of ERI) over age separately for participants with low (−1 *SD*), average, and high (+1 *SD*) levels of compassion (adjusted for gender, and socioeconomic factors in childhood and adulthood).

both official and unofficial ways. Social comparison with those employees, who receive more rewards, may further enhance the perceived imbalance between effort and reward in the less compassionate individuals.

Limitations and Strengths

Certain limitations are present in the current study. The Cronbach's alpha for the job demand was approximately 0.60, which is at the lower range of acceptable reliability estimates. We obtained similar Cronbach's alpha values for reward ($\alpha = 0.55$). However, the inter-item correlation values were within a good range for both job demand and reward, thus, indicative of good internal consistency (Piedmont and Hyland, 1993). Furthermore, the corrected item-total correlations were also within good range for job demand and reward, another indicator of good internal consistency (DeVon et al., 2007). Hence, the small number of items in these scales might explain the low alpha values. Secondly, attrition analyses revealed that included participants scored lower on job strain and ERI as well as higher on job control and reward compared to the excluded participants. Taken together, this could imply that there was a bias toward lower strain in our sample. However, it should be noted that the differences between included and excluded participants were comparatively small. Finally, the current follow-up had two measurement points of compassion and three measurement points of job characteristics. The used dataset did not have compassion measurement from 2007, which would have provided more detailed information about the examined associations and their changes over time. Furthermore, while compassion is a comparatively stable personality trait (Josefsson et al., 2013), job characteristics may experience greater fluctuation over time. The fluctuations can be due to,

for example, changes in one's work tasks/responsibilities or in the event of changing jobs. Therefore, in the future studies, it would be advantageous to measure job strain and ERI in as many measurement points as possible to capture the more subtle, short-term changes.

The current study also had several, considerable strengths. The current study utilized data from a population-based 11-year prospective follow-up with three separate measurements points of job strain, ERI, and their components. This allowed the examination of predictive and longitudinal relationships from early adulthood into middle age with a relatively large sample size. By utilizing data from the general population, we were able to include a variety of occupation groups, enhancing the generalizability of our results. We also included two prominent job strain models into the study. Lastly, we controlled several confounding variables, such as age, gender, and socioeconomic factors in childhood and adulthood.

The levels of job strain appear to be increasing (EU-OSHA, 2009; Eurofound and EU-OSHA, 2014). It has been found that the rise is particularly pronounced among manual laborers and explained by increasing job demands, such as time constraints, while the perception of reward appears to be comparatively low in these positions (Rigó et al., 2020). In addition, healthcare professionals have been suggested to be at a particular risk, since estimates indicate that almost half of US physicians exhibit burnout risk (Shanafelt et al., 2019). For some time now, there has been discussion about the "cost of caring" for those in the helping professions (e.g., nurses, firefighters, police, and therapists) and a call for stress management and self-soothing techniques (Figley, 2002). The current results demonstrated evidence for compassion as a protective factor (rather than a risk) for our population-based sample. Compassion's role in job strain, ERI, and reward can be valuable knowledge for work communities and occupational health professionals. Compassion could be, for example, included in well-being programs. As compassion can be relatively easily cultivated with interventions (Kirby et al., 2017), compassion could offer a target for intervention at workplaces in stress management and prevention. For instance, it has been suggested that 7 min of daily loving-kindness meditation (i.e., a common compassion intervention) can generate small to moderate effect sizes (Hutcherson et al., 2008). Whether compassion interventions are effective in job strain management and prevention should, however, be confirmed in future studies.

In conclusion, the current study is the first to examine dispositional compassion in relation to job strain and ERI. Thus, our study provides new insight on the role of compassion in work life. The results indicated that high compassion may buffer against ERI and increase rewards. In addition, our results showed that high compassion predicted lower job strain and higher job control over the span of 11 years (from young adulthood to middle age). The current study provides new knowledge on the role of compassion in work context and may be of use when developing well-being programs at work or for occupational healthcare professionals.

DATA AVAILABILITY STATEMENT

The data analyzed in this study are subject to the following licenses/restrictions: The datasets presented in this article are not readily available because YFS is an ongoing follow-up study and the datasets are not anonymized, and the GDPR prevents public sharing of the data. Instead, pseudonymized datasets are possible to share on request and require a data sharing agreement between the parties. Requests to access these datasets should be directed to LK-J (liisa.keltikangas-jarvinen@helsinki.fi) for compassion data and to Katri Räikkönen (katri.raikkonen@helsinki.fi) or Niklas Ravaja (niklas.ravaja@helsinki.fi) for other psychological data.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee of University of Turku (Institution name: Varsinais-Suomen sairaanhoitopiirin kuntayhtymä, Eettinen toimikunta). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IT wrote the first draft and analyzed the data. IT, AS, and MH designed the study and collaborated on the initial interpretation of the results and writing the manuscript. AS supervised the data analyses. LK-J designed and collected the data. All authors discussed the design and the results, took part in writing the manuscript, and approved the final version.

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Polish Emergency Dispatchers During a COVID-19 Pandemic – Burnout Syndrome, Perceived Stress, and Self-Efficacy. Effects of Multidimensional Path Analysis

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International research has demonstrated that emergency call operators face unique risks to their mental health, in particular job stress, and occupational burnout syndrome. There is already wide knowledge about the relationship between stress, burnout and employee personal resources, which has practical application in preventing mental health. However, more research into the subtle relationships between variables is needed. The aim of the study was to check the moderation effect of differences in the intensity of latent variables on the relationship between perceived stress, self-efficacy and professional burnout. The participants were 546 call-takers and dispatchers from 14 public-safety answering point in Poland aged between 19 and 65 years. The Link Burnout Questionnaire, the 10-item Perceived Stress Scale, the Generalized Self-Efficacy Scale, and an independent questionnaire were used to gather information. The method of path analysis was used. The study confirmed the existence of negative relationships between perceived stress (assessment of the current situation) and self-efficacy (a personal trait). Taking into account the moderating effect of latent variable: psychological comfort revealed a hidden relationship between stress and burnout. The stress-burnout relationship occurred only among participants with low level of psychological comfort, so it was not a proportional relationship. In the case of participants with a high level of second latent variable: power-to-affect, the hypothesis that a high level of this variable should weaken the relationship between stress and burnout was not confirmed. The level of latent variables did not affect the self-efficacy relationship with occupational burnout. Taking into account the differences in the intensity of latent variables showed their moderating effect, which often turned out to be different from the assumed one and obtained in the research of other authors. This allowed to discover the relationships that might otherwise have been overlooked and not included in burnout prevention. The results showed a high level of occupational burnout in the ECD's group during the COVID-19 pandemic: 32% of the responders reported emotional exhaustion, 53% loss of professional effectiveness.

Keywords: emergency service, self-efficacy, occupational burnout, perceived stress, COVID-19, emergency call-taker and dispatcher

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INTRODUCTION

Emergency call-takers and dispatchers (ECDs) are a key component of emergency care. Both in Poland and in other countries, this profession is highly fluid. One of the reasons is that work exposes the employee to a number of strong stressors. These include high responsibility for the safety of reporting individuals and for the health of the emergency personnel. American research has shown that 42% of operators assess their work as "stressful and very stressful," 47% "demanding," and 14% "extreme demanding," regardless of gender and length of service (Meischke et al., 2015). ECDs must quickly identify specific constellations of risk indicators for human health and life through the collection of critical information and the effective delivery of appropriate first aid instructions. The health and life of another person may depend on the correct selection and evaluation of the obtained information (Forslund et al., 2004; Meischke et al., 2010). Although the contact of the emergency number operator with traumatic stressors is made by phone, it is as stressful as direct contact (Golding et al., 2017; Kindermann et al., 2020). Conversation with a traumatized person may give the operator symptoms of peritraumatic stress, secondary post-traumatic stress (secondary traumatic stress, STS), PTSD and other anxiety disorders as well as depressive symptoms (Baseman et al., 2018; Klasa, 2020). It is also noted that some personal characteristics of operators may contribute to negative health changes. Excessive commitment to work, ways of coping with work stress, exhausting psychophysical forces have been indicated as predictors of stress at work ECD (Meischke et al., 2015).

According to the transactional theory of stress, every stress reaction begins with an assessment of the current situation (Folkman, 2011). Perceived stress is an outcome variable-measuring the experienced level of stress as a function of objective stressful events, coping processes, personality factors (Cohen et al., 1983, p. 386). Individuals with high level of perceived stress considered their lives as unpredictable, uncontrollable and overloading (op, cit, p. 387). Work-related stress belongs to the broad group of psychological risks, which have the potential to cause psychological and physical issues (Chirico, 2015). Cox et al. (2000) distinguished 10 categories in order to characterize sources of work-stress in the social and organizational context of work. Among the potential sources of health risks are mentioned: combined exposure to physical and psychosocial risk, job insecurity, high emotional load related to burnout and others (Chirico, 2017b). Psychosocial risks follow changes in the work environment, the economic situation of countries, changes in the labor market and the effects of random factors (SARS-CoV-2 pandemic). This fact forces the continuous improvement and evolution of the definition of psychosocial risks. Following the definition of health adopted in 1986 by the World Health Organization (WHO) as "positive state of complete physical, mental and social well-being" (Nutbeam, 1986), in which work-related stress is treated as a significant health risk factor. The social and economic costs of work-related stress from employee absenteeism, health and social care and loss of productivity are high worldwide (Chirico, 2017b). Predictors of stress at work of ECD are also: young age, female gender, lower level of education and lack of social and family support (Kindermann et al., 2020). Environmental and individual factors can buffer the negative effects of stress. It is believed that the following personal resources: self-efficacy, resilience, and empathy, may contribute to the reduction of stress related to the work of ECD's (Baseman et al., 2018). Self-efficacy refers to an "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). High levels of self-efficacy are associated with goal setting, persistence, and a constructive way of dealing with failures (Schwarzer and Renner, 2000). Furthermore, self-efficacy enables individuals to trust their capabilities and to face stressful demands with confidence (Jerusalem and Mittag, 1995).

Occupational burnout is a psychological syndrome emerging as a prolonged response to chronic interpersonal stressors on the job (Maslach and Leitner, 2016, p. 103). Recently, there has been a change in the way WHO defines the occupational burnout syndrome. Until now, burnout was understood as "state of vital exhaustion" belonging to the group "problems related to life management difficulty" (World Health Organization [WHO], 2011; Chirico, 2017a). According to the definition that will come into force in January 2022, burnout is a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one's job, or feelings of negativism or cynicism related to one's job; and reduced professional efficacy (World Health Organization [WHO], 2019). The new definition encourages the differentiation of burnout from symptoms of other mental disorders: depression, anxiety and stress (Chirico, 2017a). The distinction in the definition of three dimensions of burnout draws attention to a number of psychological risks occurring in the work environment, which cannot be identified as the stressors of the work environment alone (Chirico, 2015). After the change, occupational burnout will not be classified as a disease state, but as an "occupational phenomenon" – a strictly professional problem related to the experiences of an employee emerging in the context of professional work. Meanwhile, according to many researchers, there is scientific evidence for treating the burnout syndrome as occupational disease (Chirico, 2017a; Laštovková et al., 2018). Burnout refers specifically to phenomena in the occupational context and should not be applied to describe experiences in other areas of life. Occupational burnout syndrome has its own specific antecedents and consequences, different from the work-related stress risk factor, which can only be explained by new theoretical models (Chirico, 2017b). The Job Demands—Resources (JD-R) Model of Burnout (Demerouti et al., 2001) is one of models explaining the mechanisms of occupational burnout and work commitment. Professional work influences energy levels, which are responsible for enhancing experienced stress and lead to a depletion of psychophysical resources and the deterioration of health. Energy processes are modified by the motivational processes related to the possessed resources (e.g., self-efficacy), which protect against the development of burnout. Occupational burnout syndrome is a result of the depletion of mental and psychical energy as well as the cognitive resources of a person (Grabowski et al., 2019). The

symptoms of occupational burnout develop as a consequence of an overload caused by workplace requirements until a person's psychophysical resources are depleted, which in effect decreases their motivation to engage with their work. Other model of burnout based on the conservation of resources (COR) theory assuming that burnout is an effect of stress, which occurs when individuals perceive that the resources, they value are threatened. Following this theory, both perceived stress and self-efficacy can be treated as human resources that are interrelated in the so-called "caravans" of resources (Hobfoll et al., 2018). Stress is an element of the human resource protection system, and also a signal for the perceived threat of losing resources. However, a prolonged presence of stress can lead to a spiral of further losses. In the course of professional work, losses can manifest themselves in the form of signs of burnout that appear successively, ranging from emotional exhaustion to disappointment with the job (Jaworowska, 2014; Rogala et al., 2016). Symptoms of the burnout syndrome are indicated as the main cause of low retention in operator positions and high sickness absence (Baseman et al., 2018). Operators report lower job and life satisfaction compared to other employees (op, cit.).

Job Demands—Resources Model and COR theory treat self-efficacy as one of the important personal human factors, which protect against the development of burnout (Hobfoll, 2011; Grabowski et al., 2019). Scientific research shows that the role of self-efficacy increases when work requirements threaten to lose human energy resources, e.g., in a situation accompanied by an increased level of stress (Rogala et al., 2016). Relationships linking stress, self-efficacy, and burnout have been studied for many years. The literature underlines to the importance of self-efficacy in promoting mental health in emergency services employees (Shakespeare-Finch et al., 2015). The research results show that stress usually remains positive to the level of occupational burnout, and negative to the level of self-efficacy (Kelley and Gill, 1993; Demerouti et al., 2001). The relationships: self-efficacy – occupational burnout are most often also negative (Grau et al., 2012; Shoji et al., 2015). Self-efficacy acts as a buffer to protect the human body against burnout. The direct effect of beliefs about self-efficacy on human well-being and job-functioning is fairly well documented, however, there is less research on their indirect functions. Researchers analyzed both the mediating and moderating functions of beliefs. The mediating function is better documented (Baka and Cieślak, 2010). Jex and Gudanowski (1992) found no empirical evidence of indirect effects of self-efficacy, in the processes of stress and burnout. However, some authors (Jex and Bliese, 1999) consider that self-efficacy is relevant to stress by serving a moderating role. We propose that the so-far unknown mechanisms or variables may hide the differences in the results. Similarly, the role of perceived stress is not resolved, which can be treated both as a human resource and a manifestation of the adaptation process, as well as an expression of failure in the process of coping with adversities.

Can differences in the levels of perceived stress and self-efficacy moderate the relationships between the variables? Our study examined the impact of differences in the severity of explanatory variables on the relationship between stress, self-efficacy and burnout. We adopted the assumption to treat the perceived stress as a categorical variable which, depending on its characteristics (high – medium – low), differentiates the relationship of stress with self-efficacy and burnout. Similarly, we found that there was a rationale for considering the differences between high, medium, and low self-efficacy levels. Differences in levels affect the form of the self-efficacy relationship with stress and burnout. We were followed the information from the scientific literature showing differences in the levels of stress in patients with different somatic ailments (Juczyński and Ogińska-Bulik, 2009). Similarly, there are differences in the intensity of the self-efficacy personality trait among patients with different health problems, behavioral disorders, or mental disorders. We assumed that the results of the measurement of perceived stress can be grouped in the form of a latent variable which we called psychological comfort. The psychological comfort, measured as low level of perceiving stress, may be interpreted as a state of calmness, absence of anxiety and tension, attentiveness, which is an effect of one's perception regarding the content of cognitive beliefs about oneself during the process of appraising stressful situations. Low effectiveness in coping with existing problems leads to symptoms of low psychological comfort (measured as high level of perceived stress). Knowing about the level of psychological comfort helps to plan actions to protect against the negative impact, especially that of chronic stress on cognitive functions and against the development of clinical symptoms. Differentiation in level of self-efficacy (high – moderate – low) has been operationalized as a latent variable under the name: level of power-to-affect. Employees with a high level of self-efficacy have confidence that they can use their skills effectively to manage with job tasks, job challenges, and job-related stress (Shoji et al., 2015). Workers with low levels of self-efficacy have beliefs that they cannot protect themselves from negative outcomes of job stress and job-challenges. We created two models that were used to test the following hypotheses:

Model 1.

1. The level of psychological comfort moderates the negative relationship between stress and self-efficacy. If the comfort level is low, the relationship is stronger.
2. The level of psychological comfort is moderated by the positive relationship between perceived stress and burnout. A low level strengthens the relationship between the variables.
3. The level of psychological comfort moderates the negative self-efficacy relationship with burnout. If the comfort level is low, the relationship is stronger.

Model 2.

1. The power-to-affect level moderates the negative relationship between perceived stress and self-efficacy. If the power-to-affect level is high, the relationship is stronger.
2. The power-to-affect level moderates the positive relationship between stress and burnout. If the power-to-affect level is high, the relationship is weaker.

3. The power-to-affect level moderates the negative self-efficacy relationship with burnout. If the power-to-affect level is high, the relationship is stronger.

MATERIALS AND METHODS

Participants

The data for this study were collected between January – May 2020 among all emergency call operators working in 17 public-safety answering points (PSAP) in Poland. The participants were sampled with the help of psychologists employed by each PSAP. The respondents completed an anonymous set of questionnaires which were mailed to their workplace. In total, 800 sets of research tools consisting of information about the study, 3 standardized research questionnaires, a demographic survey, and an invitation to participate were delivered. Participation in the study was voluntary. 558 sets of questionnaires from 14 PSAP in Poland were returned of which 546 were correctly completed, for a valid rate of 68,25%. The study design and protocols were analyzed and approved by the Ethics Committee of Jagiellonian University (decision No. 1072.6120.23.2017) and was carried out in accordance with the recommendations of the APA Ethics Code.

Instruments

Burnout

The level of burnout was assessed using the Polish version of the Link Burnout Questionnaire (LBQ) created by the Laboratory of Psychological Tests of the Polish Psychological Society (Jaworowska, 2014). The measure consists of 24 items in relation to which the subject responds on a 6-point Likert scale [1 – never, 2 – rarely, 3 – once (or more) during a month, 4 – more or less once a week, 5 – several times a week, and 6 – every day]. The questionnaire has 4 subscales according to 4 dimensions of occupational burnout: psychophysical exhaustion (PE), relationship deterioration (RD), professional inefficacy (PI), and disappointment (DI). Each subscale measures a range between low (6 points) and high (36 points) severity. The LBQ includes 5 indicators: the higher the score of each subscale, the greater the intensity of each 4 dimensions of burnout. An additional, 5 indicators of burnout is the total burnout result, the so-called occupational burnout syndrome composite index (LBQ^{INDEX}). It is the sum of the results obtained on the 4 subscales of the questionnaire. The Polish version of the LBQ questionnaire has good psychometric properties. The scale of DI (Cronbach's $\alpha = 0.84$) has the highest internal reliability and the scale pertaining to the PI (Cronbach's $\alpha = 0.68$) has the lowest internal reliability. In our research, Cronbach's α for individuals ranged from PI = 0.628; RD = 0.689; PE = 0.845; and DI = 0.859.

Level of Perceived Stress

The Polish version of the Perceived Stress Scale (PSS-10; Juczyński and Ogińska-Bulik, 2009) was used. The PSS-10 questionnaire is the most widely used psychological instrument for measuring the perception of the cognitive aspects of stress and coping – appraising the effectiveness of coping strategies. The PSS-10 is designed to measure the level of perceived stress in terms of unpredictability, lack of control, and overload (Juczyński and Ogińska-Bulik, 2009). Ten questions of PSS-10 identify the level of perceived stress as an indicator of the effectiveness of dealing with life events. The questions in the PSS-10 ask about feelings and thoughts over the past month to which the respondent answers on a 5-point Likert-type scale: 0 – never, 1 – almost never, 2 – sometimes, 3 – quite often, and 4 – very often. The overall raw result ranges between 0 and 40 points. The PSS-10 includes one indicator: the higher the score, the greater the intensity of the perceived stress. The results also allow prediction of the physical and mental discomfort of the respondents. In the Polish version, the scale has obtained very good psychometric properties with a Cronbach's α value of 0.86. The Cronbach's alpha in our research was 0.883.

Self-Efficacy

To measure beliefs about self-efficacy in the group of emergency call operators, a Polish language version of the Generalized Self-Efficacy Scale (GSES) was used (Juczyński, 2001). The questionnaire based on Bandura's theory of social learning measures the strength of an individual's general belief of the effectiveness in coping with difficult life situations and smaller, daily hassles. Self-confidence in the tool tests, together with skills and knowledge, favor better coping in everyday life. The GSES consists of 10 questions to which the participant responds on a 4-point Likert-type scale: 1 – not, 2 – probably not, 3 – probably yes, and 4 – yes. The overall raw result scores were between 10 and 40 points. The GSES includes one indicator: the higher the score is, the greater intensity of the generalized self-efficacy it indicates. Cronbach's α in the Polish version was 0.85. The Cronbach's α in our study was 0.883.

Procedure

The data for this study was collected between January – May 2020 among emergency call operators working in PSAP in Poland. The respondents completed an anonymous set of questionnaires which were mailed to their workplace. In total, 800 sets of research tools consisting of information about the study, three standardized research questionnaires, a demographic survey, and an invitation to participate were sent. Participation in the study was voluntary. After choosing appropriate subgroups participant completed sets of questionnaires. 558 sets of questionnaires were returned of which 546 were correctly completed. The questionnaires came from call-takers and dispatchers working in 14 out of 17 PSAP in Poland.

Data Analyses

The authors used software environment for statistical computing R (version 4.0.5) for statistical analysis (R Core Team, 2021). A significance level of 0.05 was adopted in the analysis. Correlations between quantitative variables were analyzed using the Spearman R coefficient. The method of path analysis was used, which was performed in the R program, version 4.0.5 with the lavaan package (Rosseel, 2012).

RESULTS

The participants consisting of 238 male (43.6%) 308 female (56.40%). The mean age was 34.37 (*SD* = 8.14; min = 19.0, max = 65.0), 232 (42.5%) of the participants were married, 143 (26.2%) cohabited with a partner, 120 (22%) single, 44 (8%) divorced, 3 (0.6%) widowed, and 8 (0.7%) marital status was unknown. With regards to education, 396 (72.5%) of the operators had bachelor's and master's degrees, 143 (26.2%) had secondary education, 1 (0.18%) had vocational education, and the level of education of 6 (1.1%) participants was unknown.

Model 1. The Level of Psychological Comfort as Moderator of Predictors of Occupational Burnout

As shown by the results presented in **Table 1**, the mean group value of perceived stress was 15.95 points, which corresponds to the upper limit of the moderate range. This score is 0.67 points lower than that obtained in a representative group of 1,830 randomly selected, healthy Poles (*M* = 16.62, *SD* = 7.50; Juczyński and Ogińska-Bulik, 2009), but 1.09 points higher than that obtained in the studies of 580 Polish firefighters (*M* = 14.86, *SD* = 5.72, and Cohen's *d* = 0.17; Makara-Studzińska et al., 2019). The mean value of the self-efficacy measurement was 31.36 points and was 4.04 points higher than that obtained in a representative group of 496 randomly selected, healthy Poles (*M* = 27.32, *SD* = 5.31, and Cohen's *d* = 0.86). The average result of the measurement of occupational burnout in the ECD's group expressed using the composite LBQ^{INDEX} was 82.67 points and it was 28.31 points higher than that obtained in the group of 88 Polish air traffic controllers (*M* = 54.36, *SD* = 16.07, and Cohen's *d* = 2.16) and 17.74 points higher than that obtained in the group of 54 sea navigators (*M* = 64.93, *SD* = 14.03, and Cohen's *d* = 1.49; Makara-Studzińska et al., 2020). The results obtained in the measurement of each of the burnout dimensions were higher than those obtained in the standardization studies of the LBQ questionnaire in various professional groups, as well as in the studies of Polish firefighters (Jaworowska, 2014; Makara-Studzińska et al., 2019) and were within the scope of high scores in the case of three dimensions, and in the scope of loss of professional effectiveness within the scope of very high scores. A high level of burnout in the PE dimension was diagnosed in 32% of the responders, in the RD dimension in 28,6% of the responders, in PI dimension in 53,11% of the responders, and in the DE dimension in 8,97% of the responders. The sten scores adopted in the interpretation of the PSS-10 results were used to distinguish three groups of respondents due to the latent variable – psychological comfort. The group with low psychological comfort was composed of results in the range of 7–10 sten score, moderate 5–6 sten score and high 1–4 sten score. **Table 2** shown the distribution of the variable "level of psychological comfort." Nearly 32% of the examined ECD's reported the presence of signs of high intensity of perceived stress (low level of psychological comfort) in the month preceding the study. **Table 2** shown correlations among perceived stress, occupational burnout and self-efficacy. The results show that the level of perceived stress was moderately strongly negatively correlated with the level of self-efficacy and weakly positively correlated with the sense of loss of professional effectiveness. The level of self-efficacy weakly negatively correlated with the sense of loss of professional effectiveness and weakly positively with the sense of disappointment with the work performed. As each of the explanatory variables significantly correlated with at least two other variables, there was no reason to remove any of them from the model at this stage of the analysis. The path analyzing model was proposed to explain the moderating influence of psychological comfort on the relationship between explanatory variables and burnout (see **Table 3** and **Figure 1**). As the tested models with moderation operate at degrees of freedom (df = 1), this gives rise to a very low RMSEA value and a very high CFI value. For this reason, it is not recommended to provide the values of measures of its fit (in our model RMSEA = 0, CFI = 1). Similarly, the chi-square statistic = 0 and has zero degrees of freedom.

The results showed the following relationships. The level of psychological comfort moderated the negative relationship between stress and self-efficacy. Both when the comfort

TABLE 1 | The correlations among perceived stress, occupational burnout and self-efficacy.

Factors	*M*	*SD*	Spearman's coefficient						
			PSS10	GSES	PE	RD	PI	DI	LBQ^{INDEX}
PSS10	15.95	6.76	–	–					–
GSES	31.16	4.14	−0.537***	–					–
PE	20,94	3,74	0.031	0.03	–				
RD	20,13	4,10	0.049	0.033	0.353***	–			
PI	23,04	3,06	0.217***	−0.109*	0.038	0.193***	–		
DI	18,54	3,32	0.074	0.126**	0.29***	0.239***	0.148***	–	
LBQ^{INDEX}	82.67	9.30	0.053	0.051	0.66***	0.722***	0.468***	0.629***	–

N = 546.

****Statistical significance < 0.001; **statistical significance < 0,01; and *statistical significance < 0.05.*

GSES, General Self-Efficacy Scale; PSS-10, Perceived Stress Scale; LBQ, Link Burnout Questionnaire; PE, psychophysical exhaustion; RD, relationship deterioration; PI, sense of professional inefficacy; DI, disillusion; and LBQ^{INDEX}, occupational burnout syndrome composite index.

TABLE 2 | The distribution of the variable level of psychological comfort.

Level of psychological comfort	*n*	%
Low	217	39.74%
Medium	154	28.21%
High	174	31.87%
Unknown	1	0.18%

N = 546.

level was high ($\beta_H = -0.401$, $p < 0.001$, LLCI = −0.522; ULCI = −0.281), average ($\beta_M = -0.192$, $p < 0.05$, LLCI = −0.343; ULCI = −0.041), and low ($\beta_L = -0.383$, $p < 0.001$, LLCI = −0.492; ULCI = −0.273). The low level of psychological comfort moderated the positive relationship between stress and burnout ($\beta_{CL} = 0.174$, $p < 0.05$, LLCI = 0.036; ULCI = 0.314). When the comfort level was low, the strength of the relationship combined compound (including self-efficacy) was greater than in the case of the direct relationship ($\beta_{C+ABL} = 0.181$, $p < 0.01$; LLCI = 0,053, ULCI = 0,309). The high level of psychological comfort moderated the positive self-efficacy relationship with burnout ($\beta_H = 0{,}234$, $p < 0{,}01$, LLCI = 0,078, ULCI = 0.39). The high level of psychological comfort moderated the negative indirect impact of stress on burnout via self-efficacy ($\beta_H = -0.094$, $p < 0.05$; LLCI = −0.164, ULCI = −0.024). The low level of psychological comfort moderated the combined positive effect of stress and self-efficacy on burnout ($\beta_L = 0.181$, $P < 0.01$, LLCI = 0,053, ULCI = 0.309). Taking into account the level of self-efficacy in the relationship between stress and burnout with a low level of psychological comfort strengthened the strength of the relationship between stress and burnout.

Model 2. The Level of Power-to-Affect as Moderator of Predictors of Occupational Burnout

The sten scores adopted in the interpretation of the GSES results were used to distinguish three groups of respondents due to the latent variable – level of power-to-affect. The group with low level of power-to-affect was composed of results in the range of 1–4 sten score, moderate 5–6 sten score and high 7–10 sten score. **Table 4** exhibits the distribution of the variable "level of

TABLE 3 | Latent variable: Level of psychological comfort.

Level of psychological comfort	Effect (β)				
	a	b	Direct (c)	Indirect (ab)	Total (c + ab)
Low	−0.383 (−0.492; −0.273)***	−0.016 (−0.158; 0.126)	0.175 (0.036; 0.314)*	0.006 (−0.048; 0.061)	0.181 (0.053; 0.309)**
Moderate	−0.192 (−0.343; −0.041)*	0.123 (−0.036; 0.282)	0.046 (−0.114; 0.206)	−0.024 (−0.059; 0.012)	0.022 (−0.136; 0.181)
High	−0.401 (−0.522; −0.281)***	0.234 (0.078; 0.39)**	0.129 (−0.029; 0.287)	−0.094 (−0.164; −0.024)**	0.035 (−0.114; 0.185)

Standardized results of regression analyses performed on the total effect, direct effect, and indirect effect in group of Polish ECD's (N = 546).
*a – effect stress on self-efficacy; b – effect self-efficacy on burnout; c – direct effect stress on burnout; ab – indirect effect stress on burnout via self-efficacy; combined effect stress and self-efficacy on burnout, total (c + ab) – total stress relationship with burnout, including indirect relationships through self-efficacy. ***p < 0.001; **p < 0.01; and *p < 0.05.*

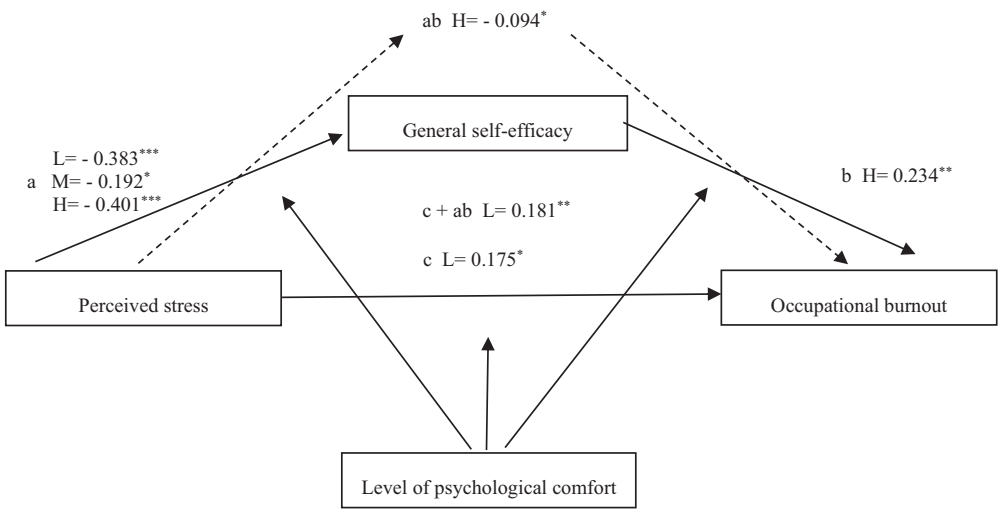

FIGURE 1 | Model 1. Relationships between perceived stress, general self-efficacy and occupational burnout moderated by level of psychological comfort in a group of Polish ECD's. L = low level of psychological comfort. M = medium level of psychological comfort. H = high level of psychological comfort. *β is significant at the 0.05 level. **β is significant at the 0.01 level. ***β is significant at the 0.001 level. For the readability of the graph, the graphic markings of irrelevant paths were omitted.

TABLE 4 | The distribution of the variable level of power-to-affect.

Power-to-affect	*n*	%
Low	28	5.13%
Moderate	140	25.64%
High	375	68.68%
Unknown	3	0.55%

N = 546.

psychological comfort." The path analyzing model was proposed to explain the moderating influence of psychological comfort on the relationship between explanatory variables and burnout (see **Table 5** and **Figure 2**).

Medium level power-to-affect ($\beta_M = -0.242$, $p < 0.01$, LLCI = −0.396, UCLI = −0.089) and a high level of power-to-affect ($\beta_H = -0.325$, $p < 0.001$, LLCI = −0.413, UCLI = −0.237) moderated the negative relationship of stress with self-efficacy. In the case of a low power-to-affect level, there was no relationship. The average level of power-to-affect moderated the positive self-efficacy relationship with burnout ($\beta_M = -0.175$, $p < 0.05$, LLCI = 0.011, UCLI = 0.339). High level power-to-affect ($\beta_H = 0.13$, $p < 0.05$, LLCI = 0.025; ULCI = 0.235) and a medium level of power-to-affect ($\beta_M = 0.18$, $p < 0.05$, LLCI = 0.017; ULCI = 0.342) moderated the positive effect of stress on burnout. The indirect effect of stress on burnout (through self-efficacy) was not significant at each power-to-affect level. The high level of power-to-affect moderated the total positive impact of stress on burnout ($\beta_H = 0.137$, LLCI = 0.038, ULCI = 0.236).

DISCUSSION

Two models were tested taking into account the moderating effect of latent variables on the relationships: perceived stress – self-efficacy – level of occupational burnout in the emergency dispatchers and call-takers occupational group. First, the changes in relationships caused by the introduction to the model of the level of psychological comfort, operationalized as three levels of perceived stress intensity, were checked. Then, the changes caused by the introduction of the power-to-affect level, operationalized as three levels of intensity of the personal factor of self-efficacy, were examined.

In line with the hypotheses, the study confirmed the existence of negative relationships between perceived stress (assessment

TABLE 5 | Latent variable: Level of power-to-affect.

Level of power-to-affect	Effect (β)				
	a	b	Direct (c)	Indirect (ab)	Total (c + ab)
Low	−0.31 (−0.643; 0.022)	0.303 (−0.061; 0.667)	0.118 (−0.258; 0.494)	−0.094 (−0.249; 0.061)	0.024 (−0.353; 0.401)
Medium	−0.242 (−0.396; −0.089)**	0.175 (0.011; 0.339)*	0.18 (0.017; 0.342)*	−0.042 (−0.091; 0.006)	0.137 (−0.025; 0.299)
High	−0.325 (−0.413; −0.237)***	−0.021 (−0.127; 0.086)	0.13 (0.025; 0.235)*	0.007 (−0.028; 0.041)	0.137 (0.038; 0.236)**

Standardized results of regression analyses performed on the total effect, direct effect, and indirect effect in group of Polish ECD's (N = 546).
*a – effect stress on self-efficacy; b – effect self-efficacy on burnout; c – direct effect stress on burnout; ab – indirect effect stress on burnout via self-efficacy; combined effect stress and self-efficacy on burnout, total (c + ab) – total stress relationship with burnout, including indirect relationships through self-efficacy. ***p < 0.001; **p < 0.01; and *p < 0.05.*

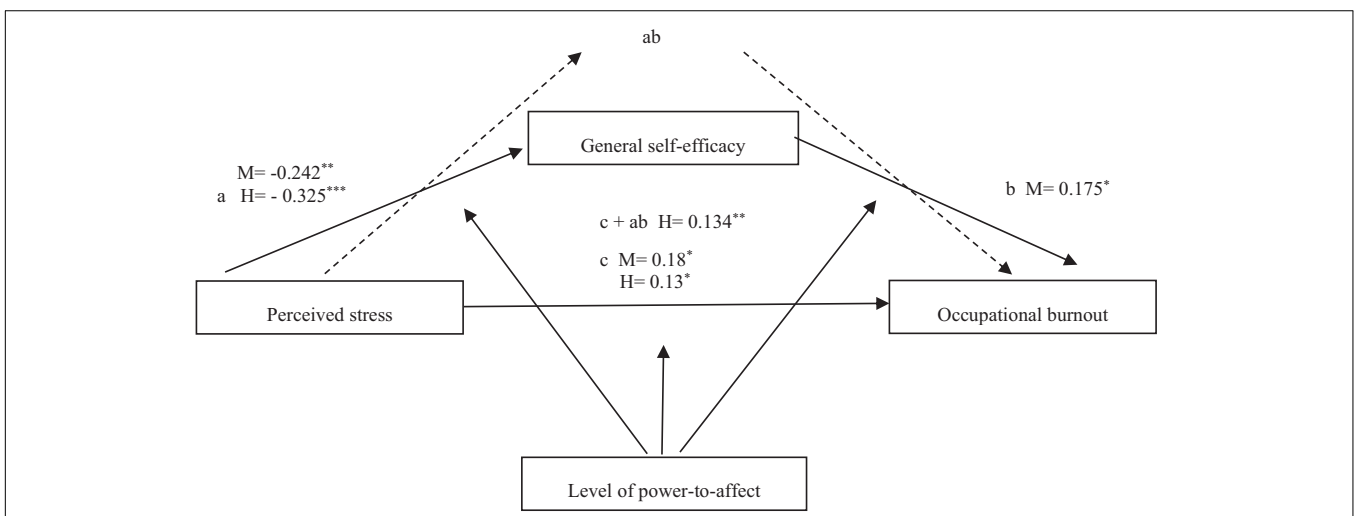

FIGURE 2 | Model 2. Relationships between perceived stress, general self-efficacy and occupational burnout moderated by level of power-to-affect in a group of Polish ECD's. L = low level of power-to-affect. M = medium level of power-to-affect. H = high level of power-to-affect. *β is significant at the 0.05 level. **β is significant at the 0.05 level. ***β is significant at the 0.05 level. For the readability of the graph, the graphic markings of irrelevant paths were omitted.

of the current situation) and self-efficacy (a personal trait). Both perceived stress and self-efficacy hide specific cognitive beliefs. A low level of comfort means the psychological tension accompanying the beliefs that a person is helpless in coping with unpredictable, uncontrollable and overwhelming life events (Cohen et al., 1983, p. 387). Self-efficacy is a generalized belief about the ability to deal with adversity. The negative relationship between the variables is consistent with the COR theory: the threat of losing of sense of self-efficacy triggers stress processes to inhibit negative reactions. If these processes fail and the loss of self-efficacy is not stopped, the sense of perceived stress increases. According to the Job Demands – Resources Model: personal resources can buffer energy processes and, as a result, reduce the level of perceived stress. Workers with a high personal factor of self-efficacy may perceive external stressors as being less threatening. They may be able to manage stressful demands and could prevent the emergence of burnout (Schwarzer and Hallum, 2008). Ivancevich and Matteson (2002) reported that persons with high levels of self-efficacy feel confident in their abilities and are more likely to perceive potential stressors as challenges and opportunities, rather than threats and losses. In contrast, individuals with low levels of self-efficacy are less confident in their abilities and in the successful completion of tasks.

Regarding to self-efficacy – stress relationships, including the moderating influence of three levels of psychological comfort and three levels of power-to-affect in this study confirmed the assumed dependence and showed its relationship with the level of severity of moderators. Regardless of the level of stress, i.e., the number of negative beliefs about controlling and counteracting current stressful life events, the self-efficacy as personal factor acts in opposition to perceiving stress. However, taking into account the differences in the intensity of the abovementioned personality trait, weak beliefs about self-efficacy no longer constituted a significant counterbalance to the currently perceived life stress.

The analysis of correlation revealed that the positive relationship between stress and occupational burnout, known from the literature, turned out to concern only one dimension of burnout in the studied group: loss of professional effectiveness. This result differs from that obtained in the teachers' research, in which the level of perceived stress co-occurred with increasing emotional exhaustion and increasing negative changes in social relations (Teles et al., 2020). According to the JD-R model, a positive relationship between stress and burnout should be initiated by an increase in exhaustion and energy depletion (Maslach et al., 2001), because professional work involves people on the energy level, leading to the depletion of their psychophysical resources. Especially when the work is performed with great engagement, which is an accompanied by high level of stress. According to COR theory, the loss of any resources, including the sense of professional effectiveness, triggers adaptation processes to stop it. This explains the negative relationship between the above-mentioned variables: stress and loss of professional effectiveness. Taking into account the moderating effect of psychological comfort revealed a relationship between stress and burnout that had not previously appeared in the correlation analysis. The analysis revealed that the positive relationship between stress and burnout occurred only among participants with a low level of psychological comfort (high level of stress), so it was not a proportional relationship. Taking into account the moderating effect of power-to-affect also showed a positive relationship between stress and burnout. It occurred in people who had a high and medium level of power-to-affect, so contrary to what we assumed in the hypotheses. Additionally, in people with a high level of power-to-affect, a positive relationship between stress and burnout occurred after taking into account the combined effect of perceived stress and self-efficacy to burnout. It can therefore be concluded that the introduction of latent variables to the models revealed relationships not visible in the correlation analysis and confirmed their compliance with data from the literature. It can also be seen that the relationships between the discussed variables are complex and not proportional. In addition, it turned out that in the case of people with a high self-efficacy level, taking into account the above-mentioned variable in the stress-burnout relationship did not result in the expected changes. Thus, the hypothesis that a high level of power-to-affect should weaken the relationship between stress and burnout has not been confirmed. If the power-to-affect level is treated as an indicator of resourcefulness in coping with tasks, challenges and stress at work (Shoji et al., 2015), then, according to the JD-R model, people with high power-to-affect should work with greater commitment, and the resource should protect them from burnout. To explain the inconsistency of results using COR theory, it should be stated that people with a higher level of comfort in the face of very burdensome working conditions that currently take place in Polish ECDs centers experience a greater risk of losing their resources, which increases their stress level and thus leads to burnout. Especially if the work takes place in extreme conditions caused by the COVID-19 pandemic.

The negative relationship between self-efficacy and burnout was not confirmed, the correlation analysis revealed a negative relationship only in the case of the loss of professional effectiveness and, contrary to assumptions, a positive relationship with the dimension of job disappointment. Even more so, the hypothesis that the strength of the negative relationship: self-efficacy – burnout is inversely proportional to the level of psychological comfort and directly proportional to power-to-affect was not confirmed. This result is contrary to the one derived from the study of Polish firefighters, in which the personal factor of self-efficacy changed the direction and strength of relationship between perceived stress and PE, sense of personal inefficacy and disillusion (3 out of 4 dimensions of burnout; Makara-Studzińska et al., 2019). In people with a high level of psychological comfort (low level of stress), we observed a positive self-efficacy relationship with burnout. ECD's with a high intensity of the aforementioned personality trait revealed a high degree of occupational burnout, although according to the literature it should be the other way around. This means that people who at the time of the study were relaxed, calm and attentive, coping well with problems and at the same time having the ability to organize the activities necessary to achieve goals turned out to be more burned out. Taking into account the differences in the level of self-efficacy, people with average intensity of the mentioned trait also revealed a higher degree

of burnout compared to the others, so an opposite relationship to the expected one appeared. The average level of power-to-affect revealed a positive self-efficacy relationship with burnout. The interrelationships between the discussed variables assumed in the hypotheses were confirmed in the case of an indirect relationship between stress and burnout via self-efficacy among participants with a high level of psychological comfort. Here, taking into account the self-efficacy personality trait reversed the direction of the stress-burnout relationship. Meanwhile, in studies of Polish firefighters, regardless of differences in the level of perceived stress, people with a lower level of self-efficacy showed more intense signs of emotional exhaustion (Makara-Studzińska et al., 2019).

An important issue is the very high level of occupational burnout identified in the ECD's group and its possible causes. It is known from the literature that ECD is a profession with a high risk of stress and burnout (Baseman et al., 2018; Smith et al., 2019). However, the results obtained in our study were higher than those obtained in 2018 in the American ECD group, where the burnout criterion was met by 32% of respondents (Boland et al., 2018). Similar data from other countries were even lower, although significantly higher than in the general population (Boland et al., 2018). There is an immediate supposition that there may be two interrelated causes behind the aforementioned differences. The first is the fact that the study was conducted during the COVID-19 pandemic, the second is that the ECD system in Poland is under development. Both of these reasons should be treated together. The system, which was insufficiently organized in formal and legal terms, was additionally ineffective in the face of the pandemic's challenges, leading to the burnout of a large number of workers in a short time. This is also reflected in the high rotation, ECD in Poland works in the profession on average 3–4 years (Klasa, 2020). A study conducted in Italy among a group of nurses working during the COVID-19 pandemic showed an equally high level of burnout. The symptoms of the syndrome were diagnosed in 68% of respondents (Damico et al., 2020). Similar trends are noticeable in the results concerning employees of emergence services from different countries of the world. The results of a study conducted in France showed a sharp increase in the number of incoming emergency calls per hour, the number of ECD's involved in a call, and the duration of a call during a pandemic (Penverne et al., 2020). The authors suggest taking specific organizational solutions helpful in times of mass disasters. The first analyzes carried out in the countries affected by the pandemic show the need to improve the methods of managing emergency services by the employees of ECD's centers in order to better manage human resources (Rashed et al., 2021).

Indications for Preventive Actions

The European Framework on Safety and Health at Work of European Union obliges employers to protect employees against workplace hazards (Chirico, 2017b). The occupational burnout syndrome has not yet been officially accepted as an occupational disease in EU countries. However, in 9 EU countries, burnout may be acknowledged as an occupational disease, which allows workers to be compensated the health loss (Laštovková et al., 2018). There are still difficulties in identifying psychosocial factors for risk of burnout. There is no clear individual diagnosis of burnout and there are problems with differentiating burnout from other mental disorders: depression, anxiety and stress. Despite the lack of sufficiently accurate methods of measuring burnout and the difficulties in defining it, steps are taken in many countries to prevent this phenomenon. Most of created programs include interventions aimed at the employee. Secondly the program also includes interventions focused on organizational changes and also combined program that include both of the mentioned interventions (Awa et al., 2010). Personal interventions are aimed at increasing the employee's professional competences, coping skills, using social support and performing relaxation exercises. Interventions aimed at organizing workplace serve to reduce the demand for work, increase the sense of work control and employee participation in decision making, remove the effort reward imbalance. Organizational changes also contribute to the growth of sense of belongings to the community, strong relationships, and work-life balance. Participation in the programs increases the employees' sense of self-efficiency at work. Along with the proposed new definition of burnout, WHO plans to develop evidence-based guidelines on mental well-being in the workplace (World Health Organization [WHO], 2019). It should be emphasized that the negative health effects of burnout are not limited to mental health alone. Inflammatory processes caused by low cortisol levels in burned out workers may contribute to impaired immune functions, pathogenesis of chronic diseases and sleep disorders (Melamed et al., 2006). Physiological changes may secondarily increase employees' feelings of emotional exhaustion and weariness. These facts indicate the importance of undertaking preventive interventions of an interdisciplinary nature, both psychological, organizational and medical. Due to the objectively high risk of burnout in the ECD's professional group, programs are created around the world to counter the phenomenon by strengthening selected personal resources (e.g., Linos et al., 2019). The results obtained by us may contain suggestions for preventive measures. It can be seen that strengthening the self-efficacy personality trait may be a way to protect against burnout, however, when the level of the current perceived life stress is not high. In such a case, it seems that the first step should be changes aimed at discovering the predictors of stress in order to exclude them. The self-efficacy personality trait does not always act as a buffer protecting the employee against burnout. It may intensify some of its dimensions, which may be fostered by the level of stress currently experienced. It seems right to treat resources as interrelated factors in order to more accurately predict the expected changes in their impact on stress and burnout.

The Limitations

In order to explain the cause-and-effect relationships concerning the discussed issue, it seems helpful to conduct longitudinal studies. The theoretical background is COR theory, which allows to show dynamic changes in relations – resources – stress – burnout. It is also reasonable not to limit research tools only to self-report methods but to use objective indicators to measure stress and burnout.

CONCLUSION

The obtained results partially confirmed the research hypotheses and answered research questions. Taking into account the differences in the intensity of explanatory variables showed their moderating effect, which often turned out to be different from the assumed one and obtained in the research of other authors. It revealed relationships that might otherwise have been missed. The study provided a wealth of information about relationships: perceived stress – self-efficacy and burnout. First, it showed a relationship characterized by proportional relationships between the variables and consistent in its direction and strength with data from the literature. We are talking about a negative relationship between perceived stress and self-efficacy, which persists despite taking into account the differences in the intensity of the explanatory variables. Second, although the correlation analyzes did not indicate it, taking into account the moderating effect of latent variables allowed us to see the expected relationships between the variables. It is about changing the direction of the relationship between perceived stress and burnout via self-efficacy, which occurred only in people with a high level of psychological comfort (low level of stress). Only in this case we observed a self-efficacy buffering effect on the relationship between stress and burnout. Third, considering the influence of the moderators revealed accounts that turned out to be opposite to the data from the literature. We are talking about a positive self-efficacy relationship with burnout, which occurred in people with a high level of psychological comfort (low level of stress) and in people with an average level of power-to-affect (average level of self-efficacy).

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 protocol was approved by the Bioethics Commission at Jagiellonian University Medical College (decision No. 1072.6120.23.2017) and was carried out in accordance with the recommendations of the APA Ethics Code. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Psychological Capital and Job Satisfaction Among Chinese Residents: A Moderated Mediation of Organizational Identification and Income Level

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The present study examined the mediating effect of organizational identification on the relationship between psychological capital and job satisfaction, and whether the mediation was moderated by income level. A total of 310 Chinese residents were surveyed using the Psychological Capital Scale, Organizational Identification Scale, Job Satisfaction Scale, and a demographic questionnaire. The findings showed a significant positive correlation between psychological capital and job satisfaction of residents, and this relationship was partially mediated by organizational identification. Moreover, income level played a moderating role in the relationship between organizational identification and job satisfaction. Fors with more income, their organizational identification influenced their job satisfaction more strongly than those with less income. The current study contributes to a better understanding of the relationship between psychological capital and job satisfaction. Implications for resident management and policymaking are discussed.

Keywords: organizational identification, psychological capital, job satisfaction, income level, residents

INTRODUCTION

Residents (also called resident physicians) are a special group of physicians who work in hospitals. They have received formal education in medical schools and must receive special clinical training at the hospital and under the supervision of the medical staff for 2–7 years before they can work independently. The job responsibilities for most of the residents in China involve taking care of hospitalized patients. They are one of the groups that have the closest contact with patients and are under enormous work stress (Chen et al., 2013). Compared with attending surgeons, residents were found to have a higher risk of burnout and poorer quality of life (Pulcrano et al., 2016). Moreover, the turnover intention of this group of employees is much higher. A systematic literature review concluded that the burnout of residents could be traced back to the period when they were medical

students, and the main reasons contributing to burnout were a lack of time control and heavy workload (IsHak et al., 2009). In this situation, it is critical to pay more attention to the resident population, helping them avoid the negative effects of work stress and gain more happiness from the work they do.

As a group of employees with relatively less seniority, building identification with the organization for residents is essential to improve work attitudes and behaviors. Research has proven that organizational identification has a positive effect on job satisfaction, and organizational commitment behaviors. A variety of studies have established that organization and environment level factors, such as organizational climate, perceived support from the organization, and the autonomy of the job contribute to employees' organizational identification (Edwards and Peccei, 2010; Salvatore et al., 2018; Barattucci et al., 2021). However, little attention has been paid to the intrinsic positive power of individuals that can impact on organizational identification.

In Chinese employees, Luthans et al. (2008a) identified psychological capital as a core psychological element of individual motivation and asserted that it is of critical importance in influencing performance, positive attitudes, and positive behaviors. Previous studies have shown that both identification and psychological capital are predictors of job satisfaction (Larson and Luthans, 2006; van Knippenberg and Sleebos, 2006; Ke and Sun, 2014; Loi et al., 2014; Karanika-Murray et al., 2015). However, the interaction between explaining and predicting such a mechanism is less clear. We propose that psychological capital is associated with job satisfaction and that this relationship is mediated by organizational identification. Meanwhile, we focus on income level as an important factor related to job satisfaction and explore whether it moderates the relationship between organizational identification and job satisfaction. We conducted this study to generate fresh insights into improving junior employees' positive perceptions of their jobs. We believe that these findings make an important Contribution To The Field of positive organizational behavior.

Theory and Hypothesis

The Positive Impact of Psychological Capital on Job Satisfaction

Job satisfaction is a work-related attitude that reflects how satisfied or dissatisfied an employee is with their job (Spector, 1985). Job satisfaction has been noted by many researchers as critical for hospital staff; for example, it has been shown to relate to many significant aspects of job performance, such as work engagement and burnout, turnover intention, emphatic behaviors toward patients, and patient satisfaction (Iyeke, 2020; Yu et al., 2020; Schneider et al., 2021). Furthermore, the effects of job satisfaction in medical personnel are reflected not only in the organizational aspects, but also in their mental and physical health conditions (Verbrugge, 1982; Cooper et al., 1989; Williams et al., 2001).

Among many individual and organizational factors that shed light on job satisfaction, one of the most important individual factors is psychological capital. Luthans et al. (2005) defined psychological capital (hereinafter PsyCap) as the core psychological element of individual motivation, including self-efficacy, optimism, resilience, and hope. Self-efficacy is defined as people's confidence about their abilities to deploy the inspiration, cognitive resources, and action plan needed to successfully complete a specific task (Stajkovic and Luthans, 1998). It was derived primarily from Bandura (1997) social cognition theory, and it is about the perception that a person can take effective action to achieve a desired goal. Resilience is defined as "the capacity to rebound or bounce back from adversity, conflict, failure or even positive events, progress, and increased responsibility" (Luthans, 2002, p. 702). It is an intrinsic resource that enables individuals to protect themselves from the negative effects of the stressors they encounter by changing their responses to adversity (Fletcher and Sarkar, 2013). Optimism is a positive attribution style that attributes positive results to personal and pervasive elements, and interprets negative events with reference to external or environmental causes (Luthans and Youssef-Morgan, 2017). Hope is defined as "a positive motivational state based on an interactively derived sense of successful agency and pathways" (Snyder et al., 1991). It mainly focuses on one's determination to pursue goals and the ability to find alternative solutions to achieve the goal. The four resources combine into a higher-order core construct named PsyCap, which satisfies the criteria of positive organizational behavior and enables individuals to gain a competitive advantage through targeted investment and development.

Studies have shown that PsyCap played an important protective role in the workplace when associated with work-related stress (Khalid et al., 2020; Tian et al., 2020). Moreover, people with higher levels of PsyCap were more positive and motivated (Luthans et al., 2008b), demonstrating more organizational citizenship behavior (Gupta et al., 2017) and voice behavior (Wang et al., 2018) in the workplace. Evidence also shows that the impact of PsyCap on employees' work attitudes is more pronounced than that of human and social capital (Larson and Luthans, 2006). Due to the lack of clinical experience, residents need to gain a lot of practical knowledge in their work, and self-efficacy can help them master the required knowledge and skills quickly. In addition, optimistic residents can regulate their emotional states, which also helps them to do their jobs with more positivity. In the current study, it was predicted that residents with higher levels of PsyCap will be more satisfied with their jobs (H1).

The Mediating Effect of Residents' Organizational Identification in the Relationship Between Psychological Capital and Job Satisfaction

Ashforth and Mael (1989) defined organizational identification (hereafter OID) as the extent to which an organization's members define themselves by their membership in the organization. Rooted in social identity theory, OID applies this theory to an organizational context. Social identity is a part of an individual's self-concept, which comes from the individual's perception of being a member of a social group, and sharing certain values with the group and its members. As part of a particular social group, employees also identify with their groups or organizations accordingly, which represents their acceptance

of the organization's value and promises their organizational commitment in the future (Barattucci et al., 2021). Lee et al. (2015) concluded in their meta-analysis that OID exists as the basis for general attitudes and behaviors in organizations. When employees identify themselves with the organization, they tend to have a higher level of commitment, loyalty, and more positive attitudes toward the organization. Several studies describe the role of OID in the job satisfaction of employees from varied vocations (Van Dick et al., 2004; Loi et al., 2014; Lee et al., 2015; Lu et al., 2015). Altogether, we hypothesized that residents' OID would positively predict their job satisfaction (H2).

Most studies that focus on these two concepts believe that they play a joint role in influencing employees' job satisfaction. However, studies exploring the relationship between PsyCap and OID are rare, and the interaction between these two concepts remains unclear. From the limited literature, we obtained two contradictory claims. On one hand, some researchers believe that OID influences PsyCap (Lu et al., 2015). The employee establishes a relationship with the organization through an employment contract in the early stages of the job. As the work continues, employees build their identity with the organization. When employees recognize that their relationship with the organization is positive, it will enhance their sense of self-efficacy, optimism, and other positive mindsets (Chen et al., 2017). Nevertheless, this sort of explanation lacks theoretical support.

On the other hand, more research has concluded the opposite relationship, that PsyCap induces OID. First, the Conservation of Resources (COR) Theory suggests that individuals with more resources tend to be less susceptible to the loss of resources, and to be more capable of gaining more resources (Hobfoll, 2001). As a positive psychological resource, people with higher level of PsyCap can get protection against the threat caused by the decline of OID and they are more likely to find more identity with the organizations, for recognition of OID is a kind of cognition resource for the employees. Consequently, an increase in PsyCap will contribute to the improvement of employees' OID (Yang and Chao, 2016).

Second, according to Fredrickson (2001) broaden-and-build theory of positive emotions, resilience can motivate employees to face the organization with a more positive mindset and put more effort into their work, thus making it easier for them to identify with the organization (Wu and Zhang, 2017).

Taking these two different views into account, this study argues that PsyCap affects OID, not the reverse. Our inference was mainly based on the explanations from the broaden-and-build theory and resource conservation theory mentioned above. Since both of the two factors have an impact on job satisfaction, we hypothesized in current research that OID would play a mediating role in the impact of residents' PsyCap on their job satisfaction (H3).

The Moderating Effect of Income Level

It has become common knowledge that residents around the world are treated poorly. The Medscape Residents Salary & Debt Report for 2021 indicated that more than 1/3 of residents are dissatisfied with their salaries because they do not reflect their actual working hours and are not comparable to the salaries of other medical staff (Martin, 2021). Current research has yet to conclude whether a low level of income affects residents' job satisfaction. In his dual-factor theory, Herzberg suggested that salary could not lead to better job satisfaction (Brenner et al., 1971). This assertion has been confirmed in some studies; for example, one study has indicated that income level is only weakly associated with workers' satisfaction (Clark and Oswald, 1996). On the other hand, researchers have found that income is one of the most influential factors on the satisfaction of medical doctors' jobs (Sharma and Bajpai, 2011; Vuong et al., 2021). The main reason for this controversy is that little research has taken into consideration the effect of OID and income level together. It is impossible for employees who only have a low level of OID to feel satisfied with their jobs, regardless of how much their salaries are. Income has something to do with job satisfaction only on the premise that the employee has identified with the organization. From this point of view, we hypothesize that income level might be a moderator in the relationship between OID and job satisfaction. The positive correlation between OID and job satisfaction increases as income level rises (H4).

The Present Study

This study focused on the relationship between residents' PsyCap and job satisfaction, as well as the mediator role played by OID. We also examine the moderating effect of income level on the relationship between OID and job satisfaction. We hypothesize that OID plays a mediating role between PsyCap and job satisfaction, whereas income level moderates the relationship between OID and job satisfaction. Based on the theories and literature reviewed above, we propose a theoretical model in **Figure 1** regarding the mechanism effect of residents' PsyCap on their job satisfaction. Specifically, it is assumed that residents who develop a higher PsyCap identify more with their organization, which in turn will increase their level of job satisfaction. Meanwhile, the influence of OID will be greater for residents with a higher income level than for those with less income.

MATERIALS AND METHODS

Participants

Participants were recruited during standardized training in a medical university of residents from public hospitals. Sampling took place twice, 1 year apart. The residents who attended the training did not attend it again, ensuring that there were no duplicates in the sample. Recruitment procedures were identical in order to ensure the standardization of the sampling process. A verbal explanation of the purpose and the anonymity of the project was given at the break time between training classes. Residents who were willing to participate in the research gave their informed consent and were given the questionnaires after the class. In two samplings, 340 residents participated altogether. We obtained 153 participants through the first sample, and 157 in the second. These two samples were combined into one sample because their demographics were not significantly different ($p > 0.05$). Thirty participants were excluded from the analyses due to the high repetition rates of their responses, which reflected

FIGURE 1 | Hypothesized model.

their lack of seriousness in answering the questionnaires. The remaining 310 participants consisted of 223 women (72.9%), 84 men (28.1%), and three participants (0.01%) who did not identify their gender.

Measurement

The materials consisted of a battery of tests covering organizational identification, psychological capital, job satisfaction, and demographic items. Each scale is described in detail below.

Psychological Capital

Psychological capital was measured using the Chinese version of the Psychological Capital Questionnaire (PCQ) translated by Chaoping Li (Luthans et al., 2008c). The validity of the Chinese version of the PCQ has been examined by several researchers. This questionnaire was also used by the originators of the psychological capital theory in a mainland Chinese sample (Luthans et al., 2005). The questionnaire contained four dimensions: self-efficacy, optimism, hope, and resilience, with six items in each subscale. A six-point Likert scale was adopted to identify residents' PsyCap, with higher total scores representing a higher level of PsyCap, and the average score for each item was calculated. Luthans et al. (2007) emphasized that PsyCap is a higher-order structure that should be viewed and studied as a whole. Therefore, this study considers psychological capital as a whole construct. In the current study, the consistency coefficient of the PsyCap questionnaire was 0.90.

Organizational Identification

We used a revised version of the Organizational Identification Scale developed by Mael and Ashforth (1988) and Mael and Tetrick (1992) to measure participants' identification with their hospitals. This scale is unidimensional and has high structural and internal consistency reliability. We replaced the phrase "name of school" with "my hospital." An example item is "When someone praises my hospital, it feels like a personal compliment." The questionnaire consisted of six items. Each item was rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The higher the total score, the stronger the individuals identified with their organization. This test showed an internal consistency of 0.81 (Cronbach's alpha).

Job satisfaction is measured by a single item that asked participants, "In general, how satisfied are you with the current job?" with a 5-point scale where 1 means not at all unsatisfied, and 5 means extremely satisfied. The single-item measure of job satisfaction has been confirmed to be comparable to the multiple-items measure of job satisfaction (Wanous et al., 1997; Dolbier et al., 2005).

Demographic Items

The demographic questionnaire included age, gender, education level, years worked, and income per month.

RESULTS

First, we performed confirmatory factor analysis using AMOS 23.0 to examine the discriminant validity of the core variables and to test the common method variance. Then, we used SPSS 23.0 to statistically analyze the means, standard deviations, correlations, and reliability of the measures for each variable. Finally, we used SPSS 23.0 to perform path analysis to test the theoretical model as a whole.

Confirmatory Factor Analysis

For the structural validity of the four variables of PsyCap, OID, job satisfaction, and income level, this study conducted a confirmatory factor analysis using Amos 23.0, and compared the model fit indices with other models. The results of the analysis are shown in **Table 1**. It indicates that the four-factor model fits best with the existing data, and each fitting index meets the criteria, which proves the uniqueness of the four variables.

Common Method Bias Test

First, the data of the present study were collected at two different times, which helped to decrease the possibility of common method bias (CMB). Second, two statistical methods were used to test CMB. Harman's single-factor test (Podsakoff et al., 2003) was performed, and the results showed that the KMO value was 0.88 ($p < 0.001$), indicating that the scales were suitable for factor analysis. There were seven factors with eigenvalues >1, and the first factor explained a variance of 29.98%, which did Not reach the critical criterion of 40%. Moreover, the result of single latent factor confirmatory factor analysis (**Table 1**) showed that the fitting indices of the one-factor structure model were poor ($\chi^2/df = 6.46$, CFI = 0.76, TLI = 0.69, RMSEA = 0.13), which indicates no serious CMB issues in this study.

TABLE 1 | Results of confirmatory factor analysis.

Models	χ^2	df	TLI	CFI	RMSEA	SRMR	Model comparison		
								$\Delta\chi^2$	Δdf
1. Baseline model	117.091	47	0.915	0.939	0.069	0.064			
2. Three-factor model 1	282.413	50	0.734	0.798	0.123	0.106	2 vs. 1	165.322***	3
3. Three-factor model 2	562.892	49	0.815	0.399	0.554	0.155	3 vs. 1	445.801***	2
4. Two-factor model	277.415	48	0.726	0.801	0.124	0.103	4 vs. 1	160.423***	1
5. Single-factor model	323.184	50	0.687	0.763	0.133	0.114	5 vs. 1	206.093***	3

Baseline (four-factor model): Psycap, OID, JS, Income; Three-factor model 1: Psycap + OID, JS, Income; Three-factor model 2: Psycap + JS, OID, Income; Two-factor model: Psycap + OID, JS + Income; Single-factor model: Psycap + OID + JS + Income.
*N = 310, $\Delta\chi^2$ is the change of χ^2 compared with the baseline model. PsyCap, Psychological Capital; OID, Organizational Identification; JS, Job Satisfaction. ***P < 0.001.*

Demographic Characteristics

The average age of participants was 27.03 years (*SD* = 2.63), and 84.19% had a bachelor's degree or higher education. The average years worked was 1.71 years (*SD* = 1.36). Furthermore, 3.4% of the residents earned a monthly income exceeding 10,000 RMB, while 77.4% earned less than 6,000 RMB each month.

Descriptive Statistics and Correlation Analysis

The means, SDs, Cronbach's alpha, composite reliability (CR), square roots of the average variance extracted (AVE), and correlation coefficients are presented in **Table 2**. The internal consistency coefficients ranging from 0.71 to 0.91 indicated acceptable reliability, CR exceeded the threshold of 0.7 and AVE exceeded 0.5, which promise a good convergent validity (Fornell and Larcker, 1981; Segars, 1997). Analysis revealed that PsyCap was positively related to job satisfaction (r = 0.41, $p < 0.01$) and OID (r = 0.30, $p < 0.01$). OID was positively related to job satisfaction (r = 0.34, $p < 0.01$), supporting Hypotheses 1 and 2. However, there was no significant correlation between income and the other three variables (r = -0.03 to 0.08, $p > 0.05$). These results provide preliminary evidence for the Hypotheses 3 and 4.

The Moderated Mediating Effects

We adopted the suggestion of Edwards and Lambert (2007) and did an analysis using the bootstrap method. Using the PROCESS Macros Model 4 and 14 developed by Hayes (2013), we examined the moderated mediating effect of OID on the relationship between PsyCap and job satisfaction, while controlling for the participants' gender, age, education level, and the years worked.

TABLE 2 | Descriptive statistics and correlations between study variables.

	M	*SD*	*Cronbach's α*	*CR*	*1*	*2*	*3*
Psycap	4.22	0.64	0.91	0.85	**0.77**		
OID	3.63	0.65	0.71	0.71	0.30**	**0.58**	
Income	1.89	1.03	–	–	0.02	−0.03	–
Job satisfaction	3.33	0.92	–	–	0.34**	0.41**	0.08

*N = 310, **p < 0.01. Square-roots of the AVEs appear in bold along the diagonal of the correlation of constructs.*

The results (see **Table 3**) showed that PsyCap had a significant positive effect on job satisfaction in the absence of mediating variables (β = 0.40, t = 7.61, $p < 0.001$), supporting Hypothesis 1. PsyCap also had a significant positive effect on OID (β = 0.29, t = 5.13, $p < 0.001$), supporting Hypothesis 2. After adding the mediating variable of OID, the positive effect of PsyCap on job satisfaction remained significant (β = 0.36, t = 6.26, $p < 0.001$), and the results of the mediation effect test using Bootstrap showed that, in terms of the direct effect, the 95% confidence interval for Psycap on job satisfaction ranged from 0.22 to 0.44. The mediating effect of OID was 0.07 (0.29 × 0.25), and the 95% confidence interval did not contain zero (from 0.03 to 0.12), which indicates that the mediation effect was satisfied, accounting for 17.5% of the total effect (0.07/0.40). The establishment of the mediation effect suggests that PsyCap not only directly affects residents' job satisfaction, but also indirectly affects their job satisfaction through OID. Thus, Hypothesis 3 was supported.

Moreover, the product of income level and OID had additional effect on job satisfaction (β = 0.10, $p < 0.05$) (**Table 3**). Simple slope test (**Figure 2**) showed that the increase in income level enhanced the positive effect of OID on job satisfaction. As seen in **Table 4**, there is a difference in the indirect effect of OID at the high and low levels of income (ΔB = 0.06). The mediating effect of PsyCap on job satisfaction through OID was significant at high income levels (M + SD) (β = 0.10, $p < 0.05$) with 95% CI of [0.04, 0.16], while the mediating effect of OID was not significant (β = 0.04, $p > 0.05$) at low-income levels (M-SD), with 95% CI including 0. Hypothesis 4 was supported.

DISCUSSION

In this study, we explored the relationship between PsyCap, OID, and job satisfaction, and probed the underlying mediation and moderation mechanisms. We established a moderated mediation model to test whether residents' PsyCap was indirectly associated with job satisfaction through OID and whether this indirect relationship was moderated by income level. The results indicated that the impact of PsyCap on residents' job satisfaction can be partially explained by their identification with the organization. Furthermore, this indirect relationship was moderated by the income level in the second stage of the mediation process, such that the effect of OID on job satisfaction was stronger in the

TABLE 3 | Hierarchical regression results.

Dependent variable	Model 1 (Job satisfaction)			Model 2 (OID)			Model 3 (Job satisfaction)			Model 4 (Job satisfaction)		
	β	t	Boot 95% CI	β	t	Boot 95% CI	β	t	Boot 95% CI	β	t	Boot 95% CI
Gender	−0.05	−1.00	[−0.37, 0.12]	0.02	0.33	[−0.21, 0.29]	−0.06	−1.06	[−0.36, 0.09]	−0.12	−1.05	[−0.36, 0.09]
Age	0.11	1.64	[−0.01, 0.08]	0.07	1.06	[−0.02, 0.08]	0.09	1.50	[−0.01, 0.08]	0.04	1.50	[−0.01, 0.08]
Edu level	0.02	0.42	[−0.10, 0.17]	−0.08	−1.36	[−0.24, 0.04]	0.05	0.06	[−0.07, 0.19]	0.00	0.06	[−0.14, 0.15]
Years worked	−0.05	−0.78	[−0.14, 0.08]	−0.10	−1.69	[−0.18, 0.01]	−0.02	−0.69	[−0.11, 0.07]	−0.03	−0.69	[−0.12, 0.06]
Psycap	0.40***	7.61	[0.28, 0.52]	0.29***	5.13	[0.18, 0.40]	0.36***	6.26	[0.22, 0.44]	0.33***	6.10	[0.22, 0.43]
OID							0.25***	4.66	[0.14, 0.36]	0.25***	4.70	[0.14, 0.35]
Income										0.10	1.84	[−0.01, 0.21]
OID*Income										0.10*	2.14	[0.01, 0.19]
R2	0.18			0.10			0.23			0.25		
F	12.60***			6.47***			15.02***			12.46***		

CI, confidence interval, it represents significance when the confidence intervals did not contain zero.
**p < 0.05; ***p < 0.001.*

context of a higher level of income. In other words, the positive relationship between OID and job satisfaction strengthens as income level increases.

The positive relationships between PsyCap and job satisfaction, and OID and job satisfaction have been proven in several studies (Larson and Luthans, 2006; Ke and Sun, 2014; Loi et al., 2014; Karanika-Murray et al., 2015). The duplicated result reminds us of the importance of an employee's psychological resources, and their identification with the organizations they are working for.

As mentioned in the literature review, OID has a significant influence on job satisfaction. However, little is known about how to improve the OID of employees (especially in newcomers). The results of the current study shed new light on this issue by introducing PsyCap as a positive psychological resource. We argue that PsyCap not only has a direct effect on job satisfaction, but it also influences job satisfaction through the mediating role of OID. It is well-established that an individual's attitude toward life and work is profoundly affected by PsyCap. Employees with less PsyCap are more likely to experience helplessness, anxiety, depression, and frustration, and thus have more negative experiences at work. It may also cause them to disagree with and distrust the organization, which leads to distress. On the other hand, people with higher levels of PsyCap are more positive. The broaden-and-build theory suggests that positive emotions have two main functions: broadening and building. The broadening function refers to the ability of positive emotions to expand the scope of attention, cognition, and action. Building function refers to the ability of positive emotions to build enduring resources for individuals (Fredrickson, 2001). Therefore, positive emotions resulting from high levels of PsyCap would help residents to be more open-minded and try harder to gain additional resources from the organization. Although it is inevitable for them to meet setbacks, their positive psychological resources would exert a protective effect against pressure and stress. They would have more objective or positive evaluations of their workplace and, therefore, would identify more with their organization.

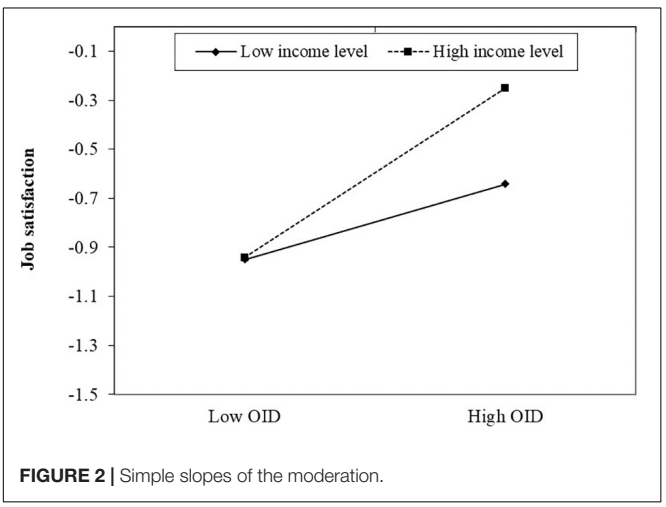

FIGURE 2 | Simple slopes of the moderation.

This study also found that income levels were significantly different for residents with different OID. Higher income significantly increased job satisfaction among employees with high OID, and for residents with lower income, the increase in job satisfaction associated with increased OID was not as dramatic as those with higher income. In other words, the effect of OID on job satisfaction is more pronounced for higher-income employees than for lower-income employees. This can be explained through the resource conservation theory. Resource conservation theory suggests that individuals tend to acquire, maintain, and protect the resources they value (Hobfoll, 2001). Wages are one of the valuable resources that organizations give to their employees. Those who get more of this resource tend to be more committed

TABLE 4 | Conditional indirect effect of income level when organizational identification (OID) mediated between PsyCap and job satisfaction.

Mediator	Income level	Effect	BootSE	95%CI
OID	−1 SD	0.04	0.03	[−0.00, 0.01]
	M	0.07	0.02	[0.03, 0.12]
	+1 SD	0.10	0.03	[0.04, 0.16]

to their organizations and, as a result, are more satisfied with their jobs. On the other hand, employees who earn less may be disappointed with their wages, making their level of identification with the organization have a minor impact on job satisfaction.

Theoretical Implications

Our findings extend the research on PsyCap and make at least three important contributions to the literature. First, our study expands the research on PsyCap by exploring the relationship between PsyCap and OID. We take PsyCap and OID into consideration simultaneously to explain their influence on job satisfaction, and our results support this hypothesis closely. This means that it is worthwhile to take into account both the concept of explanation and improvement of employees' job satisfaction.

Second, our research integrated the broaden-and-build theory of positive emotion and resource conservation theory to reveal how PsyCap affects job satisfaction through OID. Meanwhile, we further the research on positive organizational behavior to the resident population, and investigate how low-income levels affect the relationship between OID and job satisfaction in detail.

Third, few studies have examined the mechanisms underlying the effects of OID on job satisfaction among employees with less worked years. By integrating the OID and income level, we contribute to filling this gap by demonstrating the moderating role of income in such a relationship.

Practical Implications

The results of this study have important practical implications for the managers of residents, as well as policymakers who develop compensation policies. Residents' identification with the hospitals they are working for is an important prerequisite for improving their job satisfaction, and improving OID is an urgent issue to be addressed by managers who are concerned about the work attitudes of medical staff. First, providing PsyCap training to residents (especially new residents) can help them establish their OID and thus further improve their job satisfaction. The effectiveness of training in PsyCap has been demonstrated in past studies; for example, the daily online self-learning approach was shown to be effective in helping employees improve their PsyCap levels (Da et al., 2020). In addition to training, our research findings highlight the importance of improving how residents are treated.

For compensation developers, there is a need to consider residents' work stress and ensure that their income matches their workload. Particularly during the global outbreak of COVID-19, doubling workload with lower compensation than other medical staff may have a negative impact on the physical and mental health of residents. Therefore, there is an urgent need to improve resident compensation packages.

Limitations and Future Directions

First, due to the cross-sectional nature of this study, a causal relationship could not be identified. The second limitation is that this study only utilized self-report measures. Peer reports and objective evaluation indexes should be considered in future research. Third, the job satisfaction was measured using a single item, making it impossible to test the reliability and validity of this variable. Fourth, the generalizability of the construct and related scale of organizational identity in the Chinese cultural context is subject to our sample choice. Due to the training regulations of the residents, most of the sample in this study consisted of young adults who are in the process of career adjustment. They are still changing and developing their organizational identification, which may affect the results of the study. Despite its exploratory nature, this study offers some insight into the relation among PsyCap, OID, and job satisfaction. More longitudinal studies are needed to validate the relationship among them in the future.

CONCLUSION

This study highlights the importance of PsyCap with respect to residents' job satisfaction. OID has been proven to be a partial mediator of this relationship. Moreover, income level moderates the relationship between OID and job satisfaction. The influence of OID on job satisfaction was stronger for residents with a higher level of income. Interventions to improve residents' job satisfaction should be designed from the perspective of increasing their PsyCap. We advise hospital managers and policymakers to increase the income level of residents, so as to improve residents' organizational identification and job satisfaction.

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 Institutional Review Board of Capital Medical University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FZ: investigation, data curation, writing—original draft, and writing—review and editing. YL: conceptualization, formal analysis, methodology, project administration, writing—original draft, and writing—review and editing. TW: writing—review and editing. All authors contributed to the article and approved the submitted version.

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Wellbeing and Work Design in Brazilian Teleworkers

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Studies suggest that work characteristics may be related to workers' wellbeing. However, little is known about how these work characteristics may influence telework wellbeing in the face of the long period of social isolation and restrictions imposed by COVID-19. This study aimed to relate work characteristics in remote work to wellbeing using a two-stage multi-method approach. The general hypothesis is that different work characteristics will be organized into different groups and related to wellbeing. In Step 1, 108 teleworkers who participated in compulsory telework conditions answered the Work Design Questionnaire (WDQ) and Wellbeing at Work scale. A cluster analysis was conducted in which two clusters emerged based solely on their valence. The variables that contributed most to the cluster were: feedback from the job, social support, problem-solving, and decision and execution autonomy. Cluster 1 aggregated higher scores on work characteristics, and Cluster 2, lower scores. Cluster 1 presented significantly higher scores on wellbeing. In Step 2, 27 of these workers were blindly interviewed. Five classes of words emerged from the interviews: Class 1 – wellbeing, Class 2 – work dissatisfaction lexicon, Class 3 – role clarity, Class 4 – job demands, and Class 5 – job resources, including receiving feedback, conversations, praise, and support. Chi-square analysis suggests significant differences in classes 2, 3, 4, and 5. Cluster 1 appears more frequently in the role clarity class and less frequently in the work dissatisfaction and job demands classes. Cluster 2 is more frequent in the job dissatisfaction and job demands classes, however, less frequent in the job resources class. Class 1 shows no significant difference. These results partially support the general hypothesis that different work characteristics will be organized into different clusters and related to the teleworker's wellbeing, but in the sense that it prevents suffering but does not necessarily promote wellbeing. The results contribute to the understanding of the relationship between work characteristics and wellbeing during the pandemic by using a different methodological approach, describing that work feedback, social support, skill variety, and problem-solving are the most significant in differentiating the perception of the groups. Social support and feedback from the job differentiate cluster 1 from cluster 2, but social support is not able to increase wellbeing, unless buffering unwellness.

Keywords: work design, well-being, remote work, teleworker, work from home, work characteristics, multi-method, COVID-19

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INTRODUCTION

Although studies based on work design models suggest relations between work characteristics and worker wellbeing (Morgeson and Humphrey, 2006; Parker et al., 2017; Montañez-Juan et al., 2019), there is less evidence particularly in the pandemic and teleworker field. Work design models have historically organized work characteristics in dimensions due to the shift in core work activity, from manufacturing economies to service and knowledge economies, that have dramatically altered the nature of work in organizations. However, little is known about how much these work characteristics can influence wellbeing in remote work in the face of the long period of social isolation and restrictions imposed by COVID-19 (Hodder, 2020; Kniffin et al., 2021; Ipsen et al., 2021; Wang et al., 2021), with pieces of evidence of both positive (Ipsen et al., 2021; Williams et al., 2021) and negative (Ipsen et al., 2021; Wang et al., 2021) repercussions.

The Covid-19 pandemic imposes the need for compulsory remote working in many parts of the world, but it does not affect all countries equally (Kniffin et al., 2021; Pérez-Nebra et al., 2021). In Brazil, a country that suffers more due to its political conduction and social inequalities, the practice of remote work and working from home were not widely used (Helliwell et al., 2021). Workers who had this opportunity had little remote work experience and their organizations were not prepared to support them. Recent data indicate that in 2018, 3.8 million people (less than 2%) performed their work activities in their households, a number that increased to 8.7 million after the onset of the pandemic in 2020 (Góes et al., 2020; IBGE, 2020).

In this sense, this work aimed to describe how employes perceive the characteristics of remote work, how these characteristics are organized, and their relationship with wellbeing. We also investigated the relation of work characteristics to wellbeing in remote work using a multi-method approach. Moreover, this study employed the term remote work as an umbrella term, including any employe who works outside of the traditional office and uses information and communications technology to access work (Grant et al., 2013).

The literature on work design and remote work identified three different approaches on how remote work could be related to wellbeing (Wang et al., 2021). In the first approach, remote work is an independent variable that predicts remote worker outcomes, and its impact on wellbeing depends on work characteristics as a moderator (Golden and Veiga, 2005; Golden et al., 2006; Perry et al., 2018). In the second approach, work characteristics act as mediators of the effect of remote work on outcomes, by changing job demands, autonomy, and relational aspects of work, which influence employe outcomes, such as work satisfaction (Gajendran and Harrison, 2007). Finally, in the third approach, work characteristics would be shaped by the telework context and directly influence the worker's wellbeing. According to Wang et al. (2021), during the Covid-19 pandemic, remote work became the new context, and the third approach gained importance. Also, it is important to identify the best aspects of remote work associated with wellbeing, and we chose to adopt the last approach in this research.

The term work design is defined as the content and organization of the work tasks, activities, relationships, and responsibilities (Parker, 2014), and as the study, creation, and modification of the composition, content, structure, and environment in which jobs and roles are performed (Morgeson and Humphrey, 2008). While these definitions recognize the usefulness of work design for understanding how technology has affected several work contexts, they do not adapt the dimensions for the context of remote work where "unpredictability increases job complexity" (Kniffin et al., 2021, p. 71), increasing task cost and work intensification (Wang et al., 2021).

Wang et al. (2021) conducted an exploratory study of the direct relationship between work design and outcomes. Based on interviews, they described four core virtual work characteristics: social support, job autonomy, monitoring, and workload. However, it is a restricted approach to virtual work design. Morgeson and Humphrey (2006) offer a broad work design model that allowed descriptions of how much those work characteristics were present in the remote work.

Morgeson and Campion (2003) and Morgeson and Humphrey (2006) proposed a comprehensive set of work characteristics. The Work Design Questionnaire (WDQ) is an integrative set of 21 work characteristics, including the task, knowledge, social, and contextual domains. The task characteristics of the WDQ include autonomy (freedom to plan, decide, and implement work methods), task variety (need for multiple tasks), task significance (influence over other people's lives), task identity (recognizable completed products), and feedback from job (getting direct and clear information on the effectiveness of task performance). Knowledge characteristics include job complexity (use of many higher-level intellectual skills), information processing (need to attend to and process data), problem-solving (need for unique ideas and solutions), skill variety (need for a variety of different skills), and specialization (need for knowledge and skills in a particular area). Social characteristics include social support (guidance and assistance from others), interdependence (dependence on others to complete the work, and dependence of others on the worker), interaction outside the organization (demand for interaction and communication with individuals external to the organization), and feedback from others (provision of information on performance by others in the organization). Finally, contextual characteristics, that *assumes* face-to-face work, includes ergonomics (provision of appropriate posture and movement), physical demands (level of physical activity or effort required), work conditions (presence of health risks; noise, temperature, and cleanliness of the environment), and equipment use (variety and complexity of the technology and equipment used). In this study, the contextual dimension will not be applied for two reasons, it is not adapted for remote work, and remote work is the context considered here. In this sense, questions emerge: Does confinement impact the perception of work characteristics, and do they decrease significantly (below the midpoint)?

Thus, the first hypothesis is:

The Covid-19 confinement influences the rating indices of the WDQ to be below the midpoint of the scale (H1).

Work design is recognized as a key antecedent of most dependent variables, including wellbeing/strain and job performance (Parker et al., 2017). Studies also pointed out that when work characteristics are positively designed, they generate wellbeing and performance (Humphrey et al., 2007). However, studies that relate wellbeing and work design usually describe the relation with one specific dimension of wellbeing, namely job satisfaction.

The relationship between work design and wellbeing was explained by several models that in general consider two opposite types of work characteristics. Those which were negative, demands, and those which were positive, as a resource [i.e., Job Demand-Resource model (JD-R) from Bakker and Demerouti (2017)], or job decision latitude (Karasek, 1979). Job demands are defined as psychological, physical, social, or organizational aspects of the job that require human or organizational cost (Demerouti et al., 2001). Examples of job demands are: high work pressure and emotionally demanding interactions. Job resources refer to those functional characteristics in achieving work goals, reducing job demands, and stimulating personal growth, learning, and development (Bakker and Demerouti, 2007). Examples of job resources are autonomy, skill variety, performance feedback, and growth opportunities. Although it is possible to describe some typical examples of demands and resources, some work characteristics are not evident, for instance, job complexity or information processing, which for some people could be interpreted as a challenging and exciting job (challenge stressor), and for others could be interpreted as a high-cost activity (hindrance stressor) (Crawford et al., 2010).

Regarding wellbeing, two distinct philosophical streams guide studies on the field, the hedonic approach and the eudaimonic approach (Ryan and Deci, 2001). The latter consists of positive subjective states (Waterman et al., 2008) and for the hedonic approach, wellbeing is an experience of feeling good. This view has two main orientations, the emotional (e.g., emotions and affections) and the cognitive (e.g., satisfaction) (Peiró et al., 2021). For eudaimonism, wellbeing is an experience of fulfillment and purpose, self-realization, the search for meaning in life (Waterman, 1993; Ryff and Keys, 1995; Diener, 2000; Sonnentag, 2015). In this case, there are two other eudaimonic orientations, one for the present (e.g., engagement in work) and one for future orientation (e.g., meaning of work) (Peiró et al., 2021).

The wellbeing scope could be broad, but in the present case, remote work in the pandemic time, it is possible to advocate for two broad dimensions of wellbeing, one hedonic and the other eudaimonic. The most typical wellbeing measure is job satisfaction, and it was found related to work characteristics in the context of remote work (Wang et al., 2021). Although job satisfaction is a cognitive orientation, it is domain-specific, includes different facets, and is more stable than emotions. Job satisfaction is "the degree to which a person reports satisfaction with intrinsic and extrinsic features of the job" (Warr et al., 1979, p. 133). As an eudaimonic variable, the sense of connection and involvement with your work in the pandemic period is valorized, perhaps needed.

In the JD-R, Bakker and Demerouti (2017) suggested that the resources are instigated by a motivational process that includes work engagement and organizational commitment. Work engagement, a eudaimonic wellbeing concept, is "the mental state where employes feel full with physical energy (vigor), are enthusiastic about the content of their work and the things they do (dedication), and are so immersed in their work activities that time seems to fly (absorption)" (Bakker and Demerouti, 2017, p. 2). Organizational commitment, however, is not a wellbeing measure, but it is included in some models as such (e.g., Siqueira and Padovam, 2008; Siqueira et al., 2014), it shares similarities depending on how it has been conceptualized. For instance, in some definitions, it is similar to engagement, as "the relative strength of an individual's identification with and involvement in a particular organization" (Mowday et al., 1979, p. 226) or that high scores on the scale reflects affective attachment with colleagues and the organization (Allen and Meyer, 1990; Meyer and Allen, 1991). The combination of work engagement and organizational commitment could be favorable because both, according to Bakker and Demerouti (2017), could have a positive role in wellbeing.

Returning to the relationship between work design and wellbeing, work design is composed of work characteristics that are organized into four dimensions, three of which generally have empirical evidence of a relationship with wellbeing: task characteristics, knowledge characteristics, and social characteristics (Morgeson and Humphrey, 2006; Stegmann et al., 2010; Bigot et al., 2014; Montañez-Juan et al., 2019; Pérez-Nebra et al., 2020). The exceptions are some social work characteristics, such as interdependence (initiated or received) and interaction outside the organization, which are not related to wellbeing (Stegmann et al., 2010; Bigot et al., 2014). Most task characteristics, such as autonomy, other job resources (i.e., job control, feedback, and task variety), and opportunities for learning and development, are mainly linked to positive changes in wellbeing over time that translate more into an increase in work engagement and other positive indicators of wellbeing rather than a decrease in negative indicators (Sonnentag, 2015). Although we found evidence from the same dimension, i.e., social characteristics, both related and not related to wellbeing, this does not mean that the work characteristics will be grouped accordingly, and there is also evidence from the group of characteristics related to wellbeing (e.g., Montañez-Juan et al., 2019). In this sense, are the work characteristics, organized initially into different dimensions, going to be organized in the same way in a remote work context?

Thus, the second hypothesis of this work is: The data will be organized into three clusters based on the dimensions of the WDQ (task characteristics, social characteristics, and knowledge) based on the Work Design theory proposed by Morgeson and Campion (2003) and Morgeson and Humphrey (2006) (H2).

In remote work, the impact on wellbeing also depends on other work characteristics, including task interdependence (Golden and Veiga, 2005) and job autonomy (Perry et al., 2018). Studies also have examined how social and interpersonal factors predict changes in wellbeing over time, addressing social support, negative social interactions, and leadership processes as possible predictors (Wang et al., 2021). Bentley et al. (2016), in a study on organizational support in the wellbeing of teleworkers, argue that

organizational social support improves workers' wellbeing. When organizational support is present and effective, it is positive for wellbeing, however, when this support is non-existent or late, the worker feels pressured, unsupported, and negatively impacting wellbeing (Lapierre and Allen, 2006; Vander Elst et al., 2017; Wang et al., 2021).

Results from studies on remote work in pandemics support similar results in non-pandemic contexts. Thus, it is possible that virtual work characteristics may improve the effectiveness and wellbeing of remote workers (Wang et al., 2021). The results in the remote work context pointed out that social support and job autonomy, acting as job resources, help employes cope with the challenges of remote work, workload, and monitoring (Wang et al., 2021). Similar results were found in different contexts where social support and job autonomy were found to be positively related to job satisfaction or wellbeing (Morgeson and Humphrey, 2006; Stegmann et al., 2010; Bigot et al., 2014; Pérez-Nebra et al., 2020). However, other work characteristics were found to be negatively related to job satisfaction, such as job complexity (Morgeson and Humphrey, 2006; Stegmann et al., 2010) which could work as a demand and was not found in the pandemic context.

In the case of social support it is important to point out that although it is a work characteristic, it is also a coping strategy, and integrated into the job demand-control model to predict wellbeing (Johnson and Hall, 1988). In general, studies attest that social support reduces psychological distress during stressful times (Taylor, 2010). However, not all studies show beneficial effects of social support (Taylor, 2010) and particularly in Brazil, it was found that social support increases stress responses to remote workers (de Almeida Fonseca and Pérez-Nebra, 2012). Thus, in the pandemic context, where the structural support and the number of social relationships decreases, it is possible to think that social support could act as a resource or a demand. Therefore, social support can increase remote workers' work-home interference and, thereby, negatively or positively affect their wellbeing. Social support seems to be the most powerful remote work characteristic because it had positive indirect impacts on performance and wellbeing (Wang et al., 2021). Hence, the other research question is related to the intertwining between work characteristics and the wellbeing described by workers. Will different work characteristics emerge in different reports of wellbeing?

The third hypothesis of this work is: Clusters with high scores on the task and social dimensions will have more positive reports of wellbeing (H3).

This study highlighted a significant gap in understanding how work characteristics can be related to wellbeing in telework. Given the long period of social isolation and restriction imposed by COVID-19, in a country like Brazil, which is the sixth-largest country in terms of population, where nearly 55 million people earn less than €80 a month and thus live below the poverty line (IBGE, 2018; Pérez-Nebra et al., 2021), remote work takes on different configurations based on political and poverty issues (Helliwell et al., 2021). Thus, remote working is done by a privileged minority, those who earn higher-incomes, highly educated, and white-collar workers (Pérez-Nebra et al., 2021). Individual wellbeing cannot be separated from social wellbeing, the privileged wellbeing may occur at the expense of the wellbeing of others in this context (Pérez-Nebra et al., 2021). In other words, upward and downward social comparison occurs in the remote worker context (Diener et al., 1999). We contributed to the literature by testing clusters of work characteristics and describing which is more central to differentiate clusters. We also offered a multi-method methodological approach of work characteristics and wellbeing, where we could describe other facets of this relation.

MATERIALS AND METHODS

Study Design and Procedures

The Research Ethics Committee of the University of São Paulo approved this study under number 03080718.1.0000.5407. We used a two-step multi-method procedure. In Step 1, we used a quantitative approach to examine the Work Design and Wellbeing at work validated for Brazil with good psychometric qualities.

In Step 2, a qualitative approach was used to examine the relationship between work characteristics and wellbeing. Semi-structured interviews were applied to have deep and unique content related to wellbeing in the compulsory telework condition. We used an interview script based on the work design and psychological wellbeing model validated by judges. This meant that, in practice, each interview involved researchers and participants engaging in an informal, casual conversation exploring each participant's personal experience (Bhattacharya, 2017) concerning telework and wellbeing.

The focal questions included in the interview roadmap explored (1) task characteristics and wellbeing (e.g.,: How is autonomy related to your wellbeing?) (2) knowledge characteristics and wellbeing (e.g.,: How is the degree of complexity related to your wellbeing?) (3) social characteristics and wellbeing (e.g.,: How are labor relations related to your wellbeing?).

Participants were provided with information about the study, and provided written consent before the interviews were conducted. Individuals stated their age, sex, and type of telework on the consent form to report on the demographic details of the sample. All interviews were conducted online, were recorded, and completely transcripted.

Sample

Participants were recruited from Internet forum posts and advertising. The researchers accessed different teleworker forums, such as Instagram, Whatsapp groups, and Brazilian forums on telework. The research was presented, and a hyperlink to the questionnaire was provided. This strategy was adopted to reach a diversified public of teleworkers.

Data were collected online (questionnaire *via* hyperlink and interviews were *via* Google Forms). In Step 1, 108 Brazilian remote workers participated in the survey, 45 (41.7%) were independent professionals, 41 (38.0%) of whom were employed, 20 (18.5%) self-employed teleworkers, one (0.9%) entrepreneur,

and one (0.9%) fixed term contract, with a mean age of 36.63 years (SD = 8.75).

In Step 2, 27 teleworkers participated in the survey. Although we had initially made a cluster balanced interviews list, expecting negatives from respondents, 17 from Cluster 1 and 10 from Cluster 2 accepted to take the interview. They were a subsample of Step 1, including 9 women (33.33%) and 18 men (66.67%) with a mean age of 35.75 years (SD = 8.53), belonging to different areas of activity, including IT professionals, entrepreneurs, pharmaceutical industry managers, consultants, digital marketing specialists, lawyers, and others with different employment relationships (employed, self-employed, freelance, and legal person). Participants worked in private and third sector companies. Of these, 23 (85.19%) reported that they performed activities in home-office, the best-known variant practiced by professionals in remote work, and 4 (14.81%) performed the activity in hybrid mode (home office and company office). It is important to point out that all the 27 professionals in the sample were already engaged in the teleworking modality before the pandemic.

Measures

Work Design

We used Morgeson and Humphrey's (2006) model with three general dimensions of work characteristics: task, knowledge, and social. We used the scale adapted to the Brazilian population (Borges-Andrade et al., 2019) and selected the task, knowledge, and social dimensions. As pointed out, we decided not to measure work context because the scale was built for a context where people are working together in a shared place, and not adapted for the remote work context. Therefore, the response options consisted of a five-point scale from 1 (totally disagree) to 5 (totally agree).

To measure task characteristics, we had work planning autonomy (3 items, Crombach's $\alpha = 0.83$), decision and execution autonomy (6 items, $\alpha = 0.94$), task variety (4 items, $\alpha = 0.94$), task significance (4 items, $\alpha = 0.79$), task identity (4 items, $\alpha = 0.90$), and feedback from job (3 items, $\alpha = 0.92$). Knowledge characteristics included job complexity (3 items, $\alpha = 0.82$), information processing (4 items, $\alpha = 0.80$), problem-solving (6 items, $\alpha = 0.85$), and specialization (4 items, $\alpha = 0.76$). Finally, social characteristics included social support (6 items, $\alpha = 0.87$), interdependence (5 items, $\alpha = 0.87$), interaction outside the organization (4 items, $\alpha = 0.91$), and feedback from others (3 items, $\alpha = 0.92$).

Wellbeing at Work

We applied the Siqueira et al. (2014) version of wellbeing at work scale[1]. Although the scale is composed of three factors, job satisfaction (e.g., I am satisfied with the degree of interest that my tasks arouse in me), engagement (I am interested in the organization where I work), and commitment (I am proud of the company I work for), for parsimony we used it as one general factor of wellbeing (13 items, $\alpha = 0.95$). Participants were asked to rate each item on a 5-point scale, ranging from 1 (Totally disagree) to 5 (Totally agree), considering the agreement with each statement based on their current work.

Control Variables

We controlled sex (0 = male, 1 = female), age in years, the state of Brazil, where the person works, type of contract (autonomous or employed), seniority in the organization, seniority at work, number of years the person has worked from home, and size of the organization. We considered that these variables could be a significant contribution to the difference in work design.

Interview Script

A semi-structured interview script was developed based on the dimensions of the WDQ (Morgeson and Humphrey, 2006), relating the questions to wellbeing. At this stage, a content validation was performed with four expert judges in the field who received the digital document and provided feedback on the questions' semantic validation, quality, and study purpose. The judges asked to include a definition of wellbeing to facilitate understanding of issues and changes in the format of some questions to avoid laconic answers. We also conducted a pilot study with seven teleworkers to verify the remote workers' understanding and comprehension of the terminologies and the clarity of the questions. Changes were made to broader ones (e.g.,: we changed the term telework to remote work) and allowed the inclusion of independent professionals' reality (e.g.,: "do you receive support from customers, family, friends, people outside your work?"), since the questions were focused on employed workers (e.g.: "do you receive support from your manager and co-workers?").

Data Collection

Step 1: Questionnaire

In stage 1, a structured questionnaire was applied in two parts, the first on sociodemographic and labor data, and the second on the WDQ and Wellbeing at work. In this form, we asked those who wished to answer a second stage of the project to provide an email address for further contact. The dataset is disponible in Santos et al. (2021).

Step 2: Interviews

In Step 2, the interviews were conducted blindly by a single researcher, that is, a draw was made to choose the sample to be interviewed out of the 108 questionnaires applied. Not all candidates agreed to participate in this stage of the study and a total of 27 interviews were conducted. This stage consisted of a double-blind study to avoid inducing the researcher to the data collected. We call double-blind the fact that the interviewer, when given the list of which interviews to perform, did not know which cluster the interviewee belonged to.

The interviews were conducted online *via* Google Meet, and the interview script was previously sent *via* email to each participant before conducting the interviews, to facilitate their approach and preparation. All participants

[1]The authors would like to thank the reviewers for this inclusion.

in the survey were invited for an interview. We send a formal invitation *via* e-mail. Only 27 workers agreed in realize the interview and constituted the final sample. In Step 2, with the participants' consent, all interviews were audio-recorded. Each recording was transcribed with the help of Otranscribe and MXQDA, version 20.2.1 to streamline the process and verify the total reliability of the information collected.

Data Analysis

Preliminary Analysis

The study showed a minimal percentage among the missing values (up to 1% in demographic characteristics, 0% in the work design and wellbeing scale). We conducted reliability and descriptive and correlation analyses before performing the cluster analysis with the work design variables. The whole scale presents acceptable reliability. The correlations were below 0.30 on average. Next, we conducted the subsequent step of the analysis.

Cluster Analysis

The 108 workers were clustered based on their individual level of work design to identify relationship patterns, using a two-step procedure in the SPSS. The log-likelihood distance measured the distance between the 14 variables. Since the correlations between the work design variables were weak, we opted for the log-likelihood method. The log-likelihood distance measure used in the two-step cluster assumes that the variables are normally distributed and independent (Kent et al., 2014). The two-step procedure combines hierarchical and non-hierarchical methods, forming two clusters efficiently. Descriptive statistics and comparison means were conducted to get an accurate picture of the clusters.

Lexical Analysis

We transcribed all the interviews literally. After the transcription, we organized the corpus. We did it by standardizing the Portuguese language and connecting keywords. For example, wellbeing had to be rewritten as well_being. Other words have considerable differences in meanings and the same spelling, such as "*legal*," which means legal/law in English and great/fine/cool in Brazilian Portuguese.

The lexical analysis was conducted using the Iramuteq software and the Camargo and Justo (2018) Iramuteq protocol. We conducted 27 interviews, with 2,125 segments, 74,153 occurrences, and 46.75% of hapax. We also conducted Reinert Classification with Descendent Hierarchical Classification (DHC) and Correspondence Factor Analysis (CFA).

Lexical Analysis Comparison

To compare the classes of the lexical analysis with both clusters, we conducted a chi-square analysis. This analysis allowed us to identify the differences between groups. It is a similarity analysis carried out on an absence/presence of the group which crosses the selected units in a row and the active forms of the class in a column. Those differences were considered significant when the test is greater than 3.84, based on 1 degree of freedom and $p < 0.05$.

RESULTS

The descriptive results (**Table 1**) suggest that, in general, the sample presented a high quality of work design, as the averages were above the medium point of the scale. Furthermore, unlike what was posited in Hypothesis 1, all the work characteristics measured were above the scale's central point. In general, the relation between work characteristics are positive. However, it is not possible to affirm that the work characteristics that compose each dimension have a more intense relation between them, which possibly impacts the cluster analysis in the sense that the cluster may differ in how it will be composed. Negative relations are with job complexity and information processing, in this sense, these variables could be assumed as being demanding characteristics for this sample. Moreover, in general, wellbeing is positively related to all work characteristics, except for job complexity.

A two-cluster solution was identified in the two-step cluster analysis. Cluster 1 aggregates 65.74% ($N = 71$) of the sample and Cluster 2, 34.26% ($N = 37$) of the sample. Silhouette is considered fair (3) (Rousseeuw, 1987). This result refutes Hypothesis 2 of the study, which posits a 3-cluster solution from the dimensions proposed in the WDQ. **Table 2** shows the importance of the mean of the cluster predictor, and the test of differences of means. It can be observed that the cluster was organized based on valence and not on the work design dimensions. Regarding contribution, on the one hand, the work characteristics that most contribute to the clusters are Feedback from job, problem-solving, and social support. On the other hand, the variable that least contributes to the cluster is job complexity. In this sense, even being a demanding variable, it does not contribute to differentiate the clusters.

We compared control variables between the clusters and wellbeing (**Table 3**). As can be seen, no control variable showed a significant difference. Nevertheless, wellbeing was a significant difference, wherein Cluster 1, with better work conditions, shows better wellbeing when compared to Cluster 2. Cluster 2 presented slightly more women, but the difference is non-significant for this sample.

The DHC organized five classes of words. They emerged from the interviews of which two couples of variables are related, classes 1 and 4, and 2 and 3. Class 1 we named "Wellbeing" as the most frequent word is wellbeing. We named Class 4 "Job Demands" because the lexicons that emerged are related to job complexity and task variety. Those work characteristics are negatively or lowly related to wellbeing (cf. **Table 1**). Class 2, "Job Dissatisfaction," more evident from the speech extractions than the lexicons, aggregates complaints and problems related to work. Class 3, "Role Clarity," again, more evident from the extracts of speech than from the lexicons, aggregates knowledge about the task, how human resources give explicit norms of what is expected from them. Class 5, "Job Resources," differs from all others. It consists of lexicons on job resources, such as receiving feedback, conversations, praise, and support (**Figure 1**).

Table 4 represents some examples of representative speeches for each category. Iramuteq provides these verbal accounts. They contain a weighting, in descending order, of the most

TABLE 1 | Descriptive, correlations and Cronbach's alpha on the diagonal.

	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) Work planning autonomy	4.27 (0.86)	(0.83)														
(2) Decision and execution autonomy	4.09 (0.93)	0.75**	(0.79)													
(3) Task variety	4.31 (0.88)	0.05	0.28**	(0.94)												
(4) Task significance	4.42 (0.66)	0.35**	0.46**	0.13	(0.79)											
(5) Task identity	4.13 (0.85)	0.28**	0.21*	−0.02	0.33**	(0.90)										
(6) Feedback from job	3.80 (1.01)	0.28**	0.31**	0.11	0.43**	0.39**	(0.92)									
(7) Job complexity	3.52 (0.94)	−0.21*	−0.19*	0.17	−0.14	−0.22*	−0.18	(0.82)								
(8) Information processing	4.43 (0.63)	−0.11	0.10	0.49**	0.11	−0.09	0.20*	0.27**	(0.80)							
(9) Problem-solving	4.34 (0.63)	0.05	0.26**	0.46**	0.31**	0.01	0.18	0.19	0.53**	(0.85)						
(10) Specialization	4.08 (0.75)	0.06	0.18	0.21*	0.26**	0.28**	0.33**	0.14	0.29**	0.42**	(0.76)					
(11) Social support	4.02 (0.80)	0.20*	0.32**	0.46**	0.36**	0.10	0.30**	0.01	0.27**	0.36**	0.06	(0.87)				
(12) Interdependence	3.30 (1.05)	0.09	0.08	0.04	0.03	−0.04	0.04	−0.10	0.09	0.09	0.28**	0.14	(0.87)			
(13) Interaction outside the organization	3.71 (1.13)	0.17	0.22*	0.24*	0.12	−0.01	0.13	−0.07	0.23*	0.28**	0.12	0.29**	−0.03	(0.91)		
(14) Feedback from others	3.35 (1.14)	0.18	0.28**	0.18	0.32**	0.15	0.50**	−0.10	0.20*	0.27**	0.22*	0.45**	0.21*	0.05	(0.92)	
(15) Wellbeing	3.94 (1.03)	0.37**	0.42**	0.21	0.48**	0.38**	0.45**	−0.21	0.10	0.28**	0.10	0.50**	0.05	0.03	0.64**	(0.95)

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

TABLE 2 | Descriptive and differences between Cluster 1 ($N = 71$) and Cluster 2 ($N = 37$).

	Cluster 1 M (SD)	Cluster 2 M (SD)	Significance	*Z*
Work planning autonomy	4.53 (0.57)	3.79 (1.10)	0.54	21.05***
Decision and execution autonomy	4.45 (0.54)	3.42 (1.15)	0.90	39.73***
Task variety	4.56 (0.64)	3.86 (1.09)	0.46	17.53***
Task significance	4.64 (0.46)	4.01 (0.78)	0.68	28.16***
Task identity	4.21 (0.80)	4.00 (0.93)	0.07	1.52
Feedback from job	4.19 (0.76)	3.04 (0.98)	1.00	45.71***
Job complexity	3.55 (0.98)	3.46 (0.87)	0.02	0.24
Information processing	4.64 (0.45)	4.04 (0.72)	0.66	27.06***
Problem-solving	4.58 (0.42)	3.89 (0.70)	0.91	40.55***
Specialization	4.31 (0.67)	3.62 (0.71)	0.61	24.72***
Social support	4.52 (0.48)	3.62 (0.98)	0.91	40.64***
Interdependence	3.48 (1.04)	2.95 (1.00)	0.21	6.60**
Interaction outside the organization	3.91 (1.05)	3.34 (1.19)	0.21	6.50*
Feedback from others	3.75 (0.92)	2.58 (1.14)	0.77	32.93***

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

TABLE 3 | Test control variables between clusters.

Variable	Cluster 1	Cluster 2	*Z*
Sex (men = 1; women = 2)	1.39 (0.49)	1.54 (0.51)	2.11
Age	37.37 (8.65)	35.21 (8.87)	1.48
Seniority in the organization	5.31 (6.40)	5.59 (5.31)	0.05
Time in working from home	5.03 (4.71)	4.52 (5.78)	0.25
Seniority	14.63 (9.73)	13.43 (8.88)	0.39
Manager (1 = no; 2 = yes)	1.56 (0.50)	1.51 (0.51)	0.24
Wellbeing	4.16 (0.93)	3.48 (1.03)	8.70*

*$p < 0.01$.

representative utterances for each word class. The most typical reports are presented here for illustration. These reports, combined with the lexicals, helped us to name each lexical class.

The chi-square analysis suggests significant differences in classes 2, 3, 4, and 5 (**Figure 2**). Cluster 2 appears more frequently in classes 2 and 4, and Class 5 appears least in Cluster 2. Cluster 1 appears more frequently in Class 3. Class 1 showed no significant differences. Hypothesis 4 assumed that higher work characteristics scores were related to more positive verbalizations about work from home. Class 1 showed more words related to wellbeing and showed no difference refuting the hypothesis. However, the classes that present differences align with the hypothesis. Role clarity (Class 3), where speeches of Cluster 1 are more frequent, is related to greater work design. Also, Cluster 2, with lower work characteristics, is more frequent in Classes 2 and 4. Class 2 is related to feeling disrespected and job dissatisfaction. An example of speech is "I sent a message and the student told me at the last minute that he couldn't come." Class 4 is related to job demands; for example, "Sometimes it really gets in the way, but it happens. I think it is very much part of my job to have this great variability"; and Cluster 2 shows fewer speeches of Class 5 that aggregate lexicon of job resources. Overall, these results suggest that the low work characteristics are related to illbeing (e.g., work dissatisfaction), but the higher work characteristics are only related to a wellbeing dimension. The lack of resources and increased demands are also more frequent in the low work characteristic group (Cluster 2).

DISCUSSION

This study aimed to relate the work characteristics to wellbeing in remote working using a multi-method approach. H1 posited that confinement would impact the perception of work characteristics and these were notably lower, below the midpoint, so it was not

TABLE 4 | Speeches related to each class.

Classes	Examples of speech
(1) Wellbeing	"I think the feedback is very important and it is well related to wellbeing" "Autonomy is totally related to my wellbeing, 1,000 percent related, it's very important to me" "I really like having autonomy, having control over my activities, over my schedules and everything else, and as I like having autonomy, it's 100 percent related to my wellbeing, I'm very happy"
(2) Work dissatisfaction	"First, to change my schedule I need to consult the student. . .until the student answers me, it's an agony, especially if I have another class I'll have to change because then it becomes a domino effect " "And sometimes we have to make a decision that is not nice, for example, sometimes we have to disconnect someone from the company "
(3) Role clarity	"Of course the experience helps a lot because we already have a certain amount of time in the market, but the degree of complexity is great, our work varies, I do a little of everything, I know the whole process" "For me, this variety that we experience today in XXX is good because we know it from all fields within the area"
(4) Job demands	"I feel good, the degree of variety is high, as I said there are several varied tasks that happen on the same day, maybe different excitements, so it's a high degree of variety" "The degree of variety is something I like, new challenges every day and doing different things."
(5) Job resource	"I have constantly received feedback on tasks in formal ways, when it comes to my manager we have feedback routines that we conduct" "I get general support, both emotional and acknowledging how good my performance is"

confirmed. H2 suggested that the data would be organized into three clusters from the Work Design dimensions (task, social, and knowledge characteristics), and it was not confirmed either. Finally, as H2 was not supported, the clusters were organized by its valence and not by its dimension, H3 suggested that the clusters would be more frequently related to wellbeing and was partially supported since the most positive clusters were related in the wellbeing at work scale scores and verbally in interview analyses.

As for the fact that the work characteristics were presented above the midpoint of the scale, albeit unexpected, there are some explanatory possibilities. The first explanation for this result may be the evaluative bias of the respondents, who in this case had telecommuted before, which may have led to a positive evaluation due to previous experiences. Another explanation is based on the context of the Covid-19 pandemic in Brazil and the unemployment scenario, which may have led to positive evaluations related to the fear of being unemployed and/or insecurity. The effect of social comparison on wellbeing is described in natural settings, mainly the upward and downward comparison (e.g., in the current case, comparing oneself having a safe work to someone that not even work has) being typically associated with higher subjective wellbeing than upward comparisons (e.g., comparing oneself having an intensification and accelerated work to someone in a more easy-going situation) (Diener et al., 1999). Finally, another explanation already found in longitudinal attitudinal studies is that evaluations do not vary as much as we might believe, even in changing scenarios. They may change dynamically, but they also stabilize quickly (e.g., Staw, 1986).

The work characteristics organization by valence rather than by dimension of the work project was also not expected, but it is not especially a novelty. One explanation for such a result is that workers evaluate the work project in general. In this case, the evaluation occurs more or less negatively concerning all aspects of the work, rather than by evaluating each dimension separately. Finally, another question to ask is whether work characteristics have become less central in terms of importance in this pandemic context in Brazil, when comparing having a job or not, with the opportunity to be safe at home, and so there was an "overall" evaluation.

Regarding the organization of clusters, it is important to highlight that a characteristic of the work of each dimension of the work design contributed the most to the organization of the clusters, namely: work feedback, social support, skill variety, and problem-solving. Such data are in agreement with previous studies conducted during the Covid-19 pandemic that also pointed out the importance of autonomy and social support, which when functioning as job resources, help professionals deal with the challenges of remote work (Wang et al., 2021), but also outside the context (Morgeson and Humphrey, 2006; Stegmann et al., 2010; Bigot et al., 2014). Moreover, they are consistent with the results, as work feedback is possible when there is also clarity regarding work and roles, which is the description of Class 3. In this sense, these results support previous studies (Wang et al., 2021).

H3 suggested that different groups would have different lexicons. In this sense, this study supports this hypothesis. However, the clusters were organized into positive and negative features, and the positive cluster (Cluster 1) was more frequent in the class of role clarity and less frequent in the negative features, such as job dissatisfaction and job demands. It is worth noting that Cluster 1 was not more prevalent in the speech about wellbeing or resources, as one might expect. The negative cluster (Cluster 2), on the other hand, was more frequent in dissatisfaction at work and perception of demands, and less frequent in perceived resources, i.e., it seems to be more related to absence, such as an expectation that was not met. It is noteworthy that the fact that the lexicons "like" followed by "autonomy" and "meaning" emerged among the class of job demands and were related to the cluster with low levels of work characteristics. There are some possible explanations for this finding. The first is social desirability; some employes could describe that they "like complexity" because it could be interpreted as trendy. Moreover,

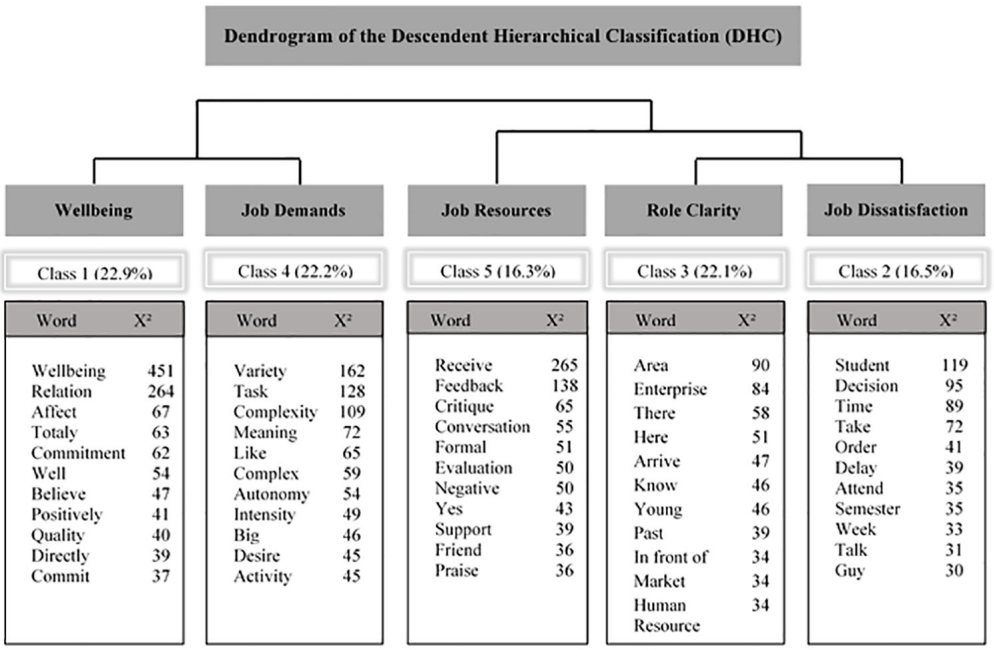

FIGURE 1 | Dendrogram of the Descendent Hierarchical Classification (DHC).

as this class is related to the Wellbeing class, the alternative explanation is that this class is a kind of Job Resource but as it was related to the low work design cluster, it could be interpreted that even though it qualifies as a challenging and positive resource, it drains. Another possible explanation is that this class could be interpreted as a personal resource (e.g., job crafting); however, if it is the case, this sort of resource is independent (in fact, opposite) to job resource (Class 5) in the qualitative analysis (the CFA suggest it[2]). Thus, these results suggest that the work characteristics of telecommuting in the context of the Covid-19 pandemic were able to "de-emphasize" the perception of unwellness. However, they were not able to increase wellbeing, i.e., they prevent unwellness, but do not promote wellbeing.

Still related to the combined results, it is important to note that the demand and resource model emerges. In this case, demand more clearly differentiates the groups than resource, where only its absence is evidenced and both related to the malaise. Considering that the demand and resource model is for burnout reduction (Demerouti et al., 2001; Bakker and Demerouti, 2007, 2017), it is consistent with the results found here. One of the contributions of this work was to understand the role of other variables in this remote context that are able to increase wellbeing (and not only avoid discomfort), such as role clarity and feedback from others.

Another point to be highlighted is that the perceived resource refers to emotional and informational or instrumental social support. Social support and feedback from others were the dimensions that most differentiated clusters 1 and 2. Moreover, the discourses referring to resources are fundamentally focused on feedback and supportive relationships. Thus, it is possible that emotional social support, such as it was found in other remote work contexts (de Almeida Fonseca and Pérez-Nebra, 2012), is functioning only as a way to disperse the unwellness and not actually able to increase wellbeing as one would expect, similarly to what occurred with the present sample.

Limitations and Future Directions

This work is not without limitations. First, regarding the topics inherent to the research methods used, the data were collected in Brazil, which may raise concerns about generalizability. The study also has limitations related to the method (two-step procedure) used, which is constrained to the sample analyzed. The entire sample was composed of remote workers who already worked remotely before the pandemic and from which they had adapted "on the fly"; thus, findings cannot be generalized to the country level or strictly for new-remote workers. However, it is important to point out that there was no significant difference in time in working from home variables between clusters. Also, the sample comprises workers of higher socioeconomic levels and higher education levels, variables that allow them to perform home office work. Remote work in Brazil and developing countries is new and less widespread, and further studies that follow the process longitudinally are needed. Thus, it will be interesting to compare remote working during the pandemic between developing and developed countries with cross-cultural samples to analyze these findings' generalizability and how cultural factors shape the impacts of virtual work characteristics on other remote worker outcomes.

[2]As this result is in Portuguese we did not present it, but it can be demanded to the authors.

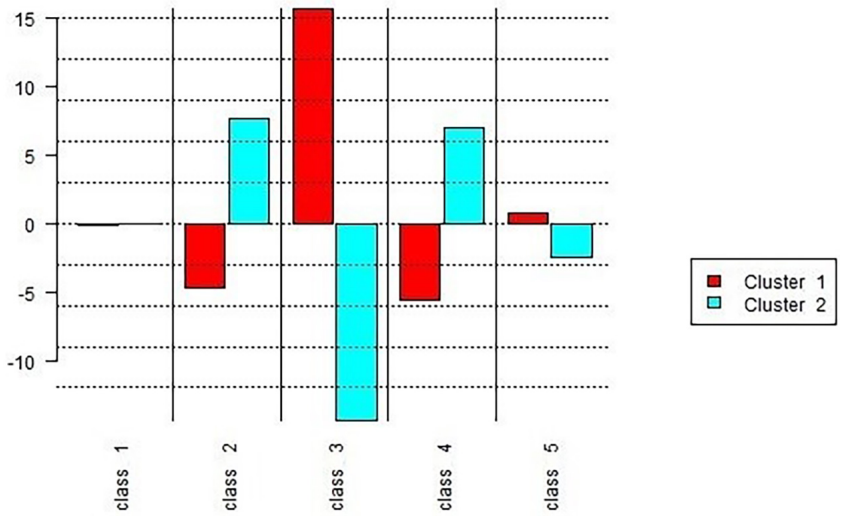

FIGURE 2 | Chi-square between clusters and classes of lexicons.

Another limitation was the absence of the contextual dimension. The context in which the telework is conducted is relevant and describing the kind of context that could improve their wellbeing is a relevant question that was not achieved in this work. It is important to develop instruments of contextual work characteristics related to remote work[3].

From a practical point of view, this work is believed to have implications for helping organizations and leaders to manage remote work effectively. First, the work design approach helps managers to consider how remote work can be designed to achieve wellbeing by focusing on setting clear goals, favoring clear tasks and identification with the task, and providing measures that allow for feedback on one's work so the worker can perform a self-assessment and these factors can lead to wellbeing in remote work.

In addition, feedback appears as an important remote work characteristic. In this sense, future studies could analyze whether feedback is a central factor in remote work, in general, or whether it assumes greater importance in the context of the pandemic. As for the emergence of social support as a differentiating factor in remote work, Wang et al. (2021) found similar results in a different Brazilian context, so managers and human resource practices should favor supportive practices in the context of the Covid-19 pandemic and the use of hybrid work models, aiming to build a climate of trust and organizational civility, and share clear information of what is expected, rather than monitoring and controlling work, for example, in addition to other ways of interaction between teams and managers to take place. As a research agenda, we suggest studying other professional categories working from home at a higher physical or emotional cost, in precarious conditions of family or work support, and differentiate challenges and hindrance job demands, and personal and job resources in the remote work context.

CONCLUSION

As initially pointed out, the present results suggest that work characteristics (work feedback, social support, skill variety, and problem-solving) affect the wellbeing of workers in telework. Social support and feedback from others were the dimensions that most differentiated clusters and role clarity is the most favorable point in increasing work characteristics. Through the use of a multi-method procedure it was possible to broaden the comprehension of the relationship between work characteristics and wellbeing in remote work by identifying in the qualitative analyses that emotional social support is not able to increase wellbeing, but to act as buffering unwellness.

The classic features of the work design proposed as a resource and demand in other studies did not contribute to the differentiation of the clusters. Finally, this work can be used as a basis for redesigning the characteristics of remote work by applying both preventive (e.g., using people management practices aimed at supporting employes) and therapeutic interventions (e.g., anticipating changes in public policies), and offers a new perspective in favor of a healthier work environment.

DATA AVAILABILITY STATEMENT

The datasets generated for this study can be found at Mendeley Data: doi: 10.17632/srwxkrr7vm.1.

[3]The authors would like to thank the reviewers for this important point.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committee of the University of São Paulo approved this study under number 03080718.1.0000.5407. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MS and AP-N: conceptualization. VM-S: data curation, funding acquisition, investigation, and resources. AP-N: formal analysis, validation, visualization, and writing – review and editing. VM-S, MS, and AP-N: methodology. MS: project administration and supervision. VM-S and MS: writing – original draft. All authors have read and agreed to the published version of the manuscript.

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Building Innovative Teams: Exploring the Positive Contribute of Emotions Expression and Affective Commitment

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The current challenging organizational context demands that organizations adapt quickly and continuously in order to survive and maintain their competitive advantage. Considering this need, one of the responses given by companies has been the valorization of work teams and their capacity for innovation, as well as fostering positive skills and emergent states in employees, such as emotional carrying capacity and affective commitment, respectively. The aim of this research is thus to study the relationship between emotional carrying capacity and group innovation, considering affective commitment as the mediating variable. To test these relationships, an empirical cross-sectional study was conducted including 138 Portuguese work teams belonging to different sectors of activity, composed of 625 members and their respective leaders. The results were analyzed through structural equation modeling (SEM) and showed positive relationships between emotional carrying capacity and affective commitment, as well as between affective commitment and group innovation. In addition, the mediating role of affective commitment in the relationship between emotional carrying capacity and group innovation was also supported. Therefore, the results suggest that a work context in which members openly express their emotions contributes to reinforcing their affective attachment to the group, making them feel more involved and available to test and implement new ideas and procedures. The findings reinforce the benefits of promoting the expression of emotions and the development of healthy bonds between team members.

Keywords: work teams, innovation, emotion, emotional carrying capacity, affective commitment

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INTRODUCTION

High customer demands and increased intensity of competition have led to greater complexity and rigor in organizational activities (Zheng et al., 2010). To survive in this dynamic environment, organizations must identify and manage obstacles and adapt quickly, and innovation is a key process (West and Anderson, 1996b; Popa et al., 2017). The aim of this study is to contribute to understanding how team innovation can be promoted. To accomplish this objective, the

relationship between the emotional carrying capacity (ECC) in teams and innovation will be analyzed, as well as the mediating role of affective commitment regarding the team on this relationship.

Innovation can be conceptualized as the intentional introduction and application, within a group or organization, of ideas, processes, products, or procedures that are new to that unit and which are intended to benefit the individual, the group, the organization, or society at large (West and Farr, 1990). More specifically, group innovation processes seem to be a powerful strategy for enhancing an organization's ability to adapt to change and react to competitors (Richardson and West, 2009).

In this sense, increased competitiveness and the need to take advantage of development opportunities require the coordination and application of the capabilities of all the members of the organization (Zheng et al., 2010), which led to the adoption of changed-oriented and team-based organizational designs (Rico et al., 2011). Indeed, teams have become the basic unit of operation in most companies (Zheng et al., 2010; Lourenço and Dimas, 2011; Rico et al., 2011), and teamwork is even pointed to as being the most effective way to deal with complex tasks and problems and with new challenges (Lourenço et al., 2014).

A work group/team[1] can be defined as a set of individuals who interact frequently, are interdependent in their tasks, share responsibility for results, and identify themselves and are identified as a social entity, embedded in a broader social system (Cohen and Bailey, 1997; Lourenço et al., 2014). Thus, as a complex, dynamic and non-enclosed social entity, the group develops from the relationships among its members and between them and their surroundings. Accordingly, the behavior of the group is the result of the relationships established among its members and between them and the organization as a whole (Lourenço and Dimas, 2011).

In line with the sociotechnical approach, groups can be considered as being constituted by two interdependent subsystems, the affective and the task subsystems (Fox, 1995), with the effectiveness of the group depending on its ability to balance both subsystems. By doing so, the group will be more consistent, and will have a greater ability to respond to the demands of the environment (Richardson and West, 2009). Nonetheless, team research has focused mainly the task dimensions of team dynamics and, although the body of research on the social and affective processes and states that may affect team functioning has developed significantly over the past three decades, there is still room for further exploration (Barsade and Knight, 2015; van Kleef, 2016). Regarding team innovation specifically, greater attention has been paid to the cognitive processes that influence it, while the knowledge regarding the impact of affective variables on innovation remains relatively underdeveloped (Hülsheger et al., 2009; Rico et al., 2011). With the present research, we intend to contribute to filling this gap in the literature by clarifying how expressing emotions and being affectively committed to the team influence team innovation.

[1]In the present paper, and following other authors (e.g., Mathieu et al., 2017), the terms group and team will used interchangeably.

Although emotions are an intra-psychic phenomenon (Frijda, 1988), they can be expressed and communicated through verbal and non-verbal behaviors (Kennedy-Moore and Watson, 2001). Emotional expression provides important informational resources as it informs about attitudes and intentions (Hareli and Rafaeli, 2008). This information will influence the behaviors, feelings, and thoughts of those who observe, affecting the quality of interactions (Reeve, 2015; van Kleef, 2016). In this context, the construct of ECC can shed some light on the study of the impact of emotional expression within teams on team effectiveness.

ECC was first mentioned in the work of Dutton and Heaphy (2003) in the context of the theory of high-quality connections, as one of the basic characteristics of high-quality relationships. At the team level, it refers to the degree to which team members express emotions, whether positive or negative, in a constructive way (Dutton and Heaphy, 2003; Stephens et al., 2013). It is not just about the amount of emotions expressed, but also relates to the diversity of those emotions (Dutton and Heaphy, 2003), and the ability of the relationship to withstand and evolve with that sharing (Stephens et al., 2013).

High-quality relationships have been shown to contribute to perceived psychological safety and learning behaviors (Härtel et al., 2009), leading to the emergence of more creative and innovative behaviors by team members (Schermuly et al., 2013). Conversely, low-quality relationships can become physically and emotionally stressful, harming individuals and teams (Williams and Dutton, 1999).

Emotional expression is a natural and adaptive process, capable of promoting closer relationships (Reeve, 2015). Thus a team environment characterized by high levels of ECC, in which team members feel that both positive and negative emotions can be expressed without leading to negative consequences, will create the conditions necessary to promote the implementation of innovative ideas (Carmeli, 2009). Indeed, previous studies reveal the positive influence of emotional expression on the emergence of creative ideas (Berg et al., 2017) on team learning and performance (Brueller and Carmeli, 2011) and also on the capacity for knowledge creation (Stephens and Carmeli, 2016). When emotions are shared in a genuine and constructive way, team members tend to be more receptive to divergent opinions and may be more available to jointly find new problem-solving strategies and to be innovative. The positive influence of emotional expression on team innovation may be explained via the broaden-and-build process (Rhee, 2007): expressing emotions stimulates team members to engage in favorable interactions and to share and discuss information, which are essential in finding new solutions and implementing new ideas and processes. Accordingly, we formulate the following hypothesis:

> Hypothesis 1 (H1): Emotional carrying capacity is positively related to group innovation.

The opportunity for self-expression and the perception of organizational support (Meyer and Allen, 1991) have been identified as antecedents of affective commitment (Klein et al., 2012), that is, the psychological bond that members feel

toward their team (Neininger et al., 2010; Klein et al., 2012). Affective commitment is one of the components of organizational commitment and has been identified as an important predictor of employees' attitudes and behaviors (Allen and Meyer, 1996). In the present study, we will focus on team affective commitment, which is reflected in a strong emotional connection, high involvement and identification with the team's goals and values, and a desire to continue belonging to the group (Allen and Meyer, 1990; Darvish and Rezaei, 2011).

Previous research revealed that the ability of the leader to express emotions, values and motives in a transparent and authentic way contributes positively to team commitment (Mazutis and Slawinski, 2008; Darvish and Rezaei, 2011; Paolucci et al., 2018), clearly highlighting the importance of emotional transparency for commitment. In the emotions as social information (EASI) model, van Kleef (2016) identifies affective reactions as one of the two mechanisms that explains the effects of emotional expression on behaviors (the other is inferential processes). As affective commitment is a positive affective emergent state, we may consider that a context in which members sincerely and openly express their emotions contributes to reinforcing their affective attachment to the group. Thus, the following research hypothesis is established:

> Hypothesis 2 (H2): Emotional carrying capacity is positively related to affective commitment.

Unlike ECC, commitment is a concept that has been widely explored in team research. However, the relationship between team affective commitment and innovation is not consensual. Indeed, previous empirical research has produced mixed results regarding this relationship (e.g., Zheng et al., 2010; Bastos et al., 2019).

On the one hand, affectively engaged employees tend to experience positive emotions and higher levels of intrinsic motivation (Battistelli et al., 2013), which in turn promote access to innovative ideas and solutions, stimulating individual creativity (Odoardi et al., 2019). Also in this sense, the fact that high affective commitment is associated with organizational citizenship behaviors and loyalty to the organization and team (Meyer and Allen, 1991), as mentioned above, will make it more likely that individuals who are highly committed to the team and the organization will be seen by their supervisors as trustworthy. As a result, their access to the resources needed to put creative ideas into practice may be facilitated (Odoardi et al., 2019). On the other hand, high levels of commitment may result in excessive trust and respect for traditional organizational policies, procedures, and practices, which may diminish the flexible thinking needed to explore and implement creative ideas and solutions (Odoardi et al., 2019; Dimas et al., 2021).

With the present research, we intend to contribute to clarifying the nature of the relationship between team affective commitment and team innovation. Specifically, grounded on social exchange theory, we expect that stronger affective connections of team members toward the group will generate the desire to reciprocate by exchanging ideas and experimenting with procedures and solutions (Cropanzano et al., 2017). Accordingly, we formulate the following hypothesis:

> Hypothesis 3 (H3): Affective commitment is positively related to group innovation.

Beyond the direct relationship that we predict between emotional expression and team innovation, we also predict an indirect relationship via team affective commitment. Indeed, building on the EASI model (van Kleef, 2016), and extending it from the interpersonal to the team level, we expect that the affective connection of team members toward the group will act as an affective mechanism through which emotional expression will positively influence team innovation. That is, we consider that a context in which members share their emotions in a genuine way promotes greater bonding among the group, generating, in turn, a greater propensity for the introduction of innovative ideas. Thus, we present the following empirical hypothesis:

> Hypothesis 4 (H4): Affective commitment plays a mediating role in the relationship between emotional carrying capacity and group innovation.

To summarize, this study aims to analyze the relationships between ECC, affective commitment and group innovation. More specifically, the main objective is to analyze the relationship between ECC and group innovation, considering the mediating role of affective commitment. Thus, the hypothetical model represented in **Figure 1** will be tested.

MATERIALS AND METHODS

Data Collection Procedures and Sample

The organizations were selected by convenience (Robson and McCartan, 2016), using the personal and professional contacts network of the research team. To collect the data, key stakeholders in each organization (CEOs or human resources managers) were contacted to explain the purpose and requirements of the study. When organizations agreed to participate, the selection of the teams for the survey was based on the following criteria (Cohen and Bailey, 1997; Lourenço et al., 2014): teams must be composed of at least three members, excluding the leader; should be perceived by themselves and other as a team; have to regularly interact interdependently to accomplish a common goal; and must have a formal supervisor who is responsible for the actions of the team. Likewise, receiving responses from at least half of the team members was an inclusion criterion, to ensure the representativeness of the team members' responses.

Data collection was then carried out through surveys filled in face-to-face or online. In each team, two sources of information were obtained: team members were surveyed about ECC and affective commitment, while team leaders were surveyed regarding team innovation. The use of surveys to collect information proved to be an appropriate method for the objectives of the investigation, since it allows a large

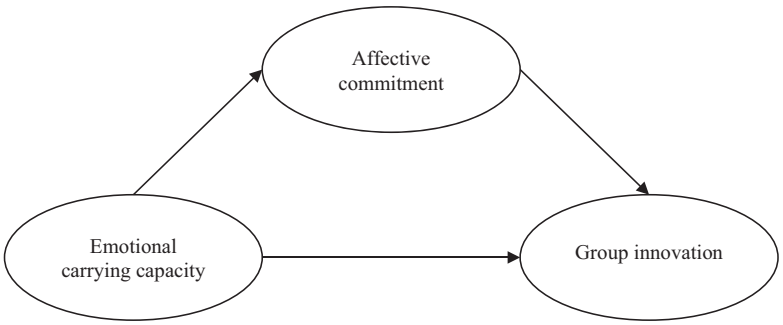

FIGURE 1 | Hypothesized model.

amount of data to be collected in a short period of time, with low costs (Robson and McCartan, 2016). The use of the online version also allowed coverage of geographically dispersed individuals. In both cases, the processes of data management, collection and processing followed the ethical assumptions of research in psychology, with the provision of informed consent, and ensuring the anonymity and confidentiality of data and participants (Academy of Human Resource Development Standing Committee on Ethics and Integrity, 1999; Ordem dos Psicólogos Portugueses, 2016).

Initially, the sample had 169 teams. However, 31 teams were excluded due to a response rate of team members below 50%, the lack of a response from the leader or for the presence of questionnaires where at least 10% of the responses were missing (Bennett, 2001; Bryman and Cramer, 2004). Thus, the sample on which the study was focused was reduced to 138 work teams, consisting of 625 members and their leaders, from 89 organizations.

The most represented organizations are considered large, with more than 250 employees (31.9%), followed by small organizations with no more than 10 employees (28.9%). Regarding the sector of activity, the majority (66.4%) are from the commerce and services sector. Likewise, the work teams also differ in their area of activity, with the most common being the services area (35.8%). As for the seniority of the teams, it ranges between less than 1 and 46 years approximately (M = 8.03; SD = 8.92). The size of the team varies between three and 22 members, with the average being approximately six (SD = 3.78).

The 625 members of the participating teams were between 17 and 67 years old (M = 36.27; SD = 11.46) and were mostly female (60.7%). Regarding academic qualifications, undergraduate degrees were the most represented (42.9%). Seniority in the organization ranged from less than 1 to 50 years (M = 9.78; SD = 10.04), and seniority in the team ranged from less than 1 to 43 years, approximately (M = 5.13; SD = 6.13). The majority (55.1%) reported having had training in teamwork.

The 138 leaders were between 18 and 67 years old (M = 36.27; SD = 11.46), mostly male (57.5%), and most reported having a college degree (57.0%). On average, they had been with the organization for 13.86 years (SD = 10.58), ranging from less than 1 to 47 years, and had led the team in question for an average of 5.63 years (SD = 6.42), ranging from less than 1 to 47 years.

Measures

All scales were used in their Portuguese versions.

Emotional Carrying Capacity

The scale used to assess ECC was based on Stephens et al. (2013) proposal for assessing this capacity in top management teams, which in turn had been adapted from Carmeli's (2009) High-Quality Relationships scale.

The team members were asked to rate the three items using a 5-point Likert-type scale, where 1 was "Strongly Disagree" and 5 was "Strongly Agree." A sample item is "Team members have no problem expressing their feelings toward each other."

In the adaptation to the Portuguese version, the psychometric qualities of the scale were assessed by Brito (2020), obtaining a Cronbach's alpha value of 0.80, whereas in the study by Stephens et al. (2013), this value was 0.71.

Affective Commitment

In order to measure this construct, a scale was used composed of four items from Allen and Meyer (1990) affective commitment scale, adapted by Han and Harms (2010). The team members were asked to rate each statement using a 5-point Likert-type scale, ranging from 1, "Strongly Disagree," to 5, "Strongly Agree." A sample item is "Team members have a strong sense of belonging to the team."

In the adaptation to the Portuguese version, the psychometric qualities of the scale were assessed by Bastos et al. (2019), obtaining a Cronbach's alpha value of 0.85, whereas in the second study by Han and Harms (2010), this value was 0.92.

Group Innovation

A three-item scale was used based on Batarseh et al. (2017). A sample item is "The team is highly innovative." Team leaders were asked to rate each item using a 7-point Likert-type scale, where 1 corresponded to "Strongly Disagree" and 7 to "Strongly Agree."

Similarly to the other instruments, the scale was translated into Portuguese and validated in a previous study (Bastos et al., 2019), obtaining a Cronbach's alpha value of 0.82, whereas in the study by Batarseh et al. (2017), this value was 0.89.

Control Variables

Previous studies show that team size has an influence on group processes and outcomes (Wheelan, 2009). However, the impact of the number of team members on innovation processes is not consensual. West and Altink (1996a) report that the larger the team, the less likely effective and successful innovation attempts are. Hülsheger et al. (2009), on the other hand, report a positive and significant relationship between team size and group innovation.

Similarly, team seniority has also been reported as potentially influencing group processes, particularly commitment (Ilgen et al., 2005). Wheelan (2009) mentions that commitment tends to increase when the group goes beyond the developmental stage characterized by internal conflicts.

Both variables were included as control variables, and the information regarding them was collected from the leaders.

Data Analysis and Previous Procedures

After the invalid teams were removed, the number of missing values in the members' sample was quite small (only three) and no missing values were identified in the leaders' sample. Little's MCAR test was used to evaluate the distribution pattern of the missing values. Since the test pointed to a random distribution of missing values ($p \geq 0.05$), these values were replaced by the mean of the respective item (Hair et al., 2019).

Then, to justify the aggregation of data concerning ECC and affective commitment, the values of the James index, or r_{wg} (James et al., 1984) and the intraclass correlation coefficients ICC (1) and ICC (2) were calculated for these scales. For the r_{wg}, the mean values obtained were 0.81 for ECC and 0.87 for affective commitment. Since both are above 0.70, the reference value, it can be considered that there is agreement among members (Lebreton et al., 2003). As for the intraclass correlation coefficients, the ICC (1) values found for ECC and affective commitment were 0.22 and 0.28, respectively, so they are congruent with what is suggested (e.g., above 0.10 according to Bliese, 1998). In turn, the ICC (2) values for the same variables were 0.56 and 0.64, respectively, also in line with what is suggested (e.g., above 0.50 according to Klein and Kozlowski, 2000). Thus, data aggregation was justified, and this procedure was performed by calculating the mean scores of the members of each group for each item.

Subsequently, an analysis of the correlations between the variables under study and the control variables was performed. To perform these procedures and to calculate the descriptive statistics used to describe the sample, the IBM SPSS Statistics software (version 25) was used.

Structural equation modeling (SEM) and AMOS software were then used to evaluate the hypothetical model under analysis (see **Figure 1**). Since the distributions of the variables were close to normality, the maximum likelihood (ML) estimation method was chosen. Following the recommendations of authors such as Kline (2016), the two-step modeling procedure was used. In the first stage, the use of confirmatory factor analysis (CFA) allowed the items' relationships with the latent variables to be assessed, thus testing the measurement model (Kline, 2016). In the second stage, SEM was performed with the aim of assessing the relationships between the variables under study and testing the research hypotheses.

In order to ensure that the assumptions of the SEM were met, the uni- and multivariate normality of the variables was assessed by the skewness (sk) and kurtosis (ku) coefficients. To evaluate the overall adjustment quality of the model, the χ^2-test of the adjustment was taken into account, as well as the following indexes: the chi-square/degrees of freedom (χ^2/gl), the result of which should be less than 2 to be considered a good adjustment (Kline, 2016); the root mean square error of approximation (RMSEA), the criterion of which is a value less than 0.05 to be considered a very good adjustment, and a non-significant p-value ($p > 0.05$) (Kline, 2016); and the Tucker-Lewis index (TLI), the comparative fit index (CFI), and the incremental fit index (IFI), which must present values greater than 0.90 to be considered a good adjustment (Kline, 2016). The quality of the local adjustment was assessed by the factorial loadings and the individual item reliability.

Finally, the bootstrapping method was used to test the statistical significance of the indirect effects contained in the structural model.

RESULTS

Psychometric Qualities of the Instruments

Preliminary analysis revealed that no variable showed asymmetry (sk $<$ 3) or kurtosis (ku $<$ 10) coefficients indicative of severe violations of the normal distribution (Kline, 2016). Given the values of the indicators listed above, the measurement model revealed a good fit to the data [$\chi^2(32) = 31.249$, $p = 0.504$; χ^2/gl = 0.98; IFI = 1.001; TLI = 1.001; CFI = 1.000; RMSEA = 0.000, IC 90% 0.000–0.061, $p = 0.878$].

Additionally, this three-factor model was compared with a two-factor model (where one factor comprised all the items answered by the members and the other factor the items answered by the leaders), as well as with a single-factor model (where all the items loaded on one latent factor) to provide evidence to overcome concerns of potential common method variance bias (Chang et al., 2010). The three-factor model shows a superior fit, with the difference between this model and the others being statistically significant: $\Delta\chi^2(34) = 127.058$, $p < 0.001$, and $\Delta\chi^2(35) = 328.141$, $p < 0.001$ concerning the two-factor and the single-factor models, respectively.

The measures used show high internal consistency, as shown in **Table 1**, through composite reliability values (Kline, 2016) and Cronbach's alpha (Nunnally, 1978) greater than 0.7 across all constructs.

Once the reliability of the scales was ensured, it was necessary to assess the construct validity, considering convergent, discriminant and factor validity. Convergent validity, assessed by the average variance extracted (AVE), proved to be adequate, presenting values greater than 0.5 in all factors (Fornell and Larcker, 1981; Hair et al., 2019; see **Table 1**). In turn, the discriminant validity of the factors was assessed

TABLE 1 | Standardized factorial loadings and individual reliability of items, composite reliabilities, Cronbach's alpha, and average variance extracted of measures.

Variables	Item	λ	λ^2	CR	α	AVE
Emotional carrying capacity	1	0.82	0.67	0.85	0.85	0.66
	2	0.79	0.62			
	3	0.83	0.68			
Affective commitment	1	0.80	0.63	0.92	0.92	0.75
	2	0.86	0.73			
	3	0.93	0.87			
	4	0.88	0.78			
Group innovation	1	0.86	0.74	0.89	0.89	0.72
	2	0.82	0.68			
	3	0.86	0.75			

λ, factorial weight; λ^2, standardized factorial weight; CR, composite reliability; α, Cronbach's alpha; AVE, average variance extracted.

by comparing the AVE with the squares of the correlation between factors, as proposed by Fornell and Larcker (1981). Since AVE_{ECC} = 0.66 and AVE_{AC} = 0.75 are higher than $r^2_{ECC.AC}$ = 0.43, it can be stated that the two factors have discriminant validity. Similarly, the discriminant validity of the factors "Affective Commitment and Innovation" and "Emotional Carrying Capacity and Innovation" was demonstrated, with the squared correlations, $r^2_{AC.INOV}$ = 0.12 and $r^2_{ECC.INOV}$ = 0.08, respectively, being considerably lower than the AVE values of each of the factors. Finally, standardized factor loadings greater than 0.5, and individual item reliability greater than 0.25, are indicators of factor validity (Hair et al., 2019).

Hypothesis Testing

Table 2 presents descriptive statistics and correlations between the variables under study. Since team seniority is significantly related to affective commitment, and team size to affective commitment and innovation, it was justified to include them as control variables in the structural model. Therefore, it was necessary to assess the adjustment of the structural model, and this also revealed a good fit [$\chi^2(47)$ = 51.840, p = 0.291; χ^2/gl = 1.103; IFI = 0.995; TLI = 0.993; CFI = 0.995; RMSEA = 0.027, IC 90% 0.000–0.064, p = 0.812].

Observing the direct relationships of the structural model (cf. **Table 3**), a statistically significant relationship is found between ECC and affective commitment, which supports Hypothesis 2, as well as a significant relationship between affective commitment and group innovation, supporting Hypothesis 3. On the other hand, the relationship between ECC and group innovation was found not to be statistically significant, thus not supporting Hypothesis 1. Results are summarized in **Figure 2**.

To assess the mediating effect, a resampling bootstrapping procedure and 2,000 samples were used with a 95% confidence interval for two-sided tests. Thus, the estimate of the indirect effect of ECC on group innovation through commitment is framed by a 95% confidence interval, with bounds [0.002; 0.397], presenting a significance value lower than 0.05, supporting Hypothesis 4.

DISCUSSION

The results supported the positive relationship between ECC and affective commitment, supporting Hypothesis 2 (H2).

The results are in line with those of Meyer and Allen's (1991) research, which suggest that the opportunity for personal expression and the perception of organizational support, which are characteristics of teams with high ECC, are related to affective commitment. Accordingly, Darvish and Rezaei's (2011) results also showed a positive relationship between leaders' ability to be authentic in their communication (i.e., leader transparency) and team affective commitment. This indicates that transparency in the expression of emotions by team members may also be a promoter of commitment. In fact, considering that the leader's relational transparency implies the ability to communicate with team members in a genuine way, particularly their emotions, it is possible to establish a parallel between the leader's ability and the concept of expression of emotions, presented above (Darvish and Rezaei, 2011). Indeed, if team members feel more comfortable and safer in sharing their emotions, there will be a greater tendency to build a strong emotional bond, and a high involvement and identification with the team's goals and values (Allen and Meyer, 1990; Darvish and Rezaei, 2011).

Regarding the relationship between ECC and group innovation (H1), contrary to our expectations, the results did not support this relationship. Additionally, it should be noted that, although a direct relationship between these variables was not identified, an indirect relationship through affective commitment was found, providing empirical support for Hypothesis 4 (H4). That is, ECC promotes team innovation because it generates commitment, which in turn increases innovation. The results are in line with those of Stephens et al. (2013), which suggest that sharing positive emotions seems to contribute to a greater adaptive capacity of the team.

The results reinforce the notion that constructs with a positive affective component tend to promote positive group attitudes and processes (e.g., Fredrickson and Joiner, 2002; Ashkanasy and Dorris, 2017; Blázquez-Puerta and Bermúdez-González, 2019). Indeed ECC is characterized by its affective component (Stephens et al., 2013), and seems to be related to other positive constructs, such as psychological security in relationships (Berg et al., 2017), team learning and performance (Brueller and Carmeli, 2011), and, as our results showed, also to affective commitment.

Finally, the results show that affective commitment has a significant positive effect on group innovation, which supports the third hypothesis of the study (H3). Although the relationship between these variables has already been studied, the positive and significant relationship found is in line with the results of previous studies (Jafri, 2010; Zheng et al., 2010), suggesting that team members, when are affectively committed, strive to propose innovative suggestions to contribute to group results (Jafri, 2010). This relationship may be the result of several factors. For instance, the tendency for affectively engaged employees to experience higher levels of motivation (Battistelli et al., 2013), more organizational citizenship behaviors and loyalty to the team (Meyer and Allen, 1991) promotes their desire to contribute

TABLE 2 | Descriptive statistics and correlation matrix.

Variables	M	SD	1	2	3	4	5	6
Emotional carrying capacity	3.60	0.52	–					
Affective commitment	3.84	0.53	0.60**	–				
Group innovation	5.10	1.00	0.26**	0.34**	–			
Team seniority	8.03	8.92	−0.25**	−0.18*	0.02	–		
Team size	6.21	3.78	−0.18*	−0.17*	−0.23**	0.19*	–	

*N = 138. *correlation is significant at the p < 0.05 level (2-tailed); ** correlation is significant at the p < 0.01 level (2-tailed).*

TABLE 3 | Summary of the structural model paths.

Paths	Hypotheses	Standardized estimates	*t*-value
ECC → Group innovation	H1	0.06	0.49
ECC → Affective commitment	H2	0.65	6.47***
Affective commitment → Group innovation	H3	0.28	2.17*
Team seniority → Affective commitment		−0.01	−0.10
Team size → Affective commitment		−0.04	−0.60
Team size → Group innovation		−0.19	−2.18*

*N = 138; *significant at the p < 0.05 level (2-tailed); ***significant at the p < 0.001 level (2-tailed); ECC, Emotional carrying capacity.*

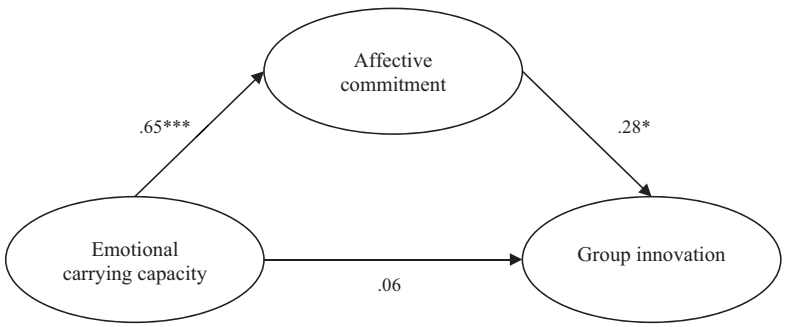

FIGURE 2 | The SEM analysis conducted to examine pathways among emotional carrying capacity, affective commitment, and group innovation. *$p < 0.05$ (2-tailed); ***$p < 0.001$ (2-tailed).

to the team by presenting suggestions and implementing them (Odoardi et al., 2019).

Theoretical Contributions and Practical Implications

This study contributes to the literature in different ways. To the best of our knowledge this is the first study that considers the direct and indirect influence of team members' capacity to express emotions on team innovation. By highlighting the influence that team members' ECC has on their ability to innovate and, specifically, by presenting affective commitment as a mechanism involved in this relationship, our study contributes to team innovation literature, supporting the fundamental role that affective dimensions have on this important team outcome. Likewise, our study contributes to the growing, but still underdeveloped, literature on emotional expression in groups (van Kleef, 2016) by providing support for the importance that the capacity of expressing both positive and negative emotions appropriately has on team states (i.e., affective commitment) and outcomes (i.e., team innovation).

Second, our study reveals that when team members are able to express themselves fully, they feel more connected to the team.

Finally, our study contributes to clarifying those mechanisms through which ECC is promoted have an impact on team members' ability to innovate, presenting affective commitment as a key mediator variable in this relationship.

From a practical point of view, focusing on the antecedents of an outcome (i.e., team innovation) that is crucial in the complex and dynamic environment in which modern organizations are embedded, our study provides guidelines about how to promote innovation in work teams. Specifically, the results highlight the importance of creating a space where members are able to fully express their emotions themselves, which leads to committing to and identifying with the team's goals and values, enabling them to speak up, suggest new ideas and take risks (Stephens et al., 2013). This healthy bond that links team members to the group will increase their desire to exert efforts on behalf of the group, which will eventually lead to innovation.

Given this relationship, it is important for leaders to promote healthy bonds between team members, characterized by friendly and welcoming interpersonal styles, mutual respect, and awareness of the needs and concerns of others (Richardson and West, 2009). That can be done by investing in inter-personal relationships and by adopting an opening and welcoming conduct when receiving suggestions, new ideas, different opinions or when addressing polemic issues. Managers can stimulate the sharing of experiences in order to regulate the team's emotional state during initial interactions (Yang and Kelly, 2016).

The development of such relationships will contribute not only to an increase in affective commitment and innovation, but also to more helping behaviors and higher levels of job satisfaction (Ashkanasy and Humphrey, 2011), which positively contribute to the well-being of employees (Ashkanasy and Dorris, 2017).

Limitations and Future Directions

Although this study contributes to a better understanding of the constructs analyzed, it presents some limitations. First, the convenience sampling used, the fact that the sample consists only of Portuguese organizations, and that more than 66% of them operate in the trade and services sector implies caution in generalizing the results (Robson and McCartan, 2016).

Second, the cross-sectional design is an obstacle to the empirical inference of causality, so it would be appropriate to conduct a longitudinal study. Third, regarding the measurement instruments, the use of self-report measures constitutes a limitation, since the information collected is related to the evaluation that individuals make of their own group and may reflect the effect of social desirability (Robson and McCartan, 2016). However, the fact that the responses were evaluated at the group level mitigates this limitation, since several people assessed the same phenomenon (Podsakoff et al., 2012). Additionally, the exclusive use of self-report measures may have contributed to the occurrence of the common method bias, namely considering ECC and affective commitment, which were obtained from the same source (i.e., team members). However, it is important to highlight that different proactive procedures were implemented in order to minimize threats of common method bias: respondents' anonymity was ensured, which reduces evaluation apprehension; variables were evaluated through previously validated scales that were constituted by concise, simple, and specific items (i.e., items are not ambiguous and show lack of overlap for the different constructs); although obtained in the same survey, the scales were separated and specific instructions were provided for each scale (Conway and Lance, 2010; Podsakoff et al., 2012). Moreover, it is important to highlight that one of the most important procedures to control for common-method bias, which is collecting data from multiple sources, was implemented in this study (Chang et al., 2010).

Finally, the sample size may also constitute a limitation, given the statistical analysis that was performed. Although the sample does have an average size to perform SEM, between 100 and 200 cases, the model is not parsimonious, presenting a ratio of 4.45, that is, very close to the cut-off of 5:1 (Mulaik et al., 1989; Kline, 2016). Thus, the suggestion is to replicate this study with a larger sample in order to get a more acceptable value of the ratio between the number of cases and the number of estimated parameters.

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 the Faculty of Psychology and Education Sciences of the University of Coimbra. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RD: data collection, data analysis, and writing the manuscript. ID: design of the study, data collection, writing the manuscript, data analysis, review, and editing. PL and TR: design of the study, data collection, review, and editing. MA: design of the study, review and editing. All authors contributed to the article and approved the submitted version.

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Working With Type 1 Diabetes: Investigating the Associations Between Diabetes-Related Distress, Burnout, and Job Satisfaction

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The present study investigates the association between diabetes-related distress (DD) and work outcomes (burnout and job satisfaction) among employed people with type 1 diabetes. Employed adults with type 1 diabetes (N = 297) completed an online survey. Measures assessed emotional, social, food- and treatment-related DD, burnout, and job satisfaction, as well as the type of insulin treatment. We conducted multiple regression analyses to test our hypotheses. Emotional DD was significantly and positively associated with burnout. Social DD was significantly and negatively associated with job satisfaction. The type of treatment (insulin pen versus insulin pump) had no significant effect on the outcomes. This study sets the stage for research on the interactions between working conditions, work outcomes and illness symptoms, and problems of people with type 1 diabetes, and, generally, employees with chronic illnesses. The findings have implications for individual health and illness management, burnout prevention, and occupational health measures.

Keywords: diabetes mellitus, burnout, job satisfaction, distress, chronic illness

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INTRODUCTION

Diabetes can negatively affect work-life, decreasing the probability of employment and increasing the likelihood of work limitations (Tunceli et al., 2005). Although guidelines summarizing the safety risks of employees with diabetes exist (American Diabetes Association [ADA], 2014), these are limited to the physical risks of diabetes during work (e.g., due to hypoglycemia). Many people with chronic illness continue working after being diagnosed; however, they often experience limitations in their work-life (Vooijs et al., 2015). Life with a chronic health condition is not only characterized by physical symptoms and impairments but requires specific illness or health management (Rak, 2014). Illness or health management refers to all activities to maintain or improve one's health and prevent adverse health consequences, such as following a medical treatment plan and attending appointments with medical professionals (McGonagle et al., 2020).

For employed people with type 1 diabetes, health management comprises controlling blood sugar levels and the intake of insulin (Rak, 2014). However, the requirements and demands caused by health and illness management can present a challenge to employed people with diabetes, as they need to balance both the demands of their job as well as those of the illness when allocating their

time and energy resources (McGonagle et al., 2020), which poses a risk of negative work-related outcomes, in particular burnout (Demerouti et al., 2001).

Burnout is associated with negative occupational consequences, such as lower retention rates (Rabatin et al., 2016), lower job performance (Taris, 2006), and withdrawal (Taris et al., 2001), and psychological consequences, such as lower life satisfaction and depressive symptoms (Hakanen and Schaufeli, 2012). Furthermore, burnout can have physical consequences, particularly affecting the metabolic and cardiovascular systems (Kitaoka-Higashiguchi et al., 2009), leading to substantial health risks for people with type 1 diabetes.

Due to the early onset age and the necessity of insulin treatment (Maahs et al., 2010), most employees with type 1 diabetes may face the challenge of integrating both work and illness management for most of their time as active members of the workforce. Thus, insights into the association between diabetes type 1 and burnout are crucial for developing appropriate working conditions for chronically ill people because certain working conditions (e.g., lack of autonomy in assembly-line work or customer service) make the illness management of employees with type 1 diabetes more difficult. Moreover, various preventative countermeasures in health education can be derived for different stakeholders, e.g., implementing educational training for leaders and HR managers and specific stress prevention training for employees with diabetes. However, even though the interest in mental health at work is steadily rising, to this point, there is only little insight into the association between chronic illness and work outcomes such as burnout and job satisfaction. This is problematic as people with chronic illnesses such as diabetes are often more likely to retire earlier, leading to an economic and societal burden (Vijan et al., 2004), and both burnout and job satisfaction are important predictors of workplace retention (Rumrill et al., 2004; Swider and Zimmerman, 2010). Furthermore, existing studies on work and diabetes have focused mostly on diabetes mellitus as a potential health outcome of work stress (Cosgrove et al., 2012) or shift work (Gan et al., 2015).

The present paper investigates the association of diabetes-related distress (DD) on burnout and job satisfaction at work compared to other work-related demands (e.g., quantitative job demands and lack of autonomy). Applying resource-based models of occupational health and burnout, namely the Job Demands-Resources Model (JDR, Bakker et al., 2014) and the Conservation of Resources Model (COR, Hobfoll and Freedy, 1997), we investigate the association between perceived illness-related distress and work-related mental health outcomes. In line with recent additions to the Job-Demands Resources model (Demerouti et al., 2001) that emphasize the role of personal resources (Schaufeli and Taris, 2014), we add to the literature by investigating the employees' existing health, respectively illness status as a personal resource (McGonagle et al., 2015). We tested our assumptions utilizing a cross-sectional online study amongst employed people with type 1 diabetes. Our findings offer a potential starting point to better understand employees with type 1 diabetes at work. Moreover, they could give a push to engage and research regarding counseling, medical treatment, the improvement of existing workplace health management programs, the development of new workplace health management programs aimed at providing support for chronically ill employees, and human resource development measures for supervisors and managers of a health-diverse workforce. Furthermore, our study responds to the call for more theory-driven research regarding the work-life and careers of people with chronic diseases (Lehmann et al., 2021).

DIABETES-RELATED DISTRESS

An important factor to consider when studying the effects of a chronic illness is that people can strongly differ regarding their individual and subjective problems with the respective disease and may experience different effects of these problems. The most prominent variable to capture the inter-individual variance regarding these experiences is assessing the level of individually perceived DD. DD comprises the "unique and hidden emotional burden or frustration that comes with living with diabetes and considers ongoing concerns, worries, and fears of diabetes management as well as diabetes complications" (Abdoli et al., 2019, p. 2). Although DD is often utilized and conceptualized as a construct with a single general factor, factor analyses suggest it can be differentiated into four subordinate dimensions: Emotional problems, food-related problems, treatment problems, and social problems (lack of support) (Polonsky et al., 2005). The general measures of DD and the emotional and treatment-related subdimensions of DD are positively associated with glycosylated hemoglobin (HbA_{1c}) levels and blood glucose self-monitoring. The HbA_{1c} level "reflects average plasma glucose over the previous eight to 12 weeks" (World Health Organization [WHO], 2011, p. 6) and is commonly used as a diagnostic measure for diabetes. However, it is important to note to this point there is no theoretical framework that supports the inclusion and definition of the subdimensions. Furthermore, there is conflicting evidence regarding the factor structure of DD assessments, as some studies (e.g., Graue et al., 2012) have failed to replicate the four-factor solution or found a one-factor general DD solution to have a better fit (Graue et al., 2012; Schmitt et al., 2016).

People with type 1 diabetes report higher general DD compared to people with type 2 diabetes, and the level of perceived diabetes distress is higher amongst people with more diabetic complications such as kidney damage, albuminuria, retinopathy, neuropathy, heart disease, stroke, and vascular disease (Fenwick et al., 2018). People with higher levels of general DD report lower subjective health, as well as more problems with self-care, dieting, and blood glucose testing (Schmitt et al., 2016) as well as higher Hb1Ac (Graue et al., 2012) and more fear of hyperglycemia (Amsberg et al., 2008). General DD is also associated with depressive symptoms, general anxiety, and lower self-esteem (Fenwick et al., 2018) and coping styles such as distractive coping, trivialization, and depressive coping (Schmitt et al., 2016). Individuals experiencing higher levels of DD also tend to experience a higher stigma associated with type 1 diabetes, including the perception that they are being treated

differently due to their illness and that they are blamed and judged (Browne et al., 2017).

As studies investigating the effects of the subdimensions are sparse, there is little evidence of differences in their effects. All four facets are negatively correlated with well-being and positively associated with worrying about hyperglycemia and trait anxiety (Snoek et al., 2000). Furthermore, all four subtypes are significantly and positively associated with depressive symptoms (Polonsky et al., 2005; Martin et al., 2018) and negatively associated with mental health, social functioning, and vitality (Graue et al., 2012). However, only emotional and treatment-related DD are significantly associated with HbA1C and self-monitoring of blood glucose (Snoek et al., 2000). Individuals with higher emotional, social, and food-related DD also report significantly greater problems regarding meal planning. Furthermore, whereas food-related and interpersonal/social DD are positively associated with higher cholesterol levels, only food-related DD is associated with lower self-monitoring of blood glucose (Polonsky et al., 2005).

ASSOCIATIONS OF DIABETES-RELATED DISTRESS AND WORK OUTCOMES

Research on the work-life of people with type 1 diabetes is sparse, however, is evidence that "working-age adults with diabetes are more likely to be unemployed or unable to work, miss workdays, or have severe difficulty with work tasks compared to those without diabetes" (Fritschi and Quinn, 2010, p. 37). In a qualitative study on diabetes and work, young adult employees with type 1 diabetes reported difficulties with diabetes management during work. Especially under time pressure or when experiencing difficulties with the illness, employees with type 1 diabetes reported that they neglected or decreased the diabetes management activities (Balfe et al., 2014). Previous research also indicates a negative association between the number of years since the onset of the illness and wages, whereas a stable HbA1c was positively associated with the wage level (Brown et al., 2012). Furthermore, a study including people with type 1 and type 2 diabetes found that working conditions characterized by high job demands, low decision latitude, and low social support predicted fatigue amongst the study sample (Weijman et al., 2003). A study on the association between burnout and receiving treatment for chronic illnesses indicates an association between burnout and treatment for diabetes. However, the authors did not indicate the diabetes type (De Beer et al., 2016).

Insights into the effects of diabetes on general well-being and everyday functioning indicate two main mechanisms through which type 1 diabetes may impact employment and lead to negative work-related outcomes. The first mechanism is rooted in the effect of disease on the perceived energy and emotional well-being. Existing evidence implies that type 1 diabetes is linked to chronic fatigue, i.e., feelings of physical and emotional exhaustion (Goedendorp et al., 2014; Kalra and Sahay, 2018). Chronic fatigue in people with type 1 diabetes is only weakly associated with blood glucose levels. It cannot be fully explained by depression (Goedendorp et al., 2014), a common comorbidity of type 1 diabetes (Gendelman et al., 2009). However, fatigue can have substantial effects on daily life, as it is related to reported functional impairments, such as mobility, social interactions, and work limitations (Goedendorp et al., 2014). A theoretical framework on fatigue in people with diabetes (Fritschi and Quinn, 2010) states that DD is one of the psychological factors associated with fatigue. However, it does not state an exact causality relation between the concepts.

The second mechanism is rooted in the burden of treatment, i.e., the time and effort required to manage a chronic illness (Sav et al., 2015). To prevent potentially fatal exacerbations, type 1 diabetes requires a high and constant level of day-to-day management activities, including, but not limited to, blood glucose monitoring. The responsibility of the management activities lies mainly on the people with type 1 diabetes themselves (Ahola and Groop, 2013). As diabetes self-management requires resources such as time, energy, and cognitive capacity, employed people with type 1 diabetes can experience tensions between their work and diabetes management (Pyatak, 2011). Moreover, people with type 1 diabetes may experience a lack of mental, emotional, and physical energy and feelings of detachment regarding their diabetes management, a phenomenon known as diabetes burnout. Diabetes burnout is strongly and positively associated with DD. However, it is conceptually distinct (Abdoli et al., 2020). In sum, both mechanisms imply that employees with type 1 diabetes experience a loss of resources in terms of time and energy due to the symptomology of the illness itself and the high and constant illness management requirements.

Individual resources are highly relevant in theories explaining work-related employee well-being and other, more distal work-related outcomes such as performance and satisfaction. Two fundamental theoretical frameworks from the field of occupational health psychology, namely the conservation of resources theory (COR) (Hobfoll, 1989) and the job-demands resources model (JDR) (Demerouti et al., 2001), include employee resources as an essential factor in their explanations of the etiology and processes underlying employee strain. As the development of the JDR was influenced by COR (Bakker and Demerouti, 2017), both theoretical frameworks lead to similar conclusions regarding their proposed effects of employee resources, or a lack thereof, on strain, which manifests as burnout. Burnout is one of the most commonly researched work-related mental health outcomes and is mainly characterized by exhaustion, loss of energy, depletion, and detachment (Maslach and Leiter, 2017).

The COR focused on the effects of the availability and investment of resources which can include material objects (e.g., money), but also personal characteristics (e.g., self-esteem), and energy resources (Hobfoll, 1989; Park et al., 2014). According to COR, a loss of resources is stressful to individuals and predicts strain and burnout (Hobfoll, 1989). As the resources of employees with type 1 diabetes resources can be limited due to the illness and its symptoms (e.g., fatigue) (Kalra and Sahay, 2018), as well as the time and effort required to manage the illness (burden of treatment) (Sav et al., 2015), they may have a higher risk for a resource loss cycle. Higher levels of DD should intensify this resource loss cycle and hence the level of burnout,

particularly because high diabetes distress is associated with negative emotionality and perceived stress (Coccaro et al., 2020).

In contrast to the COR, the JDR model considers the work characteristics as it postulates that stress and burnout are the results of direct effects and interactions of job demands and job resources. High job demands (e.g., time pressure, physical workload, shift work) directly affect employee strain. A lack of job resources (rewards, job control, support) or personal resources (resilience, self-efficacy, and intrinsic motivation) can lead to increased difficulties in meeting the job demands, thus also increasing the risk for burnout (Demerouti et al., 2001; Schaufeli and Taris, 2014).

The JDR model is one of the most frequently applied models to explain the development of stress and burnout (Schaufeli and Taris, 2014). In a recent study amongst employed people with multiple sclerosis (MS), a chronic neurological autoimmune illness, job demands and job resources predicted the experienced MS-related difficulties at work. These difficulties (e.g., cognitive and physical limitations and external barriers) mediated the effects on job demands and burnout and job demands and turnover intentions (Lehmann et al., 2021). Whereas this study investigated the health-related difficulties at work as a mechanism within the JDR model, physical health status can also be conceptualized as a personal resource within the JDR framework. Thus, a pre-existing chronic illness or health impairment signifies a loss of resources or status of diminished resources, leading to a higher vulnerability toward demands and stressors (McGonagle et al., 2015).

Previous research on diabetes (type 1 and type 2) shows inconclusive results on the association between diabetes (versus no diabetes) and burnout. In general, burnout seems to be more prevalent among employees with chronic medical illnesses than employees without any chronic medical condition (Armon et al., 2014). A study including 7895 employees from different sectors (De Beer et al., 2016) did not find a significant relationship between diabetes and levels of burnout. However, the authors did not assess or report the type of diabetes among the participants.

To our knowledge, only one existing study has investigated the effects of the individual perception of the severity of the illness in terms of DD and occupational burnout. In a sample of employees with type 2 diabetes, self-reported DD was not only significantly associated with burnout but also mediated the effect of Hb1ac levels on burnout and the effect of positive affect on burnout. Moreover, it was particularly strongly associated with the exhaustion dimension of burnout (Han, 2008). According to COR and JDR, we assume that high levels of DD are associated with high levels of burnout. Moreover, we suggest that DD explains variance in burnout above and beyond other job characteristics.

Hypothesis 1: Diabetes-related distress is positively associated with burnout.

In addition to burnout, we are focusing on job satisfaction as a secondary outcome. Job satisfaction is a positive emotional attitude or state resulting from the appraisal of one's job or experiences on the job, that is influenced by dispositions of the employee and job characteristics (Judge et al., 2020). Meta-analytical evidence (Faragher et al., 2005) shows strong and negative associations with burnout, positive associations with mental health outcomes (anxiety and depression), and smaller yet significant associations with subjective physical illness. Job satisfaction is also an important predictor of turnover intention and job tenure, but it also plays an important part in work adjustment and rehabilitation for people with chronic diseases (Roessler et al., 2004).

Furthermore, job satisfaction is strongly and positively associated with self-esteem (Faragher et al., 2005). A study on self-esteem and type 1 diabetes showed that individuals that reported feeling overwhelmed by diabetes also had low levels of self-esteem. Moreover, self-esteem and illness self-concept were positively related to diabetes-related problems. Individuals with low levels of self-esteem reported experiencing less support and more treatment- and emotional problems 5 years later (Luyckx et al., 2008). As self-esteem is related to diabetes-related problems and job satisfaction, we assume that DD affects job satisfaction negatively and explains variance in job satisfaction above and beyond other job characteristics.

Hypothesis 2: Diabetes-related problems are negatively associated with job satisfaction.

Regarding the dimensionality of DD, there are no clear theoretical and empirical indicators that allow for the development of distinct hypotheses for the specific subdimensions, particularly as all four subdimensions are positively associated with mental health problems and negatively associated with social functioning (Graue et al., 2012). Given the limited evidence so far, we, therefore, aim at an explorative analysis of the associations between different types of DD and work-related outcomes.

Research Question 1: Are there differences between the subdimensions regarding their association with burnout?
Research Question 2: Are there differences between the subdimensions regarding their association with job satisfaction?

TYPES OF DIABETES TREATMENT

Individuals with type 1 diabetes have two main options for insulin treatment: multiple daily injections of rapid-acting insulin combined with daily basal insulin or continuous subcutaneous insulin infusion (Maahs et al., 2010). Past research investigated the effect of different insulin treatments (syringe, pen, and pump) on psychological outcomes: a study on 132 patients with insulin-dependent diabetes mellitus investigated insulin therapy change. Patients who changed from traditional syringe treatment to insulin pen were more satisfied with their performance at work, life in general, and time for diabetes management and felt less restricted regarding social relationships, diet, leisure time. Patients who changed from an insulin pen to an insulin pump were more satisfied with time for diabetes management and felt less restricted regarding social relationships, diet, leisure time (Chantelau et al., 1997).

These findings suggest that insulin treatment with a pump can improve illness management, which should lead to less DD and hence lower levels of burnout and higher levels of job satisfaction.

Hypotheses 3a: Employees who use an insulin pump in contrast to an insulin pen report lower levels of burnout.
Hypotheses 3b: Employees who use an insulin pump in contrast to an insulin pen report higher levels of job satisfaction.

MATERIALS AND METHODS

Study Design

We conducted a cross-sectional study among adult employed people with type 1 diabetes. Before starting the questionnaire, the participants had to confirm that they fulfilled the inclusion criteria (minimum age of 18 years, employment with at least 20 h per week work time, medical diagnosis of type 1 diabetes). The inclusion criteria were presented to the participants as a list and the participant and to select the option stating that they fulfilled all criteria before they could proceed with the survey.

We conducted an *a priori* power analysis using G*Power (Faul et al., 2007) to determine the sample size. Based on previous similar research on chronic illness severity, burnout, and job satisfaction (Han, 2008; Siu et al., 2013), we chose a size of $f^2 = 0.08$ as the basis of our calculation resulting in a minimum sample size of $N = 155$ to reach a power of 0.80 and $N = 238$ for a power of 0.95 assuming that we would test the effects of the four DDS subdimensions and their incremental effects above and beyond six covariates. We therefore aimed at acquiring a sample size between 200 and 300.

Data collection took place in the first quarter of 2018 (early January until late March). We recruited the sample through an announcement by a German monthly magazine for people with diabetes and social media groups on diabetes. The assessment was carried out via a self-report online questionnaire and was only available in German. Participants were excluded if they did not have type 1 diabetes, suspected having type 1 diabetes yet did not have a diagnosis from a medical professional, were self-employed or unemployed, and/or did not speak German. Participants did not receive compensation for their participation in the study. The study design was submitted for a pre-review to the responsible ethics review board, which declared no necessity for a full review.[1] During the design and conduction of the study, we made sure that we adhered to the ethical guidelines of the German Psychological Association (DGPs).

Measures

Burnout

We assessed burnout with the personal burnout scale of the Copenhagen Burnout Inventory (CBI, Kristensen et al., 2005). We used the German translation of the scale as included in the German version of the Copenhagen Psychosocial Questionnaire (Nübling et al., 2006). The scale consists of 6 items answered on a 5-point Likert-type scale from 1 = does not apply at all, to 5 = applies very strongly. We calculated the mean value of the scale. Higher mean values imply more severe burnout symptoms. The scale showed very good reliability with $\alpha = 0.92$, respectively $\omega_{RT} = 0.94$ (Revelle, 2016; McNeish, 2018).

Job Satisfaction

We assessed job satisfaction with the eponymous subscale from the COPSOQ (Nübling et al., 2006). The scale consists of nine items that ask for the participant's satisfaction with different job-related aspects (e.g., salary, general working conditions, the way his/her abilities are used) with a 4-point Likert-type response scale from 1 = very dissatisfied to 4 very satisfied. Larger scale mean values imply higher job satisfaction. The scale showed good reliability with $\alpha = 0.86$ and $\omega_{RT} = 0.90$.

Diabetes-Related Distress

We assessed DD with the German version of the Problem Areas in Diabetes Questionnaire (PAID, Polonsky et al., 1995). The PAID questionnaire is frequently used amongst individuals with type 1 diabetes to assess DD and has been translated into multiple languages (El Achhab et al., 2008; Lee et al., 2015). The PAID has four subscales that assess the four different areas of diabetes-related problems: emotional (12 items), social (two items), food-related (three items), and therapy-related problems (three items) (Snoek et al., 2000). All items were answered in a 4-point Likert-type scale from 1 = does not apply at all to 5 = applies very strongly. We calculated the mean values for each subscale, with higher values signifying higher levels of DD. The scale reliabilities were acceptable to excellent, with $\alpha = 0.93$ and $\omega_{RT} = 0.95$ (emotional), $\alpha = 0.73$ and $\omega_{RT} = 0.73$ (social), $\alpha = 0.76$ and $\omega_{RT} = 0.76$ (food-related), and $\alpha = 0.70$ and $\omega_{RT} = 0.73$ (therapy-related).

Type of Insulin Therapy

We assessed the type of insulin therapy with a single item, asking the participants to check the type of therapy they currently apply (0 = pen, 1 = pump, 2 = syringe, 3 = other). Participants that chose the "other" category were asked to describe their insulin therapy in an open text field.

Control Variables

We included age and gender as covariates as women and younger employees are more likely to experience higher emotional exhaustion (Brewer and Shapard, 2004; Purvanova and Muros, 2010). To analyze the incremental validity of the predictors above and beyond working conditions whether the participant's job included leadership responsibility. We assessed leadership responsibility with one item: "What is your current job position" with two response options 1 = employee with leadership responsibility and 0 = employee without leadership responsibility. Furthermore, we assessed quantitative job demands and the degree to which the participants had control over their work time using two eponymous scales from the COPSOPQ (Nübling et al., 2006). The quantitative job demands

[1] Due to the limited capacity of the local Ethics Review Board (ERB), researchers at faculty were asked to provide a description of the study design, as well as the participant information and the consent forms for a preliminary inspection. This pre-review concluded in the statement of the ERB that a full ethics proposal was not necessary.

scale consisted of seven items with a 5-point Likert-type response scale from 1 = never to 5 = always. Higher mean values imply higher perceived quantitative job demands. Scale reliability was excellent with $\alpha = 0.86$ and $\omega_{RT} = 0.90$. The control over work time scale consisted of four items and was answered with the same response scale as the quantitative job demands scale. Scale reliability was good with $\alpha = 0.87$ and $\omega_{RT} = 0.90$.

Sample

The final sample consisted of $N = 237$ participants. Of the study sample, 67.34% were female, and 46.80% reported having a university degree. Participants reported working an average of 35.82 h/week ($SD = 7.05$). About half of the participants ($N = 156$, 52.2%) were employed in the public sector, respectively worked in the fields of healthcare, education, whereas $N = 46$ (15.5%) worked in manufacturing, $N = 29$ (9.8%) worked in trade, transport, or the hospitality industry, $N = 26$ (8.8%) worked in the information and communication industry, and $N = 24$ in the financial, insurance and business services.

The rest of the sample consisted of employees from the energy, real estate, and agricultural sectors. Most participants reported having disclosed their diabetes to their line manager (93.94%) and at least some colleagues (95.96%). Fifty-nine participants (19.87%) reported having a secondary illness (38.98% diabetic retinopathy, 30.51% diabetic neuropathy, 3.39% diabetic nephropathy, and 25.42% other/not stated). 46.46% reported using a pen, and 53.53% reported using a pump. None of the participants in this sample reported using a different type of insulin therapy.

Analytical Approach

The steps of the data analysis were planned as follows: first, a confirmatory factor analysis (CFA) was to be conducted to confirm the validity of using the four DD subscales (compared to a one-factor solution), followed by a descriptive analysis of the bivariate correlations (for the numeric variables) and *t*-tests to analyze possible associations between dichotomous and numerically scaled variables. To test the study hypotheses, we conducted a series of multiple regression analyses for each outcome. In the baseline models, we regressed the respective outcome on age and gender only (Models 1a and 2a). In the next step, we added the work-related covariates (Models 1b and 2b) before adding the main predictors in the final step (Models 1c and 2c). All analyses except for the CFA were carried out using the psych package (Revelle, 2021) for the R environment (R Development Core Team, 2015), whereas the CFA was conducted using the lavaan package for R (Rosseel, 2012).

RESULTS

Before hypothesis testing, we conducted a confirmatory factor analysis to confirm the 4-factor structure of the PAID. We compared the proposed 4-factor structure to a single-factor model. The 4-factor structure fit the data significantly better, with $\Delta\chi^2_{(6)} = 129.21$, $p < 0.001$. However, it is important to note that the 4-factor model did not meet the criteria for an acceptable model fit (cf. Schermelleh-Engel et al., 2003), with $\chi^2_{(164)} = 592.93$, CFI = 0.887, and RMSEA = 0.094 (**Table 1**).

The analysis of the bivariate correlations (**Table 2**) revealed that the number of working hours per week was not significantly associated with any of the study outcomes or predictors and was therefore not included in the further analyses. The correlation analyses further revealed positive and significant bivariate associations between all dimensions of DD and burnout and significant negative associations between DD and job satisfaction. Gender was significantly correlated with emotion-related DD and burnout, indicating that female participants reported higher levels of both variables. Control over work time was significantly and negatively correlated to all four DD dimensions, and quantitative work demands were positively correlated with food-related DD. In addition to the bivariate correlations, we conducted t-tests to investigate whether gender was associated with the study variables. Participants identifying as female reported significantly higher levels of burnout ($M = 3.15$) compared to participants identifying as male ($M = 2.78$), with $t(295) = 3.58$, $p < 0.001$. There was no significant difference in job satisfaction between genders, with $t(295) = -1.05$, $p = 0.30$. (See **Supplementary Appendix A** for the gender differences of all study variables).

We conducted *t*-tests to test for differences in the outcomes as a function of the type of insulin therapy. There were no differences in either burnout, $t(295) = -0.81$, $p = 0.42$, or job satisfaction, $t(295) = 0.65$, $p = 0.52$, between participants using a pen and participants with a pump (see **Supplementary Appendix B** for the differences between pen and pump for all study variables).

To test the study hypotheses, we conducted a series of multiple regression analyses for each outcome. In the baseline models, we regressed the respective outcome on age and gender only (Models 1a and 2a). In the next step, we added the work-related covariates (Models 1b and 2b) before adding the main predictors in the final step (Models 1c and 2c). The results of the regression analyses are stated in **Table 3**.

Controlling for demographic variables (age and gender) as well as work-related variables, emotional DD was significantly and positively associated with burnout ($\beta = 0.62$, $p < 0.001$), thus supporting Hypothesis 1. Together, all DD variables explained 36% of the variance in burnout. Finally, social DD was significantly and negatively associated with job satisfaction ($\beta = -0.19$, $p < 0.01$), controlling for age, gender, and working conditions. Together, all DD variables explained 10% of the variance in job satisfaction. Regarding Hypotheses 3a and 3b on the association between type of insulin therapy and work-related outcomes, we did not find any indication of a difference in burnout or job satisfaction between participants using insulin pens and participants with pumps in the regression analysis. These results align with the results of the *t*-tests that we carried out in the descriptive analyses. Thus, we conclude that Hypotheses 3a and 3b are not supported.

Similar to the results of the bivariate correlation, participant gender had a positive and significant effect on burnout in the regression analyses, implying that female participants were more likely to report higher burnout levels. Quantitative job

TABLE 1 | Results of the confirmatory analyses testing the 4-factor structure of the PAID.

	X^2	*df*	X^2/df	CFI	RMSEA	ΔX^2	Δdf
1-factor model	722.14	170	4.25	0.855	0.105	129.21***	6
4-factor model	592.93	164	3.62	0.887	0.094		

****p < 0.001.*

TABLE 2 | Bivariate correlations of the numerically scaled variables.

Variable	*M* (*SD*)	1	2	3	4	5	6	7	8
(1) Age	41.25 (11.09)								
(2) Quantitative job demands	3.10 (0.74)	0.05							
(3) Control over work time	3.42 (1.09)	0.16*	−0.29**						
(4) Emotional DD	2.44 (0.92)	−0.17**	0.08	−0.39**					
(5) Social DD	1.97 (1.03)	−0.17**	0.08	−0.39**	0.70**				
(6) Food-related DD	2.46 (1.01)	−0.13*	0.13*	−0.36**	0.74**	0.50**			
(7) Therapy-related DD	1.91 (0.88)	−0.22**	−0.01	−0.34**	0.67**	0.61**	0.47**		
(8) Burnout	3.03 (0.85)	−0.11	0.20**	−0.40**	0.70**	0.55**	0.52**	0.48**	
(9) Job satisfaction	3.50 (0.73)	0.03	−0.32**	0.44**	−0.42**	−0.42**	−0.37**	−0.33**	−0.40**

*N = 297, *p < 0.05, **p < 0.01.*

TABLE 3 | Models regressing the standardized outcomes on standardized predictors.

	Outcome: burnout			Outcome: job satisfaction		
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c
Intercept	−0.27**	−0.11	−0.13	0.08	−0.12	−0.10
Sex	0.40**	0.24	0.20*	−0.12	0.07	0.10
Age	−0.05	−0.02	0.06	0.02	−0.02	−0.07
Leadership		−0.24	−0.28**		0.34**	0.35**
Quantitative work demands		0.12*	0.14*		−0.23**	−0.24**
Control over work time		−0.33**	−0.06		0.37**	0.21**
Type of therapy			0.10			−0.08
Emotional DD			0.62**			−0.13
Social DD			0.09			−0.19**
Food-related DD			−0.01			−0.03
Therapy-related DD			−0.01			−0.07
R^2	0.04	0.18	0.54	0.00	0.24	0.34

*N = 297, *p < 0.05, **p < 0.01; gender coded: 0 = male, 1 = female; leadership coded: 0 = no leadership responsibility, 1 = leadership responsibility; type of insulin therapy coded 0 = pen, 1 = pump.*

demands, which were included as a covariate, had a significant positive effect on burnout and a significant negative effect on job satisfaction. In contrast, control over work time was significantly and positively related to job satisfaction only.

Supplemental Analyses

Due to the cross-sectional nature of the assessment and the strong positive correlation between emotional DD and burnout, we conducted a confirmatory factor analysis to justify treating these variables as separate constructs. We tested a single factor model (emotional DD and burnout) against the 2-factor model (**Table 4**). The 2-factor model fit the data significantly better, with $\Delta\chi^2_{(1)} = 417.62$, $p < 0.001$, therefore justifying the treatment of the variables as separate constructs. However, it is noteworthy that the 2-factor model did not fulfill the criteria for acceptable model fit (cf. Schermelleh-Engel et al., 2003).

DISCUSSION

The present study's findings on employees with type 1 diabetes show that DD is associated with burnout and job satisfaction. Higher levels of DD are linked to higher levels of burnout and lower level of job satisfaction. For each of the respective outcomes, a specific facet of DD explained variance in the outcome above and beyond job demands and control over time. For burnout, the emotional facet of DD (e.g., feeling alone with diabetes) was most relevant. In contrast, the social facet

TABLE 4 | Results of the confirmatory analyses testing the distinctions between emotional diabetes-related problems and symptoms of stress, respectively burnout.

		χ^2	*df*	χ^2/df	CFI	RMSEA	$\Delta\chi^2$	Δdf
Emotional DD and burnout	1-factor model	917.98	135	6.80	0.798	0.140	417.62***	1
	2-factor model	500.62	134	3.74	0.905	0.096		

***$p < 0.001$.

of DD (e.g., worrying about reactions) was strongly related to job satisfaction.

Additionally, it is important to emphasize the extent of the variance explained by diabetes-related variables found in this study. Previous research estimates the correlations between workplace-related stress and health variables to rarely exceed $r = 0.333$ or $R^2 = 0.10$ (Faragher et al., 2005). In one of the two full models of our study (Model 1c), the DD explained more variance than age, gender, and workplace variables together, indicating that diabetes-related problems may have a greater impact on job satisfaction than job characteristics. The variance explanation of job satisfaction in Model 2c is smaller compared to the variance explanation of burnout (Model 1c). However, it is important to note that in Model 2c DD still explained 10% of the variance in job satisfaction. The insulin treatment method (pump vs. pen) did not affect burnout or job satisfaction, implying the rejection of Hypotheses 3a and 3b. However, pump users, in contrast to pen users, reported less food-related DD.

Theoretical Implications

Our results align with findings on DD and burnout among people with diabetes type 2 (Han, 2008). This reinforces the assumption that health status should be viewed as an individual resource that plays an important role in the development of burnout (McGonagle et al., 2015). Previous research has been strongly focusing on physical health or illness as a critical outcome of burnout. Yet, systematic analyses on the exact causal nature of the association and, in particular, possible reciprocal effects are lacking (Maslach, 2001). There are, to our knowledge, no existing models of occupational health and burnout (e.g., JDR and COR) that account for a possible diversity in individual employee health statuses. Thus, our study is in line with previous work that suggests an integration of occupational health and diversity research, viewing chronic illness as a dimension of organizational diversity (Beatty and Joffe, 2006).

The associations found in this study support the proposition of investigating existing health status and health impairments as a personal resource within the JDR (McGonagle et al., 2015). Personal resources can directly impact well-being, moderate the effects of job characteristics, mediate the effect of job characteristics, and influence the perception of job characteristics (Schaufeli and Taris, 2014). Research on well-being fundamentally supports this general understanding of the impact of health (Sonnentag, 2015): The current level of well-being affects the perception of job demands (de Jonge et al., 2001), job resources (e.g., Reis et al., 2015) and personal resources (Xanthopoulou et al., 2009) in the future. Taking these findings into account, it can be assumed that health impairments like DD impact the well-being of chronic-ill employees and their perception of working conditions. This study mostly focused on the direct effect of diabetes-related problems (as a proxy for impaired health) on well-being outcomes. Future research should investigate whether individuals with diabetes-related problems or individuals with health impairments in general show different reactions to job characteristics in general terms of well-being outcomes.

Moreover, future research should analyze whether the subjective perception of job characteristics, such as quantitative and cognitive job demands, depends on the health status of the perceiver, for example by comparing employees with different health statuses working the same or very similar job within the same organization or team. Insights on these aspects allow a differentiate consideration of chronic-ill employees in their organizations. This is relevant in that illness management is predominantly the task of chronic-ill employees (Rak, 2014) and organizations should take more responsibility in this regard.

Further results of our study are that certain facets of DD are strongly related to burnout and job satisfaction. The emotional facet of DD (e.g., feeling alone with diabetes) was most relevant for burnout, whereas the social facet of DD (e.g., worrying about reactions) for job satisfaction. The strong association between the emotional facet of DD and burnout may be based on the common relationship to depression. Employees exposed to difficult working conditions for a long time have a higher risk for burnout, which can cause depression in the long term (Hakanen and Schaufeli, 2012). However, the measurement of emotional distress in diabetes and the psychiatric diagnosis of depression shows a conceptual overlap that requires a strong association (Gonzalez et al., 2011). The differences in the magnitude of explained variance between burnout and job satisfaction by the DD subdimensions is in line with the assumptions job satisfaction is a more distal outcome of work-related stressors, and a possible consequence of burnout (Wolpin et al., 1991). Thus, future studies with longitudinal designs should investigate the possibility of burnout mediating the effect of DD on job satisfaction.

Additionally, it can be assumed that employees in our sample have been confronted with the consequences of diabetes for a long time, which increases the emotional burden. The specific association between the social facet of DD and job satisfaction shows parallels to the relationship of neuroticism and job satisfaction, which is one of the strongest personality factors regarding job satisfaction (Judge et al., 2002). Employees with a high level of neuroticism are less satisfied with their work.

The anxiety of reactions from other people is a crucial element of neuroticism and the social facet of DD. This might be an explanation for the specific association between the social facet of DD and job satisfaction.

In contrast to hypotheses 3a and b, the type of insulin therapy did not predict any work-related outcome. However, the portion of pen and pump users was relatively balanced in our sample. Despite the advantages of insulin pumps in the illness management of diabetes type 1 (Karges et al., 2017), employees did not experience less burnout or more job satisfaction than employees using an insulin pen. One possible reason for this result might be the habitation of handling with the respective insulin therapy over time. People get used to dealing with the type of insulin therapy and integrate them into their daily routine. An interesting finding in the additional analyses (**Supplementary Appendix B**) was that pen users reported more control over their work time than pump users. This may imply that the choice of insulin intake could be guided my aspects of the job itself. Less control over work time could imply more difficulties regarding diabetes management (i.e., monitoring blood glucose and manually injecting), thus providing a reason to choose a pump over a pen. Future research should consider this aspect when investigating the impact of insulin therapy among employees with diabetes type 1.

Practical Implications

Our findings are highly relevant for employed or soon to be employed individuals with type 1 diabetes, diabetologists, and other diabetes-related treatment and counseling providers, as they are the main providers of diabetes-related information. Awareness of the strong associations between DD and burnout may prevent employees with high levels of burnout from using self-blame as a coping mechanism (Spataro et al., 2016) and motivate them to pay close attention to warning signs of exhaustion. Furthermore, knowledge about the effects of diabetes on work-life can be crucial for the career choices of adolescent people with type 1 diabetes.

Our results indicate that employees with type 1 diabetes have additional challenges that are associated with work-related outcomes. The reduction of DD provides an interesting starting point for improving work-life and preventing burnout among employees with diabetes type 1. Current approaches to working with diabetes mainly focus on the individual as the main actor in maintaining individual health and preventing worsening of the illness or it's symptoms. A meta-analysis on self-efficacy education programs in persons with diabetes shows positive effects on HbA1C levels, self-management behaviors, knowledge, and quality of life. However, the review notes that most of the studies are characterized by low quality, short-term follow-up periods, and deficient physiological and emotional strategies (Jiang et al., 2019). The limited usage of strategies to improve the emotional state seems problematic as our findings show that the emotional facet of DD is particularly important for burnout. Other approaches, such as a specific 12-week coaching program for working individuals with chronic illness (e.g., ankylosing spondylitis, multiple sclerosis, nerve injury or neuropathy, diabetes Types 1 and 2), may provide a first starting point (McGonagle et al., 2014). This coaching intervention focuses on reinforcing four central personal resources in the context of work-related health (job self-efficacy, mental resources, core self-evaluations, and resilience) to reduce work-related challenges of employees with chronic illness (e.g., coming to work when sick, disclosing illness at work, long-term sickness absence and low levels of workplace support) and hence prevent further resource losses (Hobfoll, 1989).

In addition to the individual initiative of chronically ill employees to improve their illness management, organizations should support these efforts in workplace health management. However, organizations may be unaware of the prevalence of chronic illness among their employees, especially because symptoms are often invisible (Beatty and Joffe, 2006). In the context of diversity, organizations should explicitly name chronic ill employees as a significant part of the organizational workforce in the mission statement and point out that their specific concerns will be considered in organizational decision-making processes (e.g., design of tasks, workflow, and roles as well as health-related offers). Chronic illness can lead to day-to-day fluctuations of the employee's capabilities. Thus, flexibility may be a core aspect in this process, for example, regarding work schedules (e.g., flextime), task assignments (e.g., completing tasks according to the present physical condition), and methods of task performance (e.g., work from home) (Beatty and Joffe, 2006). However, the respective actions must be planned and implemented with close regard to the needs and requirements of the chronically ill employees, which requires further investigation into the specific needs of employees with type 1 diabetes at work. A high level of organizational support may motivate chronically ill employees and evoke trust for illness disclosure leading to more inclusive organizations.

Strengths and Limitations

A strength of the study lies in adequately sized sample of employees with a specific chronic illness which allows us to investigate associations between health- and work factors amongst people with type 1 diabetes. Chronic illnesses are still greatly overlooked in occupational health research and organizational diversity research (Beatty and Joffe, 2006). During the data collection period, we received positive feedback from participants that felt that the topic needs more attention, and several participants shared suggestions for future research topics that were rooted in their day-to-day experiences.

However, there are several limitations. First, the cross-sectional design does not allow to test for causal relations. Future studies should include prospective and longitudinal designs, e.g., to test for reciprocal effects of diabetes-related and work-related outcomes. Second, our study is based solely on self-reported data, which is why we cannot exclude the possibility of a common method bias. Further studies should combine self-reported questionnaire data with physiological indicators such as the HbA1c to increase the validity of the findings. As the inclusion criteria were also based on self-report, we cannot exclude the possibility that people without type 1 diabetes took part in the study. Although we announced the study both in social media

and in a print outlet, the fact that we assessed the data via an online survey might have attracted a younger sample. Third, although the 4-factor solution of DD fit the data best, the overall fit of the model was not good and did not match the findings of previous studies on the factor structure of the PAID (e.g., Snoek et al., 2000). We also found less than acceptable fit indices regarding the 2-factor model of emotional DD and burnout. It is important to keep in mind that the PAID was initially developed as a unidimensional instrument, therefore further studies on the construct validity of the instrument should be carried out.

Finally, our burnout instrument assessed burnout mainly in terms of emotional exhaustion. Although emotional exhaustion is considered the core component of burnout as it is linked to physiological stress outcomes of the autonomic nervous system (Kanthak et al., 2017), as well as depression (Hakanen and Schaufeli, 2012), future research should investigate whether there are similar associations between DD and other subtypes of burnout. Furthermore, burnout and other measures of work-related well-being should be investigated as possible mediators for the association between type 1 diabetes and general well-being variables, such as depression.

CONCLUSION

In sum, our analyses suggest that diabetes distress is meaningfully associated with burnout and job satisfaction among employed people with type 1 diabetes, thus providing one of the first pieces of evidence of a link between type 1 diabetes and negative work outcomes and supporting similar findings amongst people with type 2 diabetes. These findings can contribute theory and research on occupational health, diabetes counseling and treatment, and career and health coaching of people with type 1 diabetes.

DATA AVAILABILITY STATEMENT

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

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 patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AC co-wrote the theory section and hypotheses, designed the study, collected the data, analyzed the data, and wrote the first draft of the manuscript and guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analyses. AZ co-wrote the theory and discussion sections and reviewed and edited the manuscript. Both authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.697833/full#supplementary-material

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Exploring Protective Factors in Wellbeing: How Sensory Processing Sensitivity and Attention Awareness Interact With Resilience

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The aim of the study is to analyze the relationship between sensory processing sensitivity (SPS), attention awareness, and resilience and to determine whether attention awareness may moderate the relation between sensitivity and resilience. The sample consisted of 273 adults (239 women; $M_{age} = 24.12$, $SD = 6.59$ years). The *highly sensitive person scale*, the *resiliency assessment scale*, and the *mindful attention awareness scale* were used in the study. The results indicate significant relationships between SPS and resilience; emotional reactivity is especially associated with lower resilience, whereas sensing the subtle is associated with higher resilience. The regression analyses revealed that SPS is a significant predictor of resilience, but diverse aspects of sensitivity explain resilience differently. Attentional awareness was found to be a significant moderator that strengthens the positive relationship between sensing the subtle and tolerance of negative emotions. The consequences of high sensitivity include high levels of distress, anxiety, and a sense of overload; therefore, searching for protective factors is important to maintain the wellbeing of highly sensitive people. As one of the characteristics of highly sensitive persons, sensing the subtle may be an important resource that allows to them to deal effectively with difficult situations. Training on attention awareness and conscious presence may be an important way to deal with negative emotions and develop personal competences. The results indicate that these strategies may be of high significance for improving wellbeing and protecting highly sensitive persons against various stress factors.

Keywords: sensory processing sensitivity, highly sensitive person, highly sensitive person scale, attention awareness, mindfulness, resilience

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INTRODUCTION

The aim of this study is to explore protective factors in wellbeing by analyzing how sensory processing sensitivity (SPS) and attention awareness interact with resilience. Some individual characteristics (e.g., neuroticism) help to predict how a person reacts in various stressful situations, including work-related stress (Leiter and Maslach, 2004). In the context of organizational psychology, analyzing the relationships between SPS and resilience, as well as the possible moderating effects of cognitive resources, may help to define strategies that regulate stress. This analysis may be of high significance in protecting wellbeing among highly sensitive persons.

Elaine Aron's (Aron and Aron, 1997; Aron, 2017) high-sensitivity construct concerns people with specific nervous system properties who are characterized by high sensitivity of sensory processing that results in some positive consequences but can also lead to a feeling of being overwhelmed and exhausted. SPS is a stable trait characterized by greater awareness, responsiveness, and depth of information processing. It is the way in which sensory information is acquired, selected, and processed by the central nervous system. It is linked with both greater sensitivity to exposure to negative stimuli and better use of positive aspects of situations and interactions (Aron et al., 2012). High sensitivity can be an advantage in ensuring careful, safe, mindful, and effective functioning. Highly sensitive people are characterized by the DOES acronym (Aron, 2017): D – depth of processing, O – overstimulation, E – emotional reactivity, and S – sensing the subtle. Highly sensitive people are one of three groups into which the population can be divided (Lionetti et al., 2018; Pluess et al., 2018): The floral metaphor (Lionetti et al., 2018) distinguishes *Orchids* (high level of sensory processing), *Tulips* (moderately sensitive), and *Dandelions* (lowest level of sensitivity).

Sensory processing sensitivity "is proposed to be a genetically determined trait involving a deeper (…) cognitive processing of stimuli that is driven by higher emotional reactivity" (Aron et al., 2012, p. 262). The authors refer to Craik and Lockhart's (1972) concept of processing levels, in which the main thesis is the assumption that each piece information is processed by the same brain structures but at different depths of processing, which means different processing intensities. The first level of processing relates to the physical properties of stimuli: It enables their registration and the detection of differences between them. The second, deeper level of processing includes interpretation of the meaning of stimuli and allows for the semantic categorization of objects that are in the same category. The deepest level of processing is related to the inclusion of associations, memories, and elements of knowledge in information processing; this not only allows for more complete interpretation of incoming data but also enriches knowledge by expanding or creating new cognitive structures. At deeper levels, processing takes longer, but the resistance to disturbance is greater and the results of this process are more durable. Information can be processed in the "primary circuit" (from the first to the deepest level of processing), but it can also be processed in the "secondary circuit" (data can be processed at any level). Not all information reaches the deepest level of processing. Information that is in the "secondary circuit" at any level of processing may remain there or leave it, but the direction of transfer tends toward deeper levels (Nęcka et al., 2020). High sensitivity causes increased susceptibility to external and internal stimuli, manifested in the form of deep processing of sensory information. It also entails susceptibility to being overwhelmed in conditions of overstimulation and may be associated with high levels of stress, ease of exhaustion, depression, anxiety, sleep disorders, and psychophysical disorders. At the same time, however, sensitive people may display good intuition and a high level of integrity and creativity (Aron, 2017).

The sensitivity of sensory processing is described as the interface between individual neurological functioning and the environment; it places individuals on a continuum of varying intensity responses to environmental stimuli (Dean et al., 2018). SPS is conceptualized as a meta-trait. Key to this conceptualization is the fact that high sensitivity is important not only for understanding maladaptation, behavioral disturbances, and psychophysical symptoms as the effects of the influence of an unfavorable environment, but also for optimal development and even thriving in a positive environment (Aron, 2017).

High sensitivity is associated with the dominance of the control pause system and the tendency to stop before taking action (Aron, 2017). This tendency may be referred to as Gray's concept of the behavioral inhibition system (BIS) and anxiety (Gray, 1982). Behavioral systems are disposed to approach stimuli that are beneficial from the point of view of life needs (Behavioral Activation System – BAS), but they avoid or move away from harmful or threatening stimuli (BIS). The observed behavior is the result of the proportion of BIS and BAS activity. These approach-avoidance tendencies determine the adaptive and evolutionary value of behavioral systems. BIS is sensitive to aversive stimuli (e.g., signals of punishment and lack of reward), innate anxiety stimuli, and new, surprising, or intense stimuli. In the revised theory of Gray's reinforcement sensitivity theory (Gray and McNaughton, 2000; McNaughton and Corr, 2008), BIS is responsible for resolving goal conflicts; it inhibits conflicting behavioral tendencies and enables the inclusion of situation analysis processes. The probability of the dominance of the BIS in highly sensitive persons may explain why high sensitivity is linked to anxiety and depression (Liss et al., 2005).

Environmental challenges vary greatly: In some situations, quick, direct, or even confrontational action is more beneficial; in others, careful reflection and calm planning will bring better results. As a result of the control pause, highly sensitive people are often more cautious: They compare the current situation with past experiences, analyze all its nuances, and react in a more restrained way. They are characterized by reflection, a high level of empathy, sensitivity to injustice, creativity, perceiving beauty in nature and art, and intuitiveness (Aron, 2017). However, highly sensitive people are perceived by others as shy, unambitious, and withdrawn, which may cause difficulties in building positive self-esteem. Excessive stimuli, especially those of a social nature, make them feel overwhelmed and have a tendency to avoid similar situations. If they have developed in a favorable family environment, it is more likely that they will develop their full potential and will be able to organize contexts appropriate for their needs and capabilities in adulthood (e.g., at work). But if the family environment was not favorable and did not help them build self-acceptance, they may consider sensitivity to be a weakness; they might strive to overcome it but not be able to find the right conditions for themselves, thereby constantly experience overwhelming irritation, tension, and dissatisfaction (Aron, 2017).

Research findings indicate that high sensitivity is not the opposite of resilience (Belsky and Pluess, 2009; Pluess and Belsky, 2013). Highly sensitive persons can cope with difficulties by using their strengths, such as perceiving information with

greater precision, subtle differentiation, deeper processing, and noticing nuances. Their reflective attitude allows them to combine their knowledge with data from previous experiences; they observe situations from a broader perspective (time and situational); they carefully analyze and notice many aspects of a situation; and they accept what is inevitable and build action plans for changes. If highly sensitive persons are aware of their disposition, they are able to regulate their emotions effectively using strategies, such as cognitive reformulation, taking another perspective, and humor. They can even adapt to extremely difficult situations by referring to transcendent values (Belsky and Pluess, 2009; Pluess and Belsky, 2013).

The concept of resilience (Luthar and Cicchetti, 2000) relates to positive adaptation and successful coping despite adversities, such as chronic stress. Rees et al. (2015) emphasize that psychological resilience is a predictor of coping strategies in the workplace and is the most important determinant that influences the risk of burnout, compassion fatigue, anxiety, and depression among employees: the higher the resilience, the lower the risk of negative consequences. Mental resilience determines the process of flexible adaptation to the constantly changing requirements of life, in which resilient people show positive adaptation both in traumatic situations and in everyday struggles with adversities. Tronick and DiCorcia (2015) developed the hypothesis of resilience to everyday stress, which assumes that resilience can be treated as a regulation process in coping with cumulative stressors in everyday life. Luthar and Cicchetti (2000) treat resilience as a dynamic disposition that can be continuously potentiated. Resilience is a two-dimensional construct that includes (1) exposure to adversity – negative life circumstances associated with the risk of adaptation difficulties; (2) positive adaptation – usually defined in behavioral categories of manifested social competences. Resilience is a broader category than personality traits as it covers cognitive (beliefs and expectations) and affective (dominant emotions) aspects, regulatory, and coping strategies, as well as social competences that facilitate functioning (e.g., Tebes et al., 2004). Development of mental resilience is a dynamic process that is ongoing throughout life in interactions with environmental conditions and in constant adaptation to environmental challenges (e.g., Liu et al., 2017; Neenan, 2017). For resilient functioning, the proportion of risk factors and protective factors (intrapsychic, interpersonal, and social) is important. Mental resilience also means recovering and regaining balance after painful experiences, and getting through difficult situations without serious negative psychological consequences. Various elements are emphasized in the theory of resilience, e.g., self-efficacy (Bandura, 1993), commitment, a sense of control and treating difficult situations as challenges (Kobasa, 1985), and a sense of coherence and hardiness (Antonovsky, 1987; Almedom, 2005).

Cognitive aspects play a significant role both in SPS and in resilience. Aron (2017) emphasizes that the characteristics of highly sensitive persons include deep processing, a tendency to analyze, and sensitivity to environmental stimuli. Mak et al. (2011) indicate positive thoughts about the self, others, and the future as fundamental characteristics of mental resilience. Rees et al. (2015) presented a model in which mindfulness is a significant variable that influences psychological resilience and psychological adjustment at work. In relation to varying degrees of psychological awareness, Rees et al. (2015) indicate the ability to reflect on an ongoing situation and regulate one's emotional state, which may be a significant predictor of burnout symptoms. Garland et al. (2011) indicate that positive reappraisal is a mediator between stress reduction and mindfulness.

Mindfulness is defined as a state of consciousness in which attention is focused on the "here and now," in which the reception of external stimuli, bodily sensations, emotions, thoughts, and ideas are registered and observed but are not assessed or judged; they "flow freely" in the subject's consciousness (Kabat-Zinn, 1990, 2003). In a state of mindfulness, awareness of the inner world and the external environment is deeper, fuller, and more nuanced; more peripheral stimuli are registered. Mindfulness is associated with conscious presence, low reactivity, and the ability to describe, name, and observe (Radoń, 2014); it also combines inner peace, mental toughness, and endurance. Mindfulness training brings cognitive benefits and helps in coping with stress.

There is some evidence that the brain activity of attentive people has a specific pattern. According to Davidson and Begley (2013), open, non-judgmental awareness is related to specific patterns of brain functioning. Mindfulness-based stress reduction strengthens the activation of the left prefrontal cortex; practicing mindfulness enhances prefrontal cortex control over the functioning of the neural pathways responsible for attention; and it mainly does so by strengthening the connections between the prefrontal cortex and other areas of the brain involved in attention and information processing. Due to the neuroplasticity of the brain, it is possible that the changes that result from frequent mindfulness training are not only functional but also structural. The "mindful" brain is linked to an adaptive and functional emotional style, thus mindfulness training may be a significant emotion regulation strategy (Davidson and Begley, 2013). Mindful attention awareness may also be linked with SPS and resilience; it moderates future negative consequences in adverse environmental conditions. This general association should be emphasized among employees and taken into account in prevention and intervention programs that are designed to reduce the possible health consequences of work-related stress. For highly sensitive young people, joining the labor market may be associated with a high level of stress. Analysis of the factors that increase resilience may allow cognitive strategies to be implemented (or at least considered) that facilitate young persons' job searches and adaptation to new professional circumstances, thus increasing wellbeing in future employment.

Understanding individual temperamental predisposition is important at any stage of employment, but it may be particularly valuable and profitable in the early stage, i.e., during the transition to the labor market. In this period, highly sensitive young adults may especially need emotional support with identifying their own dispositions, making choices, and making decisions considering the specificity of their functioning. The transition from education to professional work may be associated with high stress as it is a new unknown situation of great importance for further professional development and living conditions. Taking

jobs for which they are over-qualified may have a negative influence on young adults' self-esteem and significantly impact their future professional career and aspirations. Negative experiences when job-seeking may cause states of discouragement, anxiety, loss of self-confidence, symptoms of depression, and even suicidal thoughts (Lim et al., 2018). On the other hand, early unemployment may have long-term consequences, including the risk of future unemployment, lower earnings, discouragement, inability to acquire new skills, or unsatisfactory results during subsequent job interviews (Bradley and Nguyen, 2003). Therefore, it seems particularly important to consider the factors that could protect young employees' wellbeing.

Analysis of the relationships between sensitivity, mindfulness, and resilience may help to determine the regulating strategies that are crucial for facilitating adaptive ways of functioning in a demanding environment. It was assumed that the moderating variable between a constant trait that results from the specificity of the nervous system (SPS) and mental resilience (a disposition that can be developed) is mindfulness, which may be specific to highly sensitive people due to their increased depth of processing, sensing of nuances, and reflectiveness.

RESEARCH MODEL AND METHODS

Regarding the influence of cognitive processes on emotion regulation and coping with stress, in this work, we will analyze the relation between specific aspects of SPS and resilience; we will also test the possible moderating role of mindful attention awareness (**Figure 1**). The following hypotheses were formulated as:

H1: The higher the level of emotional reactivity, the lower the level of resilience.
H2: The higher the level of overstimulation, the lower the level of resilience.
H3: The higher the level of sensing the subtle, the higher the level of resilience.

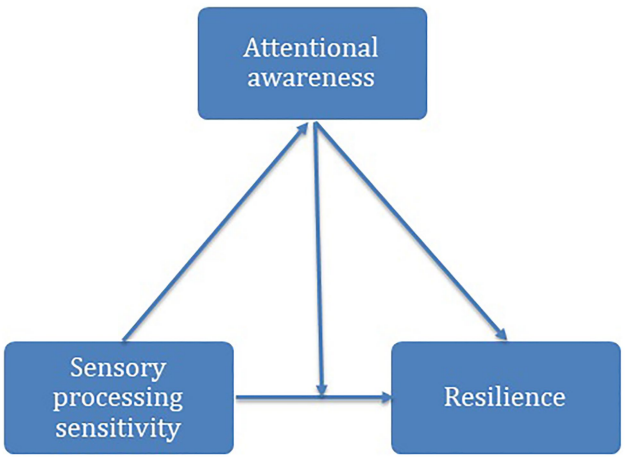

FIGURE 1 | Theoretical model of the relationships between sensory processing sensitivity (SPS), attentional awareness, and resilience.

H4: Sensory processing sensitivity and mindful attentional awareness are significant predictors of resilience.
H5: Attentional awareness is an important factor that moderates the relationship between sensory processing sensitivity and resilience.

In the exploratory analysis, we will also test the relationships between attentional awareness and SPS. To test the hypotheses, correlation (H1–H3), regression (H4), and moderation analyses (H5) will be performed.

The research model and the specifications of the tested variables are presented in **Figure 2**.

Participants and Procedure

The sample consists of 273 young adults (239 women, 87.5%; 25 men, 9.2%; and 9 other, 3.3%). The study was targeted at young people; therefore, the participants were mainly students (66.3%) and graduates (26.7%). The mean age was $M_{age} = 24.12$ years, $SD = 6.59$ years. Most participants were single (57.9%) or in an informal relationship (35.5%).

The study was voluntary; the procedure was conducted in accordance with the recommendations of the Helsinki declaration and was accepted by the Research Ethics Committee of the Institute of Applied Psychology, Jagiellonian University in Kraków. The research was conducted online using the university servers. Participants were invited to the study *via* social media and the official Web site of the Institute of Applied Psychology of Jagiellonian University. Thus, the study sample represents a university population prior to joining the workforce: Participants were mainly psychology students, whose characteristics are typical of such a sample, i.e., the sample consists mainly of women.

Questionnaires

Three self-report instruments were used in the study: the *highly sensitive person scale* (HSPS) to measure the level of SPS; the *mindful attention awareness scale* (MAAS) to measure cognitive characteristics; and the *resiliency assessment scale* (RAS) to measure resilience.

The HSPS by Aron and Aron (1997) consists of 27 items that are answered on a 7-point scale from 1 (*not at all*) to 7 (*extremely*). The Polish version was developed by the authors of this work. Smolewska et al. (2006) indicate that HSPS has a three-factor structure: *Ease of Excitation* (EOE, 12 items), *Aesthetic Sensitivity* (AES, 6 items), and *Low Sensory Threshold* (LST, 7 items). In Smolewska et al.'s study, the three distinguished subscales explained 40.5% of the total variance and demonstrated strong reliability: Cronbach's alpha of 0.89. The three-factor structure of the scale has been confirmed in many studies (Smolewska et al., 2006; Evers et al., 2008; Grimen and Diseth, 2016; Lionetti et al., 2018). There are also one-factor (Aron and Aron, 1997), two-factor (Evans and Rothbart, 2008; Ershova et al., 2018), and even six-factor (Blach, 2015) solutions. In the presented study, Cronbach's alpha was 0.88. We demonstrate the three-factor solution, which explains 41% of variance. The factors distinguished in this analysis are similar to those

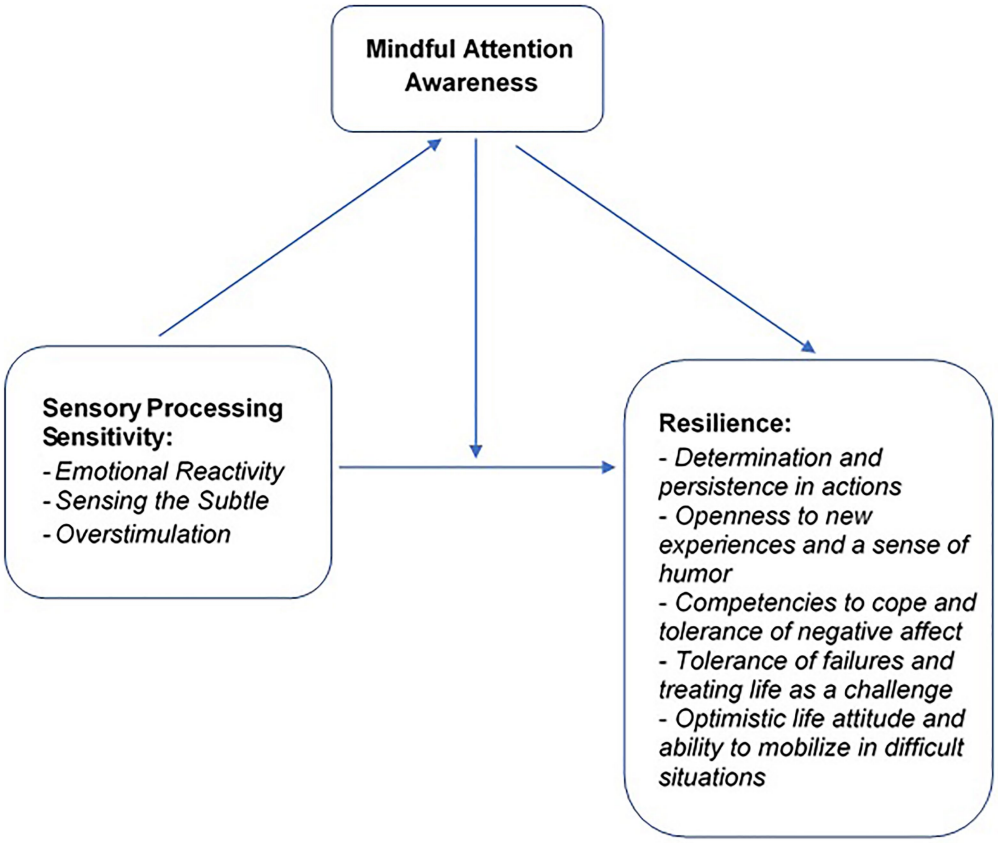

FIGURE 2 | The research model of the tested variables and their relationships.

presented by Smolewska et al. (2006). When analyzing the content of the items, we abstracted the following subscales: (1) *Emotional Reactivity* (ER, 12 items); (2) *Sensing the Subtle* (StS, 6 items); and (3) *Overstimulation* (OvSt, 7 items).

Brown and Ryan's (2003) MAAS consists of 15 items that are answered on a 6-point scale, from 1 (*almost always*) to 6 (*almost never*). The Polish version was developed by Radoń (2014) and has satisfactory reliability: Cronbach's alpha 0.81–0.85; stability 0.81–0.91. The scale can be used for people who have had no previous experience in practicing mindfulness. Mindful attention awareness is measured by MAAS as a one-factor construct; it is defined as a receptive state of attention which through awareness of current experiences enables open observation of what is happening (Brown and Ryan, 2003; Radoń, 2014). Research by Radoń (2014) indicates that mindfulness is significantly negatively related to level of rumination ($r = -0.33$; $p < 0.01$), neuroticism ($r = -0.26$; $p < 0.01$), emotional instability ($r = -0.25$; $p < 0.01$), lack of personality integration ($r = -0.24$; $p < 0.01$), and personality disorders ($r = -0.21$; $p < 0.01$); mindfulness is significantly positively related to openness to experience ($r = 0.34$; $p < 0.01$) and reflexivity ($r = 0.11$; $p < 0.01$).

Ogińska-Bulik and Juczyński's (2008) RAS was used to measure resilience to stress. RAS consists of 25 items that are answered on a 4-point scale, from 1 (*definitely not*) to 4 (*definitely yes*). Cronbach's alpha is 0.89 for the entire scale. The internal stability was measured with a retest after 4 weeks and is 0.85. Factor analysis revealed that the scale has a five-factor solution. The scale includes the following subscales: (1) *Determination and persistence in actions*; (2) *Openness to new experiences and a sense of humor*; (3) *Competencies to cope and tolerance of negative affect*; (4) *Tolerance of failures and treating life as a challenge*; and (5) *Optimistic life attitude and ability to mobilize in difficult situations*. The reliability of the five separate subscales ranges from 0.67 to 0.75. Each subscale consists of five items.

Data Analysis

The analysis was conducted using SPSS version 27 (IBM SPSS Statistics, IBM Corporation, United States) with the Proces_v3.5 module (Hayes, 2018). Correlation and regression analyses were performed to explore the relationships between SPS, mindful attention awareness, and resilience. Then, the moderation analysis was performed to explain the role of mindful attention awareness in the relationships between various aspects of SPS and resilience.

RESULTS

The Kolmogorov-Smirnov tests showed that most of the tested variables did not meet the assumption of normality; therefore,

Spearman's test was used for bivariate correlation to test hypotheses H1–H3. As the analyses of normal Predicted Probability (P-P) plots revealed that the residuals were normally distributed, and the assumptions of linearity, homoscedasticity, and the absence of multicollinearity (correlation between predictors lower than 0.08; variance inflation factor values below 5.00) were met, multiple linear regression and moderation analyses were performed to test hypotheses H4–H6 (Dawson, 2014).

The three components of the Polish version of HSPS accounted for 41% of the variance (eigenvalues: 7.18, 2.21, 1.69). The abstracted subscales were defined considering the content of the items and the DOES highly sensitive person model (Aron, 2017). SPS is defined by the following subscales: (1) *Emotional Reactivity* (ER); (2) StS; and (3) OvSt.

Correlation Analysis

The global HSPS score is significantly and negatively correlated with the overall result of the resilience scale and its four subscales: *Openness to new experiences and a sense of humor*; *Competencies to cope and tolerance of negative affect*; *Tolerance of failures and treating life as a challenge*; and *Optimistic life attitude and ability to mobilize in difficult* situations (**Table 1**).

The correlation coefficients obtained for the HSP scale subscales showed that different aspects of sensitivity relate differently to resilience. While *Emotional Reactivity* and *Overstimulation* were negatively related to almost all resilience subscales (except for a weak positive correlation between *Overstimulation* and *Determination and persistence in actions*), the HSPS *Sensing the Subtle* subscale showed completely different relations: significant positive relationships with the general resilience score and the subscales of *Determination and persistence in actions* (the strongest correlation), *Openness to new experiences and a sense of humor*, *Competencies to cope and tolerance of negative affect*, and *Tolerance of failures and treating life as a challenge* (in these relationships, significant but weak correlations were observed).

The analysis of the correlation coefficients gives support for hypothesis 1 (*H1*: The higher the level of emotional reactivity, the lower the level of resilience) and hypothesis 3 (*H3*: The higher the level of sensing the subtle, the higher the level of resilience).

The correlation between *Overstimulation* and the global score of the RAS, as well as the correlation, among the three RAS subscales was not significant; the significant correlation coefficients between *Overstimulation* and other RAS subscales were ambiguous: *Overstimulation* positively correlated with *Determination and persistence in actions*, but it negatively correlated with *Competencies to cope and tolerance of negative affect*; however, both correlations are weak. Thus, hypothesis 2 (*H2*: The higher the level of overstimulation, the lower the level of resilience) is not confirmed.

Moreover, significant positive correlations were observed between the *Sensing the Subtle* subscale and the *Mindful Attention Awareness* subscale. Significant positive relationships were found between attention awareness and the general resilience score as well as the RAS three subscales: *Determination and persistence in actions*, *Openness to new experiences and a sense of humor*, and *Tolerance of failures and treating life as a challenge*.

The obtained results might suggest that high sensitivity is linked with diminished resilience: The overall HSPS score negatively correlates with the overall RAS score. However, a negative relationship was observed only in one HSPS subscale, i.e., *Emotional Reactivity,* and this correlation is stronger than the overall HSPS score. A completely opposite relationship was observed between the HSPS *Sensing the Subtle* subscale and general resilience. This may indicate that if negative emotionality is dominant in one's "image" of one's high sensitivity, it actually may reduce the adaptive potential and the ability to cope with difficult situations. However, if the "image" of high sensitivity is dominated by the perception of nuances, subtleties, and positive emotions related to art, i.e., an individual is characterized by a rich inner life, self-awareness, and empathy toward others, these may influence adaptive potential and resistance in difficult situations. Additionally, the significant positive correlation between *Sensing the Subtle* and *Mindful Attention Awareness* may indicate that people with a high score in this HSP subscale are more focused on "here and now" and conscious presence; also, they are more aware of stimuli from the external and internal environment. Developing mindfulness can significantly contribute to counterbalancing negative emotionality and can influence individual wellbeing.

Regression Analysis

Regression analysis revealed that SPS and attention awareness are important predictors of selected aspects of resilience (**Table 2**). Consequently, the *Emotional Reactivity* and *Sensing the Subtle* HSPS subscales are significant predictors of general resilience and each tested aspect of resilience. They also influence resilience in an opposite way: Emotional reactivity has a negative influence, while ability to sense the subtle (StS) has a positive impact. Additionally, the *Overstimulation* subscale was found to be a significant predictor of general resilience and its subscales: *Determination and persistence in actions* and *Optimistic life attitude and ability to mobilize in difficult situations*. Interestingly, in both cases, it had a positive influence on resilience. Mindful attention awareness was shown to be a significant predictor of the *Openness to new experiences and a sense of humor* and *Tolerance of failures and treating life as a challenge* resilience subscales, on which it had a positive impact. Thus, the results of the regression analysis confirm hypothesis 4 (*H4*: Sensory processing sensitivity and mindful attentional awareness are significant predictors of resilience).

Moderation Analysis

In the next step, moderation analysis was performed to evaluate the role of mindfulness in explaining how individual cognitive dispositions influence the relationship between temperamental characteristics associated with SPS and resilience. The type of model 1 (Hayes, 2018) was tested in numerous configurations in which sensitiveness (HSPS, ER, StS, and OvSt) was an exposure variable, mindful attention awareness was a moderator, and resilience and its different aspects (DPA, OH, CNA, TFC,

TABLE 1 | Descriptive statistics, Cronbach alpha, and the results of rho Spearman correlation between the scores of the highly sensitive person scale (HSPS), the mindful attention awareness scale (MAAS), and the resiliency assessment scale (RAS).

S.no	Variable	*M*	*SD*	*α*	1	2	3	4	5	6	7	8	9	10	11
1	HSPS	5.12	0.71	0.88	–										
2	ER	5.28	0.80	0.83	0.85***	–									
3	StS	5.41	0.80	0.71	0.57***	0.30***	–								
4	OvSt	4.77	0.79	0.79	0.87***	0.60***	0.38***	–							
5	MAAS	3.97	0.69	0.84	0.06	−0.07	0.18**	0.08	–						
6	RAS	2.47	0.55	0.90	−0.17**	−0.39***	0.22***	−0.07	0.18**	–					
7	DPA	2.39	0.75	0.79	0.09	−0.13*	0.35***	0.15*	0.21***	0.63***	–				
8	OH	2.99	0.59	0.59	−0.16**	−0.32***	0.15*	−0.10	0.22***	0.78***	0.29***	–			
9	CNA	2.31	0.71	0.74	−0.23***	−0.39***	0.14*	−0.12*	0.05	0.85***	0.44***	0.61***	–		
10	TFC	2.62	0.65	0.68	−0.17**	−0.31***	0.15*	−0.11	0.25***	0.79***	0.37***	0.63***	0.60***	–	
11	OM	2.05	0.74	0.74	−0.22**	−0.39***	0.08	−0.10	0.05	0.88***	0.44***	0.64***	0.75***	0.66***	–

*In HSPS: ER – Emotional Reactivity; StS – Sensing the Subtle; OvSt – Overstimulation. In RAS: DPA – Determination and persistence in actions; OH – Openness to new experiences and a sense of humor; CNA – Competencies to cope and tolerance of negative affect; TFC – Tolerance of failures and treating life as a challenge; and OM – Optimistic life attitude and ability to mobilize in difficult situations. (N = 273). *p<0.05; **p<0.01; ***p<0.001.*

and OM) were an outcome variable. **Figure 3** presents a model in which a significant interaction effect was observed as: Mindful attention awareness was a significant variable that strengthens the influence of the ability to StS on the coping with negative affect (CNA) competence, F (3,269) = 2.927, p = 0.034, R^2 = 0.032. The moderation analysis revealed that the moderator value that defines the Johnson-Neyman significance region (Hayes, 2018) was 3.979. When this value is higher, the higher the mindful attention awareness score, the stronger the positive interaction effect of sensing the subtle and attention awareness on coping and tolerance of negative affect.

This analysis shows that attentional awareness is a significant moderator between a selected aspect of SPS, namely, sensing the subtle, and a selected aspects of resilience, namely, competencies to cope and tolerate negative affect; this partially supports hypothesis 5 (H5: *Attentional awareness is an important factor that moderates the relationship between sensory processing sensitivity and resilience*).

DISCUSSION

The presented study focused on analyzing the relationship between sensitivity and resilience, taking into account cognitive aspects that may be important moderator of these relationships. We analyzed these relationships in a group of young adults during their transition to the labor market. The results showed significant relationships between SPS, attention awareness, and resilience. Specifically, the results indicate negative associations between emotional reactivity and resilience; and a positive association between sensing the subtle, mindful attention awareness, and resilience. The results of correlation analysis showed that some aspects of high SPS are individual resources that may significantly decrease resilience (i.e., emotional reactivity), while other (i.e., sensing the subtle) may increase it or have an ambiguous effect (i.e., overstimulation). Other research also presents some ambiguous associations between specific aspects of sensitivity and resilience. For example, research on high interpersonal sensitivity and resilience in young adults showed that the key moderating factor is the need for social approval, which can be a risk factor when it is high or a protective factor when it is low (Aydogdu et al., 2017). These findings indicate that interpersonal sensitivity can have two effects on resilience: It can increase or decrease mental toughness, depending on other individual characteristics.

Regression analysis showed that SPS is an important predictor of general resilience and each tested aspect of resilience: Emotional reactivity has a negative influence, while ability to StS has a positive effect. The tendency to be overstimulated was found to be a significant predictor of general resilience and its two subscales: *Determination and persistence in actions* and *Optimistic life attitude and ability to mobilize in difficult situations*. In both cases, it had a positive influence on resilience that could be linked with awareness of one's state and the ability to develop functional regulatory strategies in a state of overstimulation. As expected, mindful attention awareness was a significant predictor of resilience but only in two its aspects:

TABLE 2 | Multiple regression analysis for variables predicting general resilience and its subscales ($N = 273$).

		B	Std. Error	Beta	*t*	*p*	95% confidence interval of the B	
Model for Resilience	**Variables**						**Lower**	**Upper**
	Constant	2.891	0.277		10.441	<0.001	2.346	3.436
	ER	−0.421	0.044	−0.613	−9.470	<0.001	−0.508	−0.333
	StS	0.241	0.039	0.346	6.216	<0.001	0.165	0.318
	OvSt	0.070	0.033	0.142	2.153	0.032	0.006	0.134
	MAAS	0.041	0.041	0.052	1.005	0.316	−0.040	0.123
$R = 0.574$, $R^2 = 0.330$, Adj. $R^2 = 0.320$								
Model for Determination and persistence in actions								
	Constant	1.363	0.399		3.412	0.001	0.577	2.149
	ER	−0.382	0.064	−0.407	−5.954	<0.001	−0.508	−0.255
	StS	0.384	0.056	0.403	6.858	<0.001	0.274	0.495
	OvSt	0.147	0.047	0.218	3.132	0.002	0.055	0.239
	MAAS	0.066	0.060	0.061	1.116	0.266	−0.051	0.184
$R = 0.502$, $R^2 = 0.252$, Adj. $R^2 = 0.241$								
Model for Openness to new experiences and a sense of humor								
	Constant	3.112	0.322		9.671	<0.001	2.478	3.745
	ER	−0.301	0.052	−0.413	−5.837	<0.001	−0.403	−0.200
	StS	0.187	0.045	0.251	4.135	<0.001	0.098	0.275
	OvSt	0.006	0.038	0.012	0.170	0.865	−0.068	0.081
	MAAS	0.109	0.048	0.129	2.273	0.024	0.015	0.203
$R = 0.449$, $R^2 = 0.202$, Adj. $R^2 = 0.190$								
Model for Competencies to cope and tolerance of negative affect								
	Constant	3.704	0.377		9.831	<0.001	2.962	4.446
	ER	−0.512	0.060	−0.579	−8.469	<0.001	−0.631	−0.393
	StS	0.235	0.053	0.261	4.448	<0.001	0.131	0.339
	OvSt	0.071	0.044	0.112	1.613	0.108	−0.016	0.159
	MAAS	−0.076	0.056	−0.074	−1.346	0.179	−0.186	0.035
$R = 0.503$, $R^2 = 0.253$, Adj. $R^2 = 0.242$								
Model for Tolerance of failures and treating life as a challenge								
	Variables						Lower	Upper
	Constant	2.605	0.344		7.564	<0.001	1.927	3.283
	ER	−0.358	0.055	−0.444	−6.470	<0.001	−0.466	−0.249
	StS	0.213	0.048	0.260	4.417	<0.001	0.118	0.308
	OvSt	0.017	0.040	0.029	0.409	0.683	−0.063	0.096
	MAAS	0.169	0.051	0.181	3.301	0.001	0.068	0.270
$R = 0.498$, $R^2 = 0.248$, Adj. $R^2 = 0.237$								
Model for Optimistic life attitude and ability to mobilize in difficult situations								
	Constant	3.670	0.396		9.276	<0.001	2.891	4.449
	ER	−0.551	0.063	−0.597	−8.680	<0.001	−0.676	−0.426
	StS	0.188	0.055	0.200	3.382	0.001	0.078	0.297
	OvSt	0.109	0.046	0.164	2.338	0.020	0.017	0.200
	MAAS	−0.062	0.059	−0.058	−1.050	0.294	−0.178	0.054
$R = 0.495$, $R^2 = 0.245$, Adj. $R^2 = 0.234$								

ER – Emotional Reactivity; StS – Sensing the Subtle; OvSt – Overstimulation; and MAAS – Mindful Attention Awareness ($N = 273$).

Openness to new experiences and a sense of humor and *Tolerance of failures and treating life as a challenge*. This may lead to the conclusion that cognitive dispositions and strategies are of high importance in coping with stress and for improving individual wellbeing.

The results of the moderation analysis indicate that attention awareness training may be particularly helpful for highly sensitive persons as conscious presence significantly moderates the relation between sensing the subtle and CNA. Mindfulness training may be a substantial regulation strategy that can help cope with overstimulation and the consequences of high emotional reactivity. The importance of mindfulness training was demonstrated by Amemiya et al. (2020). A group of graduate students with high and low SPS participated in a yoga course. Mood and level of attention control were analyzed. Prior to starting the yoga course, the highly sensitive

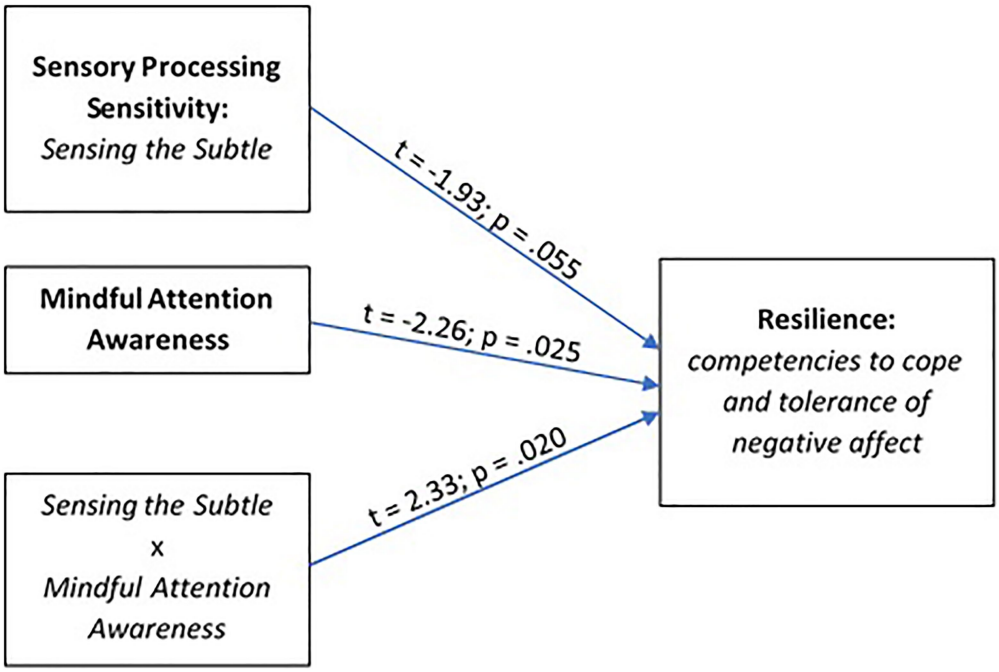

FIGURE 3 | The model of relations between SPS (*Sensing the Subtle* subscale) and resilience (*Competencies to cope and tolerance of negative affect* subscale) moderated by mindful attention awareness.

participants had lower attention control scores and a more negative mood than the less sensitive participants. However, attention control and mood scores improved in the group of highly sensitive participants after the yoga course. Although high SPS is associated with mental health risks, including symptoms of anxiety and depression (Liss et al., 2005), effective methods of regulation can be obtained by developing cognitive competences, especially communication skills, decision-making skills, and emotional coping skills (Yano et al., 2021). Yoga promotes attention and emotional control, therefore it can effectively counteract the feeling of being overwhelmed or overstimulated, consequently improving mood. The beneficial importance of yoga for mental health is also indicated by Büssing et al. (2012).

Complex effects related to high sensitivity were discussed in research that indicated the significant influence of external conditions. Boyce and Ellis (2005) indicate that reactivity to stress is not a linear process that leads to increased arousal; it also includes circuits that are used to modify or alleviate it. Depending on the context, hyperresponsive phenotypes may have positive and negative consequences, i.e., both risk-increasing and protective effects. The effects of highly responsive phenotypes are more bivalent than univalent; they have both risk-increasing and protective effects, depending on the context. According to Boyce and Ellis (2005), increased stress responsiveness reflects biological context sensitivity; it has potentially negative effects under adversity and positive effects under supportive and protective conditions. This is in line with the findings of De Villers et al. (2018), who indicate that highly sensitive persons may benefit much more from positive interventions than less sensitive people; this includes responses to psychotherapeutic intervention and the influence of social support.

High sensitivity and its possible consequences for an individual may be analyzed in context of stress models. Belsky and Pluess (2009) note that the *Diathesis-Stress* model (Monroe and Simons, 1991) focuses on individual differences (risk factors) in exposure and susceptibility to stressful situations, while the concept of *Differential Susceptibility* (Belsky et al., 2007) includes both negative and positive responses to environmental requirements. In the *Diathesis-Stress* concept, non-susceptibility equates to resistance. Within the framework of the *Differential Susceptibility* theory, Pluess and Belsky (2013) propose the *Vantage Sensitivity* model, which focuses on the individual differences (protective factors) that give an adaptive advantage as a result of benefiting from positive experiences. The *Vantage Sensitivity* model focuses on the benefits of positive interactions, while resilience stands for *Vantage Resistance*, which focuses on the benefits of coping with negative experiences. In these terms, highly sensitive sensory processing offers an adaptive advantage not only in terms of the "control pause" (stopping an action, analyzing situations, and reflecting), but also by making full use of positive experiences. The reference to the *Vantage Sensitivity* concept makes it possible to treat high SPS as a resource that allows one to take full advantage of positive exposures, focus on the positive aspects of events, and refer to positive past experiences in new situations.

Wyller et al. (2017) proposed a model whose basic thesis is the assumption that the negative effects of stress are not caused by the sensitivity of sensory processing itself: Instead, maladaptive content and overwhelming emotions are considered

to be the result of cognitive reactivity. In the concept of cognitive reactivity, attention shifts from external stressors to internal negative thoughts, beliefs, or prejudices. This indicates that distress can occur even without exposure to strong negative environmental stimuli. Highly sensitive people perceive negative stimuli more intensely, which in turn intensifies negative emotions and negative cognitive processing, thus creating vicious circles that result in symptoms of anxiety and depression or somatic complaints. Emotional regulation strategies mediate between the sensitivity of sensory processing and psychological distress. Psychological interventions that target cognitive reactivity have a greater chance of success than interventions aimed at SPS, which is difficult to modify. Wyller et al. (2017) propose increasing the ability to shorten "self-propelling erroneous cycles" as the main goal of the intervention.

Harms et al. (2019) oppose perceiving high sensitivity in terms of weakness and indicate that highly sensitive people can be very entrepreneurial because they process environmental and social stimuli more deeply and perceive social signals faster: They can quickly recognize opportunities; they are empathetic and creative. By engaging in entrepreneurship, they can shape their work environment in a way that suits them, e.g., by determining the rhythm of work and the level of workload. As a result, they may be more independent and successful. The research of Harms et al. (2019) showed relationships of complex causality. The ability to recognize opportunity turned out to be a core factor, and its combination with SPS or with the entrepreneurial trait profile created sufficient conditions for the emergence of entrepreneurial intention. Traditionally, entrepreneurs are viewed as extroverted, open-minded, and conscientious, but the meta-trait of high sensitivity creates an alternative path. The necessity to adjust the working environment to the unique needs of highly sensitive people may stimulate their willingness to act as entrepreneurs. SPS reflects perceived desirability, while the ability to recognize opportunities reflects perceived feasibility. Both these aspects reflect the entrepreneurial trait profile and are crucial in achieving goals.

The sample consisted of young adults, mostly at the stage of entering the labor market. In this period, highly sensitive young people who are leaving education and looking for employment may experience a high level of stress due to, for example, social exposure, assessments, and potential rejection by prospective employers. Since high SPS can result in a high level of distress, anxiety, and a sense of overload, the search for protective factors is important in order to maintain the wellbeing and efficient functioning of highly sensitive people, especially in relation to potentially stressful situations, such as transition to the labor market. This process can be viewed in terms of self-regulatory, autonomous, goal-oriented, and proactive processes (Van Hooft et al., 2013; Wanberg et al., 2020). The three dimensions of a job search are the effort put into it, the quality of the search (activities in which the person engages), and persistence, which means the continuity or variability of efforts over time. Jobseekers must develop a strategy for daily action plans; they must also motivate themselves and initiate or modify their behavior based on feedback from the environment. Contextual factors (such as the unemployment rate in the region, the specificity of existing workplaces, the level of economic development, and cultural conditions), factors relating to the professional situation, and the preferences of employers should be taken into consideration. Additionally, in order to achieve success, jobseekers should control negative emotions, maintain openness to new suggestions, and strengthen their sense of internal control and self-efficacy, all of which are helpful in maintaining a persistent pursuit of the goal. According to Van Hooft et al. (2013), the four-stage cyclical self-regulatory model of the job search process includes the following phases:

- goal establishment (selecting a goal, goal commitment, goal clarity, and organized goal hierarchy).
- planning goal pursuit (strategy selection, selecting and forming intentions, prioritizing, preparation, deadline setting, and forming implementation intentions).
- goal striving (self-control of attention, thoughts, emotions, motivation, behavior, goal maintenance, self-monitoring, and active feedback seeking).
- reflection (evaluation of performance in the light of the established goals, attribution of potential failures to changeable causes, learning from failures, and self-rewarding).

The variables included in this model are largely related to the abilities to reflect, focus attention, self-motivate, emotionally regulate, and learn from experience. On the one hand, highly sensitive people, due to their excessive emotional reactivity and tendency to be overstimulated, may experience failures more strongly, become discouraged easily, or be overwhelmed by the novelty of the situation and excessive stimulation. However, regarding their deep processing, they may also be fully aware of their emotions, regulate their intensity and duration, distance themselves from the situation, present it in a wider perspective, relate current goals to priorities, refer to their values in goal selection, or change the situational context. The ability to perceive demanding or difficult situations in a nuanced way may constitute an adaptive resource. It is possible that perception of difficult situations depends on both early experiences (as suggested by Aron, 2017) and on competences related to mindfulness, thus facilitating the reception of external and internal stimuli and their deep and reflective multi-level analysis. This may develop the potential of a highly sensitive persons, thus improving their wellbeing and health.

According to research, highly sensitive persons may constitute about 25–30% of the population (Aron and Aron, 1997; Lionetti et al., 2018) and may cope worse than others in difficult situations if their sensitivity is not accompanied by mental resilience. Elst et al.'s (2019) analysis of the professional situations of highly sensitive people showed that high sensitivity should be treated as both a personal resource and as a risk factor that increases susceptibility to work-related stress. High sensitivity can strengthen the relationship between job demands and the feeling of exhaustion; it can

do the same for the relationship between work resources and supportive behavior toward co-workers. In Elst et al.'s research, EOE and LST were found to positively moderate the relationship between job demands and emotional exhaustion. However, low sensory threshold positively moderated the relationship between resources in the workplace and supportive behaviors. The role of each of the three components of high sensitivity turned out to be different. Bakker et al. (2014) analyzed high SPS in the context of the Job Demands-Resources model. Elst et al. (2019) emphasized that the high-sensitivity trait may act as both a risk factor and a personal resource, depending on the perceived nature of the work environment. Employees with a high level of SPS react more strongly not only to negative aspects of the work environment but also to positive experiences, relationships, and circumstances, which can they therefore use more fully than others. Under optimal conditions, highly sensitive individuals can function excellently, but when faced with increased professional demands they may feel overwhelmed and overstimulated. Highly sensitive people are therefore more susceptible to the conditions prevailing in the work environment. Elst et al.'s study provided evidence for the phenomenon of differential susceptibility to the work environment and developed the Job Demands-Resources model by adding SPS as a new feature that is essential for employee functioning in the workplace.

The study has raised a number of methodological questions. High sensitivity, tested by Aron and Aron's (1997) scale, includes two subscales related to emotionality (12 *Emotional Reactivity* items and 7 *Overstimulation* items) and only one scale referring to the perception of nuances and subtleties and deeper processing of stimuli (6 *Sensing the Subtle* items). The proportion of items indicates that the overall HSPS score is influenced by two scales reflecting aspects of emotional sensitivity (*Emotional Reactivity* and *Overstimulation*), which may be close to neuroticism in the case of high scores (Evans and Rothbart, 2008, 2009). On the other hand, the potential advantage of high sensitivity may be underestimated as there is only one *Sensing the Subtle* subscale, which has the least items. Moreover, the positive and negative effects of high sensitivity may neutralize each other; therefore, it is particularly important to specify different aspects of SPS instead of analyzing the overall HSPS score. The other aspects that are important to emphasize are the negative way in which questions are formulated (Greven et al., 2019) and the inconsistent results of factor analyses in various studies (e.g., Aron and Aron, 1997; Smolewska et al., 2006; Evans and Rothbart, 2008; Blach, 2015; Lionetti et al., 2018). It seems valuable to specify the nature, strength, or quality of a stimulus that is considered to be discomforting for the examined person. In addition, it seems that the measure of high sensitivity would be stronger if it could examine the "control pause" mechanism. For further studies, it would be valuable to explore physiological indicators of SPS in different tasks and contexts. Moreover, as noted by Wyller et al. (2017), neither the heterogeneity within the high-sensitivity category nor the variability of individual sensitivity over time are taken into account in theory and research; the development of interventions that could facilitate the functioning of highly sensitive people would be more practical if a certain level of plasticity in terms of the phenotype was assumed.

Limitations

The limitations of the presented research are associated with the characteristics of the study sample, which consists of young adults (mainly students) and is not representative. The obtained results should be verified in a sample that is more varied in terms of gender, age, and employee status. The study sample consists mainly of women; therefore, in future studies, it is important to balance the ratio of women and men. The limitations are related to the online character of the study and the lack of control over completion of the survey. Additionally, we used self-report questionnaires, which may be biased by current emotional state and expectations. In future research, it would be valuable to test the moderating effect of attention awareness in the experimental design by analyzing how highly sensitive persons may be supported through cognitive training in, e.g., demanding contexts or stressful situations, and analyze how such cognitive training may influence their stress response.

CONCLUSION

The results indicate significant relationships between SPS and resilience, and a significant moderating role of mindful attention awareness. Mindfulness was found to strengthen the association between the ability to StS and to tolerate negative affect. Thus, it may be particularly important to involve highly sensitive employees in training dedicated to attention awareness and conscious presence. Highly sensitive persons with the dominant characteristics of high emotional reactivity and a tendency to be overstimulated may especially need support to take advantage of the protective factors associated with high sensitivity, i.e., sensing the subtle, detecting nuances, and seeing things from different perspectives, all of which result in deeper analysis and greater reflectivity. Applying cognitive strategies in stress-related contexts may be crucial for coping with difficulties and improving individual wellbeing.

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 Research Ethics Committee of the Institute of Applied Psychology, Jagiellonian University in Kraków. Written informed consent for participation was not required for this

study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

BG and KG: substantial contributions to the conception and design of the work, acquisition, analysis, interpretation of data, drafting the work, revising it critically, final approval of the version to be published, and agrees to be accountable for all aspects of the work. All authors contributed to the article and approved the submitted version.

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Study Engagement and Burnout of the PhD Candidates in Medicine: A Person-Centered Approach

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This study focused on exploring individual variations in doctoral candidates' well-being, in terms of experienced research engagement and burnout by using a person-centered approach. In addition, the associations between well-being profiles and gender, country of origin, study status (full-time or part-time), research group status and drop-out intentions were explored. The participants were 692 PhD candidates in the field of medicine. Latent profile analysis was employed to identify the well-being profiles. Four distinct profiles were identified: *high engagement–low burnout, high engagement–moderate burnout, moderate engagement–moderate burnout*, and *moderate engagement–high burnout.* Working in a clinical unit or hospital and working in a research group seemed to be related to increased engagement and reduced risk for suffering burnout, while the intentions to quit one's doctoral studies were more frequently reported in profiles with moderate levels of engagement. The findings imply that although a significant number of PhD candidates in medicine had an increased risk for developing burnout, for most of the PhD candidates research education is an engaging experience.

Keywords: burnout, drop-out, PhD candidate, research engagement, well-being

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INTRODUCTION

Undertaking a doctoral degree provides both highs and lows, potentially significantly reducing or increasing PhD candidates' well-being (e.g., Stubb et al., 2011; Divaris et al., 2012; Caesens et al., 2014; Hunter and Devine, 2016; Swords and Ellis, 2017). Yet, previous research on the topic has focused heavily on the negative attributes such as stress (e.g., Oswalt and Riddock, 2007; Pappa et al., 2020), depression (e.g. Peluso et al., 2011; Levecque et al., 2017), anxiety (e.g., Barry et al., 2018; Liu et al., 2019), and exhaustion (e.g., Hunter and Devine, 2016), while positive aspects of PhD experience have been studied to a lesser extent (Barnes and Randall, 2012; Sverdlik et al., 2018; Pyhältö et al., 2019). In particular, the number of studies exploring the combination or co-existence of positive and negative attributes of PhD candidates' well-being is limited (for an exception, see Stubb et al., 2011), although PhD candidate's well-being cannot be reduced simply to an absence of negative experiences (Schmidt and Hansson, 2018).

A large body of research has indicated that the risk of burnout among physicians and other health care workers is high (van Vendeloo et al., 2018; Dyrbye et al., 2020; Woo et al., 2020). The COVID-19-pandemic has further increased the risk of burnout among health care workers (Chirico et al., 2021; Magnavita et al., 2021). In contrast, we know little about the well-being of research-active employees in the medical fields. Based on the literature on doctoral education, PhD candidates working in the medical context have rarely been studied. The medical research context is affected by the culture and hierarchy of the wider organizational culture of health care and hospital hierarchy, likely affecting PhD candidates' well-being (Kusurkar et al., 2021). Furthermore, there are at least two distinct subgroups of PhD students in these contexts (Naylor et al., 2016): those who also work clinically and those working in the basic sciences. These two groups of PhD candidates often work under very different conditions, within the same medical university setting (Naylor et al., 2016). More context-specific studies into PhD candidates in medical research education and the differing subgroups of PhD candidates in medicine have been called for (Naylor et al., 2016; Kusurkar et al., 2021).

In this study, we aimed to explore the individual variation in well-being among PhD candidates in medicine by employing a person-centered approach. We focused on identifying burnout-engagement profiles employed by PhD candidates in the medical fields, and how they are related to working in a clinical unit or hospital, study status (full-time or part-time), research group status, and drop-out intentions. Also, differences between international and native (Swedish) PhDs candidates, and men and women were examined.

PhD Candidates' Well-Being

PhD candidates' study well-being is a multidimensional construct referring to a combination of positive mental states, such as satisfaction, self-efficacy or/and study engagement, and absence of extensive and severe negative ones such as burnout or strain related to doctoral studies, further contributing to a candidates ability to pursue their study goals (Korhonen et al., 2014; Widlund et al., 2018). Study well-being is constructed in an interplay between demands and resources of the PhD. candidate and their doctoral study environment (see on study well-being among undergraduates Salmela-Aro and Upadyaya, 2014). In this study, we explore PhD. candidates' study well-being in terms of study engagement and burnout. It has been suggested that s*tudy engagement* is a symbol of an optimal PhD experience, characterized by vigor, dedication, and absorption (Schaufeli et al., 2002b; Salmela-Aro and Upadyaya, 2012). Among PhD candidates, engagement is typically manifested as high levels of energy and mental resilience while working with one's doctoral research, a strong willingness to invest effort in the doctorate, a sense of significance, enthusiasm, and inspiration, and being fully focused on one's work, whereby time passes quickly (Virtanen and Pyhältö, 2012; Vekkaila et al., 2013, 2014). Engagement in doctoral study has been shown to be positively related to study progress and negatively to drop-out intentions (Castelló et al., 2016).

Study burnout, in turn, refers to a negative study experience that is characterized by two core symptoms, exhaustion and cynicism, resulting from prolonged stress (Schaufeli et al., 2002a; Salmela-Aro et al., 2009). Exhaustion refers to lack of emotional energy and chronic fatigue (Maslach and Jackson, 1981), and cynicism refers to alienation from one's studying, perceiving them as meaningless and losing interest in them (Maslach, 2003). Burnout during doctoral study has been shown to be related to delaying doctoral study and intending to quit them (Pyhältö et al., 2012; Anttila et al., 2015; Hunter and Devine, 2016; Cornér et al., 2017; Barry et al., 2018).

In variable-based studies, study engagement and burnout have typically been found to be negatively related to each other (Schaufeli et al., 2002a; González-Romá et al., 2006; Salmela-Aro and Upadyaya, 2012; Swords and Ellis, 2017). This means that the PhD candidates experiencing high levels of study engagement are likely to experience low levels of study burnout and vice versa. However, various combinations of study engagement and burnout are also possible (Tuominen-Soini and Salmela-Aro, 2014; Salmela-Aro and Read, 2017). For example, a PhD candidate can be highly engaged in their doctorate, but simultaneously experience high levels of exhaustion. A reason for this might the gradual development of burnout: burnout typically begins with exhaustion, and then, if working conditions remain the same, also the levels of cynicism increase (Maslach and Leiter, 2016). Studies using a person-centered approach to explore PhD candidates' study engagement and burnout simultaneously are scarce, resulting in a lack of knowledge about individual variations in the study well-being of PhD candidates in medicine. In addition, it is not known how different study well-being profiles are related to individual and contextual factors.

Antecedents of PhD Students' Study Well-Being

Research has identified several individual and contextual antecedents of PhD candidates' well-being. For instance, gender has been shown to be associated with study well-being, yet the evidence is mixed: although there is some evidence showing that female PhD students experience more stress and exhaustion than males (Toews et al., 1997; McAlpine et al., 2020), there is also evidence of male postgraduates being more likely to experience increased levels of exhaustion than their female colleagues. Hunter and Devine (2016), on the other hand, showed that PhD students' gender was not associated with their experiences of exhaustion. The mixed findings imply that gendered impact may be dependent on the socio-cultural or disciplinary practices.

Some differences between international and native PhD candidates have also been reported. It has also been suggested that international PhD candidates are more career-oriented and more satisfied with their doctoral studies, which might make them more likely to experience research engagement compared to native PhD candidates (Harman, 2003; Sakurai et al., 2017). However, international PhD candidates have also been shown to experience stress due to a lack of a supportive network

(Pappa et al., 2020), which increases their risk of burnout. Yet, evidence concerning the differences between domestic and international PhD candidates' well-being is particularly limited.

Working conditions can be expected to have an impact on the well-being of PhD candidates in the medical fields. First, it has been suggested that the PhD candidates who are involved in clinical work experience high work strain due to constant balancing with their clinical or patient responsibilities and PhD research (Kusurkar et al., 2021), which makes them prone to burnout experiences. On the other hand, there is also evidence that real work-life experiences such as clinical work can inspire candidates in their doctoral studies, and thus contribute to increased engagement (see Vekkaila et al., 2013). In a qualitative case study, comparing clinically active and basic science PhD candidates in the same context, Naylor and others (2016) showed that clinical doctoral candidates were initially less competent in basic research skills than candidates who had learned these skills at earlier stages of their basic science education. An adjustment from an established position at the clinic to being a junior researcher in the laboratory was challenging. On the other hand, financial stress characterized the experience of the science candidates more than that of the clinicians. Clinical PhD candidates also saw research education as being more clearly connected to career opportunities in the future than their basic science counterparts in the same setting did. Perceived employment opportunities have been associated with lower burnout levels in biomedical PhD candidates (Nagy et al., 2019). Differences in the working conditions of medical PhD candidates may thus affect the levels of burnout and engagement in differing ways.

Research group status, i.e., whether the PhD candidate is undertaking their doctoral research within a research group or alone, can be assumed to have impact on study well-being. Research group has been shown to be an important source of social support to PhD candidates, and hence, working in a research group can be assumed to increase the experienced engagement (Stubb et al., 2011; Peltonen et al., 2017). However, it has also been found that working within a research group can be a source of stress (Stubb et al., 2011). Moreover, study status, i.e., whether the PhD candidate is undertaking their degree part-time vs. full-time, may have an impact on their study well-being. Yet, the evidence in this regard is partly contradictory. While those who work full-time are shown to be more satisfied with their supervision and perceive the scholarly community as empowering compared to those who work part-time (Stubb et al., 2011; Pyhältö et al., 2016), candidates working part-time are shown to be more satisfied with their mental health and friendships (Isohätälä et al., 2017).

AIM OF THE STUDY

The aim of the study was to understand the individual differences in study well-being among PhD candidates in medicine. More specifically, we explored the PhD candidates' study engagement–burnout profiles and their associations with background variables that have previously shown to be associated with PhD candidates' well-being [i.e., gender, country of origin, and study status (i.e., whether they were completing their doctorate full-time or part-time], and research group status). We also explored whether PhD candidates classified into different study well-being profiles differed in their intensions to drop out from doctoral studies. The following general hypotheses were formulated:

H1: Different study engagement–burnout profiles can be detected among PhD candidates in medicine, ranging from profiles with high levels of burnout and low levels of engagement to profiles with low levels of burnout and high levels of engagement.
H2: The PhD candidates in the different study well-being profiles differ from each other in terms of gender, country of origin (i.e., domestic/international), and whether they are completing their doctorate full-time or part-time, and whether they work in hospital/clinical unit or not, and whether they worked with their doctorate alone or as a part of a research group (i.e., research group status).
H3: The PhD candidates with different study well-being profiles differ in their intentions to quit the doctoral studying, i.e., the students with high levels of burnout and low level of engagement are more likely to consider dropping out from the doctorate than those with low levels of burnout and high levels of engagement.

MATERIALS AND METHODS

Research Context

This study had a cross-sectional design. The data were collected during 2015–2016 through a web-based survey using a secure platform (Artologik). The survey was conducted in English. All PhD candidates at Karolinska Institutet with an activity rate of more than 10%[1] received an invitation to participate in the survey. Karolinska Institutet is a research-oriented medical university with more than 2000 PhD candidates enrolled. "Medical" is understood as an umbrella term encompassing a wide array of fields with a connection to medicine: From clinical research to a wide variety of basic research topics in microbiological and life sciences. Several allied health sciences, behavioral and medical social sciences, such as nursing, physiotherapy, occupational therapy, psychology, medical ethics, and management are also represented.

All participants were enrolled in the same university-wide research education program and have the same overall formal requirements for their training, regarding the number of credits required from research education courses, general criteria for quality of research work, and basic structures of supervision and quality control of the research education process. However, within that universal organizational framework there is great variation in terms of the topics investigated, practices of individual research groups and supervisors and departmental structures.

[1]Time devoted to a thesis is more than 4 h/week.

There are clinical and basic science PhD candidates at Karolinska Institutet. The clinical PhD candidates typically work within two organizations: The hospital clinic or another health care organization (the manager or supervisor of the clinical work being the person the clinician reports to) and another one in the research group on the university side (the main doctoral supervisor most often being the candidate's responsible manager). The basic science PhD candidates only work within one organization, the university, and have their main supervisor in doctoral education.

In Sweden, all PhD candidates are fully financed, meaning that they get a monthly salary. Their salary level depends on a variety of factors, mainly the source of finance (for example, grants from abroad, external competitive research funding, research funding from medical industry, or funding provided by the healthcare system for their employees). Clinical PhD candidates typically have considerably higher salaries than their basic science counterparts.

The context of the current study is similar to many other natural science contexts in that much of the research work is done within a research group, and a collaborative "teamwork research training structure" (Chiang, 2003) is prevalent. However, there is considerable variation in this regard. At least two co-supervisors in addition to a main supervisor is an organizational norm.

Participants

In total, 2044 PhD candidates were invited and 692 responded to the survey (response rate 34%). PhD candidates were all in the medical fields. Of the participants, 61.3% were females and 36.6% males. The age of the participants ranged from 24 to 88, the mean being 35 years. Forty six percent of the participants ($n = 320$) were Swedish and 53% ($n = 366$) were from another country. Of the participants, 67.2% ($n = 465$) reported that they were completing their doctorate full-time and 32.7% part-time. Nearly one-third (32.7%, $n = 226$) of the participants were working in a hospital or a clinical unit. The proportion of those working mainly on their own with their doctorate was 54.8% ($n = 379$), and 44.4% ($n = 307$) of the participants reported that they were working in a research team.

Participants were informed that participation was completely voluntary and that they may withdraw from the study at any time without providing any explanation. They were also informed that all of the data which they provided would be strictly anonymous and treated confidentially, responses to the survey would not be linked to any other personal data and that analyses would be made at the group level. Before completing the survey, participants indicated that they had read and understood the information provided above and whether they agreed to participate in the study. The research was approved by the Swedish Central Ethical Review Board (Ref. No#2015/1626-31/5).

Measures

The participants completed the cross-country doctoral experience (C-DES) survey (see C-DES manual Pyhältö et al., 2018; Castelló et al., 2018). In this study, we used the following C-DES-scales to study PhD students' study well-being: (1) *research engagement* (5 items) and (2) burnout in studying consisting of two factors: (a) *exhaustion* (4 items) and (b) *cynicism* (5 items). All items were rated on seven-point scales (1 = not at all, 2 = very rarely, 3 = rarely, 4 = sometimes, 5 = often, 6 = very often, 7 = all the time; See **Appendix 1** for the items). Mean variables were formed to represent research engagement, exhaustion, and cynicism in studying. The Cronbach alpha reliability and descriptive statistics of the subscales are shown in **Table 1**.

Data Analyses

A latent profile analysis (LPA) was used to identify subgroups of individuals based on their experiences of study engagement and burnout. LPA is a person-centered approach that involves grouping individuals into latent classes based on their observed response patterns on specific variables instead of exploring the relationships between the variables (Berlin et al., 2014). LPA provides statistical criteria for model comparisons in selecting the best-fitting number of latent classes and opportunity to include predictors and outcomes compared to other clustering approaches (e.g., Vermunt and Magidson, 2002; Morin et al., 2018). The analyses were carried out using Mplus version 8.6 and MLR estimator that produces maximum likelihood estimates with standard errors and χ^2test statistics that are robust to non-normality (Muthén and Muthén, 1998–2017). Within-class variances were held constant across classes. We used several statistical criteria to choose the best fitting model: The Akaike (AIC), the Bayesian (BIC), adjusted Bayesian (aBIC) information-based measures of fit, and a Vuong-Lo-Mendell-Rubin (VLMR) and Lo-Mendell-Rubin (aLRT), and bootstrapped (BLRT) likelihood ratio tests (Nylund et al., 2007; Berlin et al., 2014). In addition, the theoretical meaningfulness of the profile solution was emphasized in selecting the number of profiles. The average latent class probabilities and entropy values were used to evaluate the clarity of different profile solutions.

To explore whether the PhD candidates with different study well-being profiles differed from each other in terms of background variables (gender, country of origin, working in clinical unit or hospital, study status (full-time or part-time), research group status), we used auxiliary Mplus command (Muthén and Muthén, 1998–2017). The background variables were included as antecedents of the latent class variable while accounting for the measurement error in classification (Asparouhov and Muthén, 2014). This analysis was carried out with the R3STEP procedure of Mplus that performs a multinomial logistic regression and provides the odds ratios describing the effect of background variables on the likelihood of membership in each of the latent profiles compared to other profiles (McLarnon and O'Neill, 2018). DCAT procedure for Mplus was used for examining whether candidates in different profiles differed from each other in terms of their intentions to quit studying for their doctorate.

RESULTS

The Study Well-Being Profiles

LPAs were run with 1–6 classes (**Table 2**). According to VLMR and aLRT likelihood ratio tests, adding a subsequent class

TABLE 1 | Descriptive statistics and correlations of the study variables.

	N	*α*	*M*	*SD*	Min/Max	1	2	3
1. Exhaustion	692	0.837	3.65	1.19	1/7	–		
2. Cynicism	692	0.895	3.00	1.35	1/7	0.56**	–	
3. Engagement	690	0.918	4.90	1.00	1/7	−0.22**	−0.60**	–

**$p < 0.001$.

TABLE 2 | Information criteria values for different profile solutions in LPAs.

No. classes	LogL (nf)	AIC	BIC	aBIC	Entropy	Latent class probabilities	VLMR	aLRT	BLRT	Class counts[a]
1	−3268.89 (6)	6549.77	6577.01	6557.96	N/A	1.00	N/A	N/A	N/A	
2	−3073.97 (10)	6167.93	6213.33	6181.58	0.72	0.93, 0.89	0.00	0.00	0.00	431, 261 (430, 262)
3	−2983.58 (14)	5995.16	6058.71	6014.26	0.80	0.93, 0.89, 0.90	0.00	0.00	0.00	286, 319, 87 (282, 325, 85)
4	**−2953.34 (18)**	**5942.67**	**6024.39**	**5967.23**	**0.80**	**0.93, 0.93, 0.86, 0.87**	**0.01**	**0.02**	**0.00**	**226, 62, 230, 174 (227, 60, 231, 174)**
5	−2927.05 (22)	5898.10	5997.97	5928.12	0.84	0.94, 0.94, 0.90, 0.86, 0.88	0.02	0.02	0.00	222, 7, 68, 222, 173 (223, 7, 69, 224, 169)
6	−2914.54 (26)	5881.09	5999.12	5916.56	0.85	0.92, 0.87, 0.97, 0.93, 0.86, 0.90	0.02	0.02	0.00	9, 170, 7, 221, 222, 62 (7, 169, 7, 223, 223, 63)

LogL, log likelihood value; nf, number of free parameters; AIC, Akaike information criterion; BIC, Bayesian information criterion; aBIC, adjusted Bayesian information criterion; VLMR, VuongLo-Mendell–Rubin likelihood ratio test; aLRT, Lo-Mendell-Rubin adjusted likelihood ratio test; BLRT, bootstrapped likelihood ratio test. The selected model is in boldface.
[a]*Profile counts based on estimated posterior probabilities and the classification of individuals based on their most likely latent profile membership (in parenthesis).*

increased the model fit all the way to six classes, while the information criteria (AIC, BIC, and aBIC) showed that adding a new latent profile enhanced the model fit all the way to five profiles. However, the elbow plot (**Figure 1**) showed that the BIC and aBIC values clearly decreased from one to four profiles, after which the decline levelled off. Therefore, the four-profile solution was selected. The four-profile solution was also considered to be the most parsimonious model, had a clear theoretical interpretation, and included profiles with sufficiently large memberships (i.e., >5% of the cases). The entropy value (0.80) and latent class probabilities (>0.80) also showed sufficient separation between the profiles in the four-profile solution showed sufficient separation between the profiles.

Four well-being profiles were identified (**Figure 2**). The first study well-being profile was *high engagement–low burnout* profile (see **Table 3**). It was the second most common profile among the participants with a 32.7 percent share ($n = 226$). The PhD candidates in this profile reported rather high levels of study engagement meaning that they often felt enthusiastic and inspired by their doctoral work. They reported low levels of cynicism, but moderate levels of exhaustion. However, when compared to other profiles, the exhaustion levels were lowest in this profile.

The second profile was *high engagement–moderate burnout* profile, and it was the most common profile among the participants with a 33.2 percent share ($n = 230$). The PhD candidates within this profile reported moderate levels of both exhaustion and cynicism, and high levels of study engagement. The third profile was *moderate engagement–moderate burnout* profile. It represented 25.1 percent of the participants ($n = 174$). The PhD candidates with this profile demonstrated moderate levels of study engagement, exhaustion, and cynicism. This means that although the PhD candidates within this profile felt rather inspired and enthusiastic about their doctoral studies, they also sometimes felt overwhelmed by the doctoral study related workload and perceived their doctoral studies as meaningless. The fourth profile was *moderate engagement–high burnout* profile. The PhD candidates with this profile reported high levels of both exhaustion and cynicism. The candidates' high levels of study burnout were combined with moderate levels of study engagement. This profile represented 9.0 percent of the participants ($n = 62$) being the least common profile.

The profiles differed statistically significantly ($p < 0.01$) from each other in all study variables, research engagement, exhaustion, and cynicism.

The Antecedents of Study Well-Being Profiles

Gender and country of origin did not have statistically significant relationships with study well-being profiles.

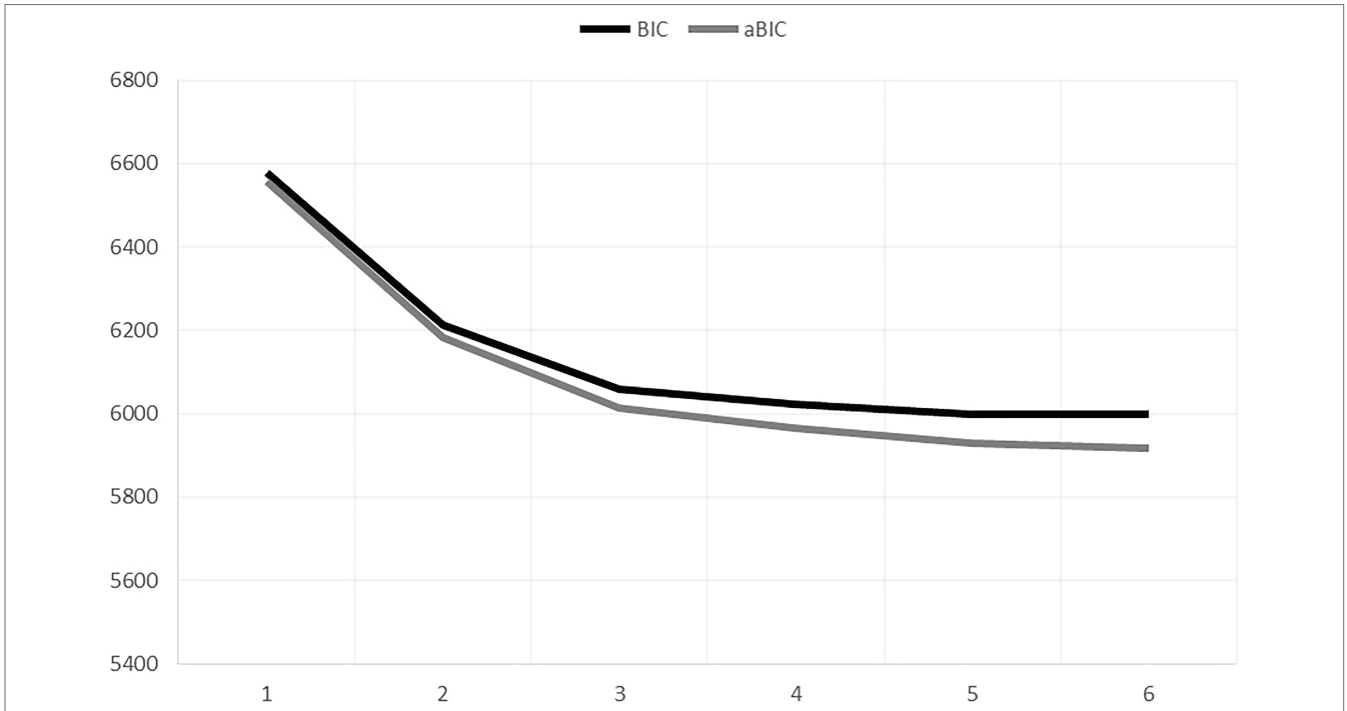

FIGURE 1 | Elbow plot of information criteria for different profile solutions.

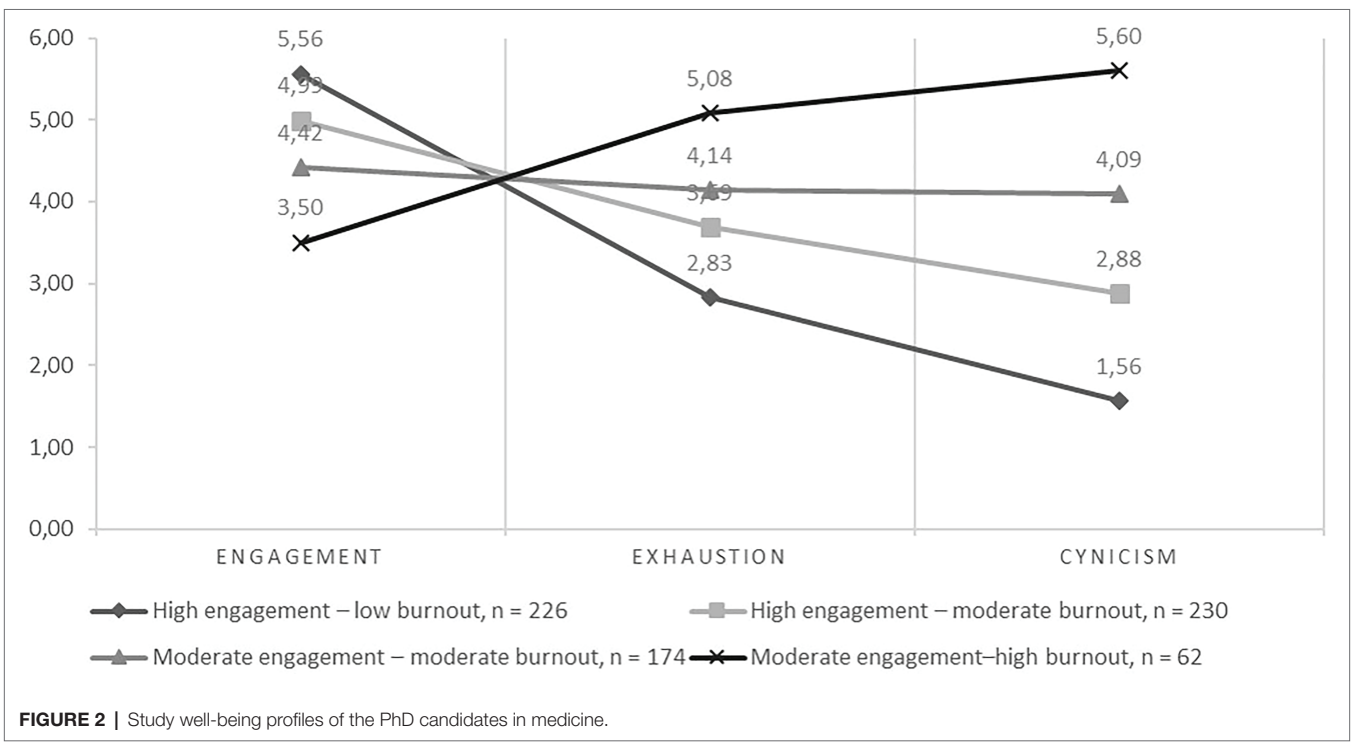

FIGURE 2 | Study well-being profiles of the PhD candidates in medicine.

Whether the PhD candidates were completing their doctorate full-time or part-time did not predict the profile membership either.

The PhD candidates who reported that they were working alone with their doctoral thesis had higher odds of belonging to *moderate engagement–high burnout* profile than to *high engagement–moderate burnout* profile ($b = 0.98$, SE = 0.38, $p = 0.011$, OR = 2.86, 95%CI[1.25–5.64]) or *high engagement–low burnout* profile ($b = 1.35$, SE = 0.38, $p < 0.001$, OR = 4.22, 95%CI[1.83–8.11]) compared to those who were completing

TABLE 3 | Profile means and standard deviations.

	High engagement- low burnout		High engagement– moderate burnout		Moderate engagement – moderate burnout		Moderate engagement–high burnout	
	M	SD	M	SD	M	SD	M	SD
Engagement	5.56	0.743	4.99	0.709	4.42	0.819	3.50	1.13
Exhaustion	2.83	0.964	3.69	0.932	4.14	0.981	5.08	1.12
Cynicism	1.56	0.437	2.88	0.467	4.09	0.483	5.60	0.578

their doctorate in a research group. In addition, the PhD candidates who reported that they were working alone with their doctorate had higher odds of belonging to the *moderate engagement–moderate burnout* profile than to the *high engagement—low burnout* profile ($b = 0.83$, SE = 0.25, $p = 0.001$, OR = 2.28, 95%CI[1.39–3.75]) compared to those working in research groups.

The PhD candidates who were working in a clinical unit or hospital had higher odds of belonging to *high engagement–low burnout* profile than to *moderate burnout–moderate engagement* ($b = 0.61$, SE = 0.29, $p = 0.037$, OR = 1.85, 95%CI[1.04–3.25]) or *moderate engagement–high burnout* ($b = 1.30$, SE = 0.52, $p = 0.012$, OR = 3.56, 95%CI[1.30–9.72]) profiles compared to those who reported that they were not working in a clinical unit or hospital. Those working in hospital or clinical unit also had higher odds of belonging to *high engagement–moderate burnout* ($b = 1.23$, SE = 0.50, $p = 0.015$, OR = 3.66, 95%CI[1.33–10.10]) profile than to *moderate engagement–high burnout* profile than those who were not working in a clinical unit or hospital.

Taken together, the PhD candidates who reported that they were working alone with their doctorate had higher odds of belonging to profiles displaying lower levels of engagement and higher levels of burnout compared to those working in a research group. In turn, the PhD candidates who reported working in a clinical unit or hospital had higher odds of belonging to profiles displaying higher levels of engagement and lower levels of burnout compared to those who were not at a clinical unit or hospital.

Differences Between PhD Candidates in Different Profiles in Their Dropout Intentions

The PhD candidates in various profiles differed statistically significantly from each other in terms of their dropout intentions [χ^2 (3, $N = 690$) = 147.6, $p < 0.001$]. The intentions to interrupt one's doctoral studies were most frequently reported in the following profiles: *moderate engagement–high burnout* profile (74.7%) of the PhD candidates with this profile had considered dropping out) and *moderate engagement–moderate burnout* profile (53.4%). However, the candidates with profiles characterized by high study engagement reported less intentions to interrupt their doctoral studies: 7.2% of the PhD candidates with *high engagement–low burnout* profile and 16.6% with the *high engagement–moderate burnout* profile had considered dropping out.

DISCUSSION

Findings in the Light of the Literature

In this study, we explored PhD candidates' research engagement–burnout profiles. Adopting a person-centered approach allowed us to explore individual variation in PhD candidates' study well-being by considering both positive and negative attributes of well-being at the same time rather than concentrating on the negative ones which has been the focus of several previous studies (e.g., Oswalt and Riddock, 2007; Peluso et al., 2011; Levecque et al., 2017; Pappa et al., 2020). Four distinct profiles among the PhD candidates in the field of medicine were identified: high engagement–low burnout, high engagement–moderate burnout, moderate engagement–moderate burnout, and moderate engagement–high burnout. The person-oriented approach complements variable-based studies showing a negative association between engagement and burnout (Schaufeli et al., 2002a; González-Romá et al., 2006; Salmela-Aro and Upadyaya, 2012; Swords and Ellis, 2017) by indicating that there are individual differences in how exhaustion, cynicism, and engagement can combine within a person. Our findings supported the bivariant approach on burnout and engagement, positing that burnout and engagement present two distinct, yet related dimensions of the individual's affective study related experiences (Shraga and Shirom, 2009; Larsen and McGraw, 2011; Shirom, 2011).

The results showed that the levels of research engagement were high or moderate in all the profiles and the most common profiles were those displaying high levels of engagement. Thus, the results indicate that undertaking doctoral studies in the field of medicine is a highly engaging experience. However, the results also showed that the risk of experiencing study burnout was also elevated (i.e., moderate or high) among most of the PhD candidates. These results are in line with earlier findings (Kusurkar et al., 2021) suggesting an increased risk of burnout in medical researcher education.

The results also showed that those PhD candidates who reported working alone with their doctoral studying were more likely to belong to the profiles displaying moderate levels of engagement and higher levels of burnout. This implies that engaging in researcher group provides a potential resource for cultivating not only study progress but also the candidate's well-being, identified also in previous studies (Pyhältö et al., 2009; Stubb et al., 2011; Peltonen et al., 2017). Interestingly, although medicine presents typical group-based discipline, i.e., the basic unit for conducting research is a research group providing the platform for researcher education, according to our results only about half of the candidates reported that they were engaged in a

research group. This implies that formal research group structure does not automatically guarantee an experience of membership or a well-functioning collaboration with the research group.

The results showed that the PhD candidates who were working in a hospital or clinical unit had lower risk of experiencing burnout and were more likely to experience high levels of study engagement than others. This means that undertaking one's doctoral degree when having clinical responsibilities might protect the PhD candidates from study burnout and support their study engagement. On the contrary, Kusurkar et al. (2021) found that candidates in clinical departments had lower autonomy and higher levels of conflict between work responsibilities, especially among those PhD candidates who were working with patients. A variety of factors may explain our finding. The relevance of the research itself and doctoral studies in general might become apparent in the clinical work and hence, be a source of research engagement (see also Vekkaila et al., 2013). On the other hand, the candidates engaging in clinical work might have more extensive support networks to draw from as a resource for their studying and recovery when needed. They might be also less stressed by their career prospects after completing the PhD degree or they might be aiming for a non-academic career to reduce the stress caused by the doctoral studies (see Nagy et al., 2019). In addition, financial security may explain the differences in burnout levels: Clinical PhD candidates typically receive a much higher salary than PhD candidates who do not have clinical training or employment. In addition, basic science researchers will typically rely on external, competitive funding not only for the research work itself but even for maintaining a position at the university, thereby having much lower job security than their clinically active counterparts, who always have the chance of increasing the proportion of clinical work, should funding for research be scarce.

International PhD candidates did not differ in their likelihood of belonging to any subgroup. As previous studies have suggested that although international students might be prone to experience stress (Pappa et al., 2020), they are also likely to be motivated and satisfied with their studying (Harman, 2003; Sakurai et al., 2017), and thus be likely to experience research engagement. To our knowledge, no earlier study has looked at engagement and burnout of international doctoral students specifically in the medical research education, a context that tends to be extremely international and intercultural. Based on this finding, it seems that there were no distinctive differences between the international and native PhD candidates regard to their engagement-burnout-profiles. Accordingly, this suggests that the international PhD candidates in the field of medicine are highly heterogeneous group in terms of study well-being, not primarily determined by their status as international students. For example, it might be that whether they experienced working alone or within a research group or were clinical vs. basic science medical PhD candidates, were more significant in terms of their well-being than being an international PhD student.

The PhD candidates within the profiles displaying moderate levels of engagement and moderate or high levels of burnout symptoms more often reported intention to quit the doctoral degree than those with high levels of engagement, which was in line with previous findings (Anttila et al., 2015; Cornér et al., 2017). Hence, in addition to having mental health benefits, high levels of experienced engagement are related to study progress among PhD candidates in the field of medicine. Accordingly, investing in developing engaging doctoral education environments has potentially significant individual and organizational benefits, considering that according to previous studies, drop-out rates among the PhD candidates typically range from 25 to 60% (e.g., Council of Graduate Schools, 2004; Golde, 2005; McAlpine and Norton, 2006; Gardner, 2009).

Limitations of the Study

There are some methodological limitations in the study that need to be considered when interpreting the results. First, the criteria for selecting the number of profiles were ambiguous (Nylund et al., 2007), and hence, further studies exploring whether similar profiles can be found among other groups of PhD candidates are needed. For example, models for how profiles can be reproduced in new samples are being developed and may be helpful in exploring the well-being of PhD candidates across different medical research contexts (e.g., Gillet et al., 2021). Second, it is important to note that due to cross-sectional design, causal or process-related conclusions between study well-being and dropping out cannot be drawn. Third, the survey was sent to all doctoral students at the university simultaneously. Although the number of students who responded is sufficient for the analyses conducted, the sample only represents 36% of all doctoral students enrolled in the program. This should be kept in mind when generalizing, as we do not know whether self-selection might have affected the results. Fourth, the study was carried out in a specific social-cultural country context and in health sciences, accordingly one should be careful in drawing conclusions based on the results, across the doctoral education systems or disciplines. Last, it is important to note that data were collected before the COVID-19-pandemic. The pandemic has affected both the clinical and basic-science doctoral students in many ways. Further studies are needed to explore how stress, engagement and well-being of doctoral students working in the medical context have been affected by the pandemic at its different phases and afterwards.

CONCLUSION

Undertaking a PhD in medical fields is an engaging experience for most of the PhD candidates. However, the results suggested that there are several PhD candidates with high or increased risk of burnout. Thus, it seems that individual differences occur between PhD candidates in terms of their well-being. For individuβals displaying a higher risk of burnout, it was more common to experience studying alone in their PhD compared to those with lower burnout risk. In addition, the lower risk of burnout was related to working in a clinical unit or hospital. Therefore, it can be concluded that in the field of medicine, working in research group, and in a clinical unit or hospital during their PhD can help buffering study burnout and provide sources of research engagement.

Practical Implications

The results of the present study can be used by educational developers and staff trainers working with doctoral education. The stressors experienced by basic science PhD candidates in the highly competitive, externally funded research universities need to be taken into consideration by supervisors and policymakers. Particular attention should be paid to the candidates who experience that they are studying alone. Supervisors should be encouraged to be particularly careful in mapping out the actual support networks of their PhD candidates, instead of just formal connections to officially defined research groups. Moreover, the similarities and differences between the conditions of the clinical and non-clinical PhD candidates are worth discussing, as they work in the same general setting. The positive news for medical universities is that despite the pressures and competing responsibilities, the medical research setting is often experienced as engaging and does not automatically lead to burnout, a message worth spreading in this community engaged with cutting-edge, life-saving academic research. The study also has implications for policymakers: the findings highlight the importance of surveillance of the occupational health within the hospitals to check the psychosocial risk factors for staff undergoing research education, not merely that of residents and other health care workers.

The results also provide directions for future research on PhD candidates' well-being. Our findings suggested that although an official membership in a research group is common in medical university, over half of the participants in this study reported that they were working alone. Working alone instead of within a research group was more common in profiles with higher burnout levels and lower levels of engagement. Therefore, reasons for the finding that most of the participants experienced working alone needs to be studied further. For example, investigation is needed to see if working alone is an active choice of a candidate or whether it represents a failure of the research education system in ensuring a supportive setting for doctoral students. In such further investigations, special attention should be paid to the actual networks, communities of practice and support. Also, factors involved in medical doctoral students' engagement and burnout warrant closer investigation. As engagement may be more of a day-to-day experience, while burnout takes more time to develop (Sonnentag, 2017), it might be useful to look more closely at the sources of engagement for both the clinically active and the basic science subgroups of medical PhD candidates, both to identify them more precisely and to investigate the variability and trajectory of them. Given the highly competitive, high-pressure nature of research-oriented medical contexts, it might also be useful to look at experiences of exhaustion as separate from fully developed burnout, as recent research indicates that weariness does not necessarily develop into more serious burnout (Gustavsson et al., 2010; Gillet et al., 2021). For PhD candidates, supervisors, and decision-makers in these competitive environments, where high workload is more the norm than the exception, a more detailed understanding of these processes would be invaluable in terms of identifying high-risk situations and individuals in urgent need of help.

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 research was approved by the Swedish Central Ethical Review Board (Ref. No#2015/1626-31/5). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LT, KP, AB, and JN have contributed to writing the original draft and editing it. AB has contributed to data collection and project administration. LT has contributed to conducting the analyses. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.727746/full#supplementary-material.

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Individual Differences and Susceptibility to Burnout Syndrome: Sensory Processing Sensitivity and Its Relation to Exhaustion and Disengagement

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The aim of the study is to analyze the relationship between sensory processing sensitivity and occupational burnout. This analysis makes it possible to explore the problem of sensitivity as a predictor of burnout syndrome and to discuss adequate coping strategies in the work environment to improve employee well-being. The sample consists of 516 employees (236 women; M_{age} = 28.97, *SD* = 6.62 years). The *Highly Sensitive Person Scale* (HSPS; 27 items) was used to measure sensory processing sensitivity; the *Oldenburg Burnout Inventory* (OLBI; 16 items) was used to measure exhaustion and disengagement from work. The analysis of sensitivity is based on the 'DOES' model of a highly sensitive person, which includes *depth of processing* (D), *overstimulation* (O), *emotional reactivity and empathy* (E), and *sensing the subtle* (S). Burnout due to exhaustion and disengagement is analyzed. The factor analysis of the HSPS confirms its three-factor structure. The results indicate significant relationships between sensory processing sensitivity and burnout symptoms. However, the influence of specific aspects of sensitivity on the burnout problem varies: the results indicate that higher *emotional reactivity* is linked to worse burnout symptoms, but *sensing the subtle* shows the opposite effect and may be a protective factor against exhaustion. Significant gender differences were observed [$F(511,1) = 136.63$, $p < 0.001$; $\eta^2 = 0.21$]; women revealed a significantly higher level of general sensitivity (M_{women} = 4.66, *SD* = 0.62) as compared to men (M_{men} = 4.01; *SD* = 0.64). Awareness of one's high sensory-processing sensitivity and its potential outcomes in the work environment may be essential in order to implement appropriate regulatory strategies. Proactive strategies aimed at reducing prolonged emotional overload may be critical for highly sensitive employees. Recognizing high sensitivity may reduce burnout symptoms and improve well-being at work.

Keywords: burnout, sensory processing sensitivity (SPS), highly sensitive person, Oldenburg Burnout Inventory (OLBI), Highly Sensitive Person Scale (HSPS), well-being

INTRODUCTION

Research on job burnout has been carried out for nearly four decades, but in recent years it has become an extremely important topic. Changing work environments, rapidly developing technology, time pressure, globalization related to contact with different cultures and working in different time zones are all associated with high work demands and the necessity to constantly adapt to new job conditions. These trends, however, have been significantly reinforced since 2020 due to the COVID-19 pandemic. In an article entitled "How the Pandemic Exacerbated Burnout" (Lievens, 2021), the author interviewed pioneering burnout researchers Michael Leiter and Christina Maslach, both of whom emphasized that the pandemic has intensified the conditions that lead to burnout.

Burnout syndrome is defined as a psychological reaction to prolonged work-related stress that is influenced by both individual and organizational context (Schaufeli et al., 1993). This reaction has a processual nature and combines several components: (1) a feeling of energy depletion or exhaustion; (2) increased mental distance from one's job, or a feeling of negativism or cynicism related to one's job; and (3) reduced professional efficacy (World Health Organization, 2019). This assumption is based on the psychological definition of burnout syndrome introduced by Maslach et al. (1996), who described burnout as a state of exhaustion, depersonalization or cynicism, and low professional efficacy. According to the latest 11th International Classification of Diseases (ICD-11), burnout is an occupational phenomenon that is specifically related to stress at work that is not being effectively managed. It is not classified as a medical condition; however, it may lead to an increased risk of health problems. It is classified among 'Factors influencing health status or contact with health services' in the section 'Problems associated with employment or unemployment' (code: QD85) (World Health Organization, 2019).

In its more than 40-year history, the research on work-related chronic stress has focused on the antecedents, consequences and methods of counteracting burnout syndrome (Maslach and Leiter, 2016). The existing findings reveal that both organizational and individual factors are of great importance in the response to burnout. In this perspective, Leiter and Maslach (2004) accentuated the problem of mismatches between the individual and the work environment regarding workload, control, reward, community, fairness, and values. It is especially relevant to study individual differences when seeking characteristics that may be crucial in stress response and that influence a greater mismatch between an employee and their job. The benefits of research on burnout from the point of view of individual differences help to describe, explain and predict individual responses in particular work circumstances. Gaining knowledge in this area may help individuals understand the relation between their needs, abilities, limitations, values, and the work itself. On the other hand, selection, support and training for employees could be much more adequate if we understood the further consequences for well-being of employees' characteristics that might cause them to be predisposed to overstimulation and exhaustion.

The research on factors that may predispose an employee to burnout syndrome emphasize the role of individual differences (e.g., Langelaan et al., 2006; Van der Linden et al., 2007). Research on the relationships between work stress and individual temperament has shown that temperamental variables were related to the perceived work stress in a group of general hospital nurses (Kikuchi et al., 2013). In terms of affective temperaments, Akiskal et al. (1998) found that depressive temperament was associated with over-commitment and a sense of a lack of balance between effort and reward. This temperament is characterized by the tendency to blame oneself, shyness, lack of assertiveness, and sensitivity to criticism. An anxious temperament is related to over-commitment. Kikuchi et al. (2013) suggest that nurses with a depressive or anxious temperament should be identified, monitored for all signs of job stress, and adequately supported by interventions that prevent adverse physical and mental effects. The findings of Kikuchi et al. (2013) indicate that temperamental characteristics may result in stressors being experienced as more serious than they actually are. The existing research implies that personality may moderate levels of experienced stress (Van der Linden et al., 2007) and influence stress-related consequences such as health problems and burnout (e.g., Cano-García et al., 2005). Research on personality traits emphasizes the role of neuroticism, negative affectivity, and anxiety as significant antecedents of burnout (e.g., Langelaan et al., 2006; Golonka et al., 2019). In this work, by referring to the concept of a highly sensitive person (Aron and Aron, 1997), we focus on sensory processing sensitivity as a temperamental characteristic in order to explore its association with employees' exhaustion and disengagement.

The Concept of a Highly Sensitive Person

The concept of the highly sensitive person relates to the Sensory Processing Sensitivity (SPS) construct, which is well known in the scientific literature. The high-sensitivity construct falls within a broader theoretical framework, known as environmental sensitivity, which assumes that humans can be classified according to the extent to which they register and process environmental stimulation (Greven et al., 2019). Regardless of the relationships with other psychological constructs, according to Pluess et al. (2018) the existing data indicate that high sensitivity is a separate construct. A highly sensitive person is an individual who distinguishes lower-intensity stimuli. This lower threshold of stimuli perception entails the tendency to become more easily distressed in response to higher levels of stimulation. The characteristics of a highly sensitive person include the tendency to process information more deeply; susceptibility to overstimulation due to greater sensitivity of the senses and more intense experiences; high emotional reactivity; and the ability to notice subtleties and nuances. The DOES acronym that describes highly sensitive persons stands for D – *depth of processing*, O – *overstimulation*, E – *emotional reactivity and empathy*, S – *sensing the subtle* (Aron, 2013).

Before the concept of high sensitivity appeared, individuals with such dispositions were described as shy, insecure, anxious, introvert or neurotic. In common knowledge, these terms refer to features that have low social value and may be

pejorative. When high sensitivity is described in terms of specific characteristics, this normalizes possible states, e.g., tiredness, exhaustion, irritation, frustration, as natural consequences of being overstimulated. Furthermore, it helps to emphasize the resources and valuable features of a highly sensitive person, e.g., empathy. The theme of a positive view of people who may sometimes be less effective, a bit withdrawn, less open or more easily overwhelmed by stimuli is accentuated by Wagele (2006) and Cain (2012), who show "the power of introverts."

Research findings suggest an association between SPS and personality traits and between SPS and positive and negative affect (e.g., Lionetti et al., 2019; Bröhl et al., 2020). When trying to define the relationship between SPS and the Big Five personality traits, Lionetti et al. (2019) adopted the three-factor solution of SPS proposed by Smolewska et al. (2006): *Ease of Excitation* – EOE, *Aesthetic Sensitivity* – AES, and *Low Sensory Threshold* – LST. A meta-analysis based on 24 selected articles revealed that sensory processing sensitivity is to some extent related to other individual characteristics that reflect environmental sensitivity, such as introversion, neuroticism, openness, behavioral inhibition and negative affect. However, the data on these relationships were not always consistent, especially when the SPS subscales were included. With regard to the Big Five dimensions (8 articles; 6,790 participants), SPS in children correlated with neuroticism ($r = 0.42$) but not with extraversion, openness, agreeableness or conscientiousness. In adults, SPS correlated with neuroticism ($r = 0.40$) and openness ($r = 0.14$), but not with extraversion, agreeableness, or conscientiousness. With regard to positive and negative affect (19 studies; 5,326 participants), SPS in children was moderately correlated with both negative ($r = 0.29$) and positive ($r = 0.21$) affect, but only with negative affect ($r = 0.34$) in adults. The authors conclude that the relationships between SPS and personality traits and affect are complex configurations, and SPS is relatively distinct from other personality traits and affect in both children and adults. Bröhl et al. (2020) observed that for sensory processing sensitivity the most relevant variables were neuroticism and openness to experience. Extraversion was less related to sensory processing sensitivity, while the relationships between SPS and conscientiousness and agreeableness were of little importance. In older adolescents and young adults, openness was significantly associated with the *Aesthetic Sensitivity* subscale, which relates to aesthetic experiences, creativity and cognitive curiosity. In contrast, anxiety and lack of self-confidence were linked with the *Ease of Excitation* and *Low Sensory Threshold* subscales. According to these authors, in order to capture the relationships between SPS and various dimensions of personality, it is necessary to analyze these relationships at the level of specific aspects of sensory processing sensitivity.

Sensitivity relates to temperamental characteristics; it has a biological basis and distinct neurobiological correlates. Symptoms of a highly sensitive central nervous system are already noticeable in reactions to stimuli in infancy (Belsky and Pluess, 2009), and childhood (Boterberg and Warreyn, 2016), and they are combined with strong emotional reactions and empathy. Belsky and Pluess (2009) highlighted the importance of plasticity in human development in the context of varying vulnerability: some children with negatively emotional temperaments or certain genotypes are more susceptible to the effects of negative experiences, but they may also be more prone to positive experiences, which are less frequently analyzed in psychology. Assary et al. (2020) showed that differences in susceptibility to external influences and ways of reacting to the environment have a genetic basis. Using the *Highly Sensitive Child Scale*, in a large sample of adolescent twins the authors determined that the heritability of sensitivity was 0.47. They found that the genetic factors that underlie sensitivity to positive environmental influences are different from those underlying sensitivity to negative environmental ones. This supports the concept of a multi-dimensional genetic model of environmental sensitivity. Furthermore, Assary et al. (2020) identified common and specific genetic and environmental influences on the level of each aspect of environmental sensitivity (EOE, AES, LST). The latent sensitivity factor, which relates to common genetic and environmental influences, was heritable (0.51) and explained 90% of ease of excitation variance, 58% of low sensory threshold, and 29% of aesthetic sensitivity. Assary et al. (2020) indicate that the phenotypic similarities regarding environmental sensitivity, neuroticism and extraversion can largely be explained by common genetic influences, while the differences can be attributed to unique environmental influences.

Chen et al. (2011) and Homberg et al. (2016) indicate the genetically determined nature of the HSP disposition: high sensitivity is combined with genetically determined levels of selected neurotransmitters, i.e., lower availability of dopamine and serotonin. Acevedo et al. (2014) showed that highly sensitive persons manifest higher activation of mirror neurons, which are associated with empathy and imitation. Additionally, highly sensitive participants revealed higher activation in the insula. This brain structure is described as a center of sensory awareness; it is associated with limbic functions and self-referential processing (Fan et al., 2011; Acevedo et al., 2014). High sensory processing sensitivity is associated with activation of the brain in regions responsible for deep processing, memory and psychophysiological regulation in response to emotive stimuli (Acevedo et al., 2017, 2021). Using functional magnetic resonance imaging (fMRI), Acevedo et al. (2017) analyzed brain activity due to sensory processing sensitivity exposure to negative, positive or neutral stimuli revealed that highly sensitive sensory processing was related to increased activation of the hippocampus, the hypothalamus, the entorhinal area, and the temporal gyri; it was also related to decreased activation of the inferior parietal area. Interestingly, these researchers analyzed the influence of early environmental impacts on neural response to emotional stimuli. Positive subjective assessment of one's own childhood was associated with lower intensity of response to stimuli in certain brain areas. The positive childhoods of highly sensitive people were found to be related to activation of reward areas, which act as a buffer in emotional situations; on the other hand, negative childhoods were associated with activation of the amygdala, which is associated with responses to threats. A positive childhood may favor adaptation to emotogenic stimuli through the higher-order cortical systems involved in consciousness, reflexive thinking and self-regulation. In the light

of neuroimaging research, it may be assumed that sensory processing sensitivity has a biological basis and relates to the functioning of the central nervous system; however, life experiences may modulate HSPs' responses to emotogenic stimuli and therefore influence the types of regulating strategies that these persons apply.

Borries and Ostendorf (2012) indicated that sensitivity may not be a dimension but rather a category, and emphasized its dichotomic nature (either one is highly sensitive or not). However, further research on the sensitivity of sensory processing instead designates this disposition as a continuum in which three main levels of sensitivity are indicated: low, medium and high (Lionetti et al., 2018; Greven et al., 2019). The flower metaphor, introduced by Boyce and Ellis (2005), who called highly sensitive individuals (highly reactive phenotypes) *Orchids* and low-sensitive individuals (low-reactive phenotypes) *Dandelions*, was further developed by Lionetti et al. (2018), who introduced a third group of moderately sensitive people, known as *Tulips*. *Dandelions* represent people who do not need special circumstances in order to function; *Tulips* (medium sensitivity) have moderate needs and requirements; and *Orchids* represent people who need special circumstances in which they can fully function, develop and use their potential. This metaphoric attitude is presented in **Figure 1**.

Summarizing, high sensitivity is an individual characteristic; it is neither a weakness nor a defect. An HSP does not need protection; however, this person does need support and proper conditions that will enable them to use their abilities and potential. It is especially important to learn how to function efficiently with the disposition of high sensory processing sensitivity. Aron (2013) compares high sensitivity to left-handedness: most people are right-handed, but this does not mean that there is something is wrong with being left-handed.

Grimen and Diseth (2016) observed that some aspects of sensory processing sensitivity are associated with subjective health complaints. Evers et al. (2008) dealt with the importance of high sensory processing sensitivity in relation to work-related stress and the risk of burnout. A highly sensitive person may perceive the workplace as being full of strong, chaotic stimuli; this causes difficulties in understanding and carrying out tasks and managing their own functioning in the workplace. As a further consequence, work ceases to be a source of satisfaction; it becomes a reason for feeling overloaded; it inflicts emotional distress; it leads to dissatisfaction with work that results in a need for change. Evers et al. (2008) showed that high sensitivity measured by HSPS is associated with a high level of work stress; however, this relationship is not visible in the first phase of the stress response (the alarm phase) as in this stage a sense of work overload or emotional burden is not observed. However, dissatisfaction with work and the need to make changes was identified in the second phase of the stress response (the adaptation stage). This indicates the increased risk of burnout in highly sensitive individuals who, depending on their resources, initially seem to meet job demands but may bear higher psychological costs in the long term.

Most of the research models on burnout explore the role of individual traits in developing burnout syndrome. In this work, we will analyze the relationship between sensory processing sensitivity and occupational burnout. Knowledge of the link between burnout and sensitivity may facilitate regulatory behaviors and proper coping strategies, both of which may influence employees' well-being. Furthermore, we will discuss the possible practical implications for both employees and organizations, thus enabling them to support highly sensitive persons.

MATERIALS AND METHODS

Participants and Procedure

The sample consists of 516 adult employees (236 women: 45.7%; 277 men: 53.7%; 3 did not state: 0.06%). The average age of participants was 28.97 years (SD = 6.62). The sample consists of various employee groups, but the largest groups represented IT (26%) and financial (13%) companies. 10% of the sample held managerial positions in small (up to five persons: 42% of managers) and big teams (more than 25 persons: 20% of

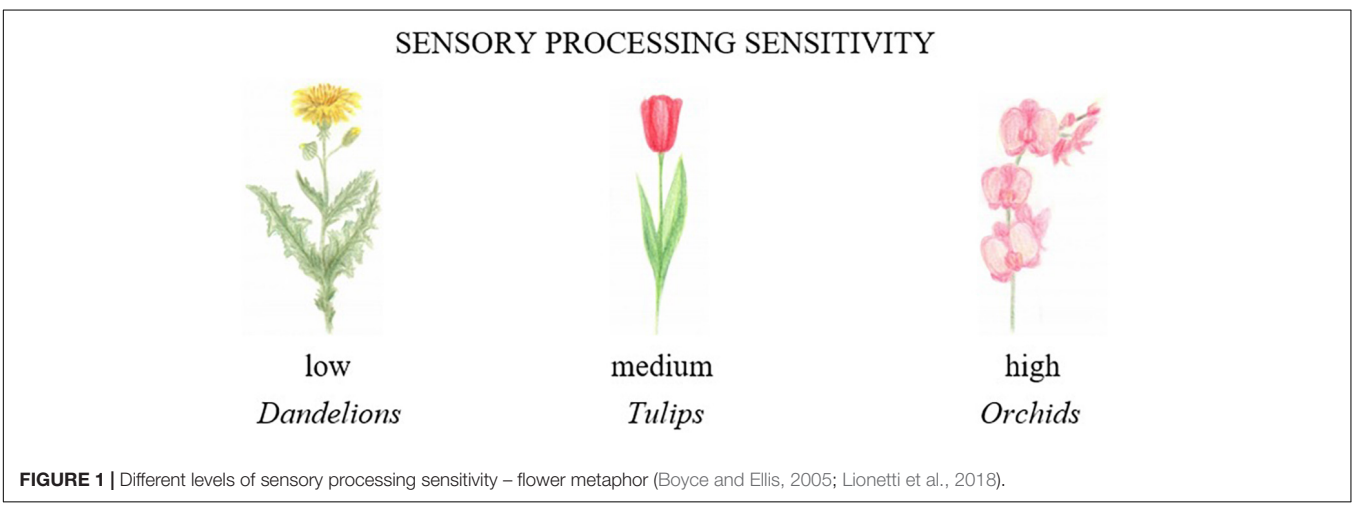

FIGURE 1 | Different levels of sensory processing sensitivity – flower metaphor (Boyce and Ellis, 2005; Lionetti et al., 2018).

managers). The 76% of respondents worked full time. Most of the participants had completed higher education (74%).

Regarding the other sociodemographic data, 67% of respondents were married or in relationships; 20% had at least one child. Only 8% of the respondents did not answer the open question concerning the potential sources of stress besides work. Most frequently, answers referred to family duties and responsibilities, the need to combine work with studies, and health problems. 6% of the sample reported serious health problems; 20% some health problems; 20% assessed their health as average; most of the sample (57%) assessed their health as good or very good. Many of the tested employees revealed sleep problems. Only 24% of the sample reported very good quality of sleep; other respondents complained about problems with falling asleep (8.5%), waking up at night (11%), or early awakening (27%). The 34% of respondents found their sleep not fully regenerative, and 26% complained of sleep deficit.

This online study was voluntary; it was conducted in accordance with the recommendations of the Helsinki declaration and was accepted by the Research Ethics Committee of the Institute of Applied Psychology, Jagiellonian University in Kraków.

Methods

Two self-report instruments were used in the study: the *Highly Sensitive Person Scale* (HSPS) and the *Oldenburg Burnout Inventory* (OLBI).

Highly Sensitive Person Scale was developed by Aron and Aron (1997). The Polish version was developed by the authors of this article using a back translation procedure. The questionnaire consists of 27 items answered on a seven-point scale from 1 (*not at all*) to 7 (*extremely*). The analysis proposed in this paper refers to the three-factorial solution that was confirmed in two studies by Smolewska et al. (2006), and Evers et al. (2008): EOS (*Ease of Excitation*, 12 items), AES (*Aesthetic Sensitivity*, 6 items) and LST (*Low Sensory Threshold*, 7 items). The three-factor structure of the HSPS has been confirmed in other studies, e.g., Grimen and Diseth (2016), Lionetti et al. (2018). However, results of Lionetti et al. (2018) suggest three orthogonal scales and one general sensitivity factor across all items. Some research specifies a different HSPS structure: there are also one-factor (Aron and Aron, 1997), two-factor (Evans and Rothbart, 2008; Ershova et al., 2018; Montoya-Pérez et al., 2019), five-factor (Chacón et al., 2021), and even six-factor (Blach, 2016) solutions. In Evans and Rothbart's (2008) research, in which the HSP scale was compared with the *Adult Temperament Questionnaire* (ATQ), two factors were distinguished: the first covers negative emotionality and is close to the neuroticism construct (high correlations with *Negative Affect* and its sensory discomfort subscale in ATQ); the second factor concerns paying attention to external and internal stimuli (high correlations with *Orienting Sensitivity* and its sensory sensitivity subscale in ATQ). HSPS demonstrated strong reliability across samples: Cronbach's alpha higher than 0.84 (May et al., 2020).

The Oldenburg Burnout Inventory was developed by Demerouti et al. (2001) and Demerouti and Bakker (2008). Baka and Basińska's (2016) Polish adaptation of OLBI was used in this study. The questionnaire contains 16 items, rated on a scale from 1 (*agree*) to 4 (*disagree*). The analyses confirmed that the structure of the questionnaire is based on two subscales: exhaustion and disengagement from work. The method includes positively and negatively worded items. Example items for exhaustion: "After my work, I regularly feel worn out and weary" and "After my work, I regularly feel totally fit for my leisure activities" (reversed). Example items for disengagement from work: "I frequently talk about my work in a negative way," and "I get more and more engaged in my work" (reversed) (Demerouti and Bakker, 2008). The results are summed up separately for each subscale, but the most common factor is the overall burnout factor, which is the sum of all items. This method has satisfactory psychometric parameters: Cronbach's alpha for individual scales ranges from 0.82 to 0.89; for the general indicator, the coefficient was 0.88. The analyses showed that both exhaustion and disengagement correlated positively with perceived stress and negatively with commitment to work (Baka and Basińska, 2016).

RESULTS

The analysis was conducted using SPSS version 27 (IBM SPSS Statistics, IBM Corporation, United States) with the Proces_v3.5 module (Hayes, 2018). The analyses included a factor analysis for HSPS to describe the structure of the Polish version of the scale. The k-means cluster analysis was conducted in order to define potential clusters that are differentiated in terms of the level of sensory processing sensitivity. Following Lionetti et al. (2018), we ran a cluster analysis with three defined clusters. To explore the characteristics of each cluster, mean difference tests on sensitivity features and burnout symptoms were performed. Then, the correlation analysis was conducted to explore the relationships between burnout symptoms and sensory processing sensitivity and its specific factors. The regression analysis provided insight into which aspects of SPS are significant for particular burnout symptoms. Additional analyses were dedicated to investigating gender differences because previous findings have shown significantly higher sensitivity scores among women (e.g., Jonsson et al., 2014; Şengül-İnal and Sümer, 2020) and significant differences in burnout symptoms between men and women (Ahola et al., 2006).

A principal components analysis with oblimin oblique rotation was applied to test the three-factorial solution for HSPS as it was presented by Smolewska et al. (2006; **Table 1**). These three components accounted for 37% of the variance (eigenvalues: 6.35, 2.10, 1.51). Individual items were included as component indicators if the loading on a given component was greater than 0.35. If an item loaded high on more than one component, it was eliminated from further analyses. The analysis of the Polish version of HSPS led to the elimination of two items: item 6 – *Are you particularly sensitive to the effects of caffeine?*; and item 24 – *Do you make it a high priority to arrange your life to avoid upsetting or overwhelming situations?* Item 6 loaded below 0.35; item 24 loaded high on two components: *Emotional*

TABLE 1 | Principal components analysis with oblimin rotation: Component loadings, alphas, and mean inter-item correlations for the HSPS (three-factor analysis).

Item		Components		
		I (ER)	II (StS)	III (OvSt)
1.	Are you easily overwhelmed by strong sensory input?	0.70		
3.	Do other people's moods affect you?	0.51		
4.	Do you tend to be more sensitive to pain?	0.48		
5.	Do you find yourself needing to withdraw during busy days into bed or into a darkened room or any place where you can have some privacy and relief from stimulation?	0.56		
11.	Does your nervous system sometimes feel so frazzled that you just have to go off by yourself?	0.54		
13.	Do you startle easily?	0.54		
14.	Do you get rattled when you have a lot to do in a short amount of time?	0.69		
16.	Are you annoyed when people try to get you to do too many things at once?	0.61		
21.	Do changes in your life shake you up?	0.60		
23.	Do you find it unpleasant to have a lot going on at once?	0.63		
26.	When you must compete or be observed while performing a task, do you become so nervous or shaky that you do much worse than you would otherwise?	0.59		
27.	When you were a child, did parents or teachers seem to see you as sensitive or shy?	0.56		
2.	Do you seem to be aware of subtleties in your environment?		0.49	
8.	Do you have a rich, complex inner life?		0.59	
10.	Are you deeply moved by the arts or music?		0.72	
12.	Are you conscientious?		0.30	
15.	When people are uncomfortable in a physical environment, do you tend to know what needs to be done to make it more comfortable (like changing the lighting or the seating)?		0.53	
22.	Do you notice and enjoy delicate or fine scents, tastes, sounds, works of art?		0.73	
7.	Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by?			0.55
9.	Are you made uncomfortable by loud noises?			0.75
17.	Do you try hard to avoid making mistakes or forgetting things?			0.40
18.	Do you make a point to avoid violent movies and TV shows?			0.55
19.	Do you become unpleasantly aroused when a lot is going on around you?			0.60
20.	Does being very hungry create a strong reaction in you, disrupting your concentration or mood?			0.43
25.	Are you bothered by intense stimuli, like loud noises or chaotic scenes?			0.81
	Coefficient alpha	0.83	0.61	0.74
	Mean inter-item correlation	0.30	0.20	0.30

ER, Emotional Reactivity; StS, Sensing the Subtle; and OvSt, Overstimulation.

Reactivity and *Overstimulation*. To analyze the general indicator of HSPS, all items from the original version of the scale were included. The analysis confirmed the structure of HSPS as it was presented by Smolewska et al. (2006). However, we propose labeling each component differently than was done in previous studies (Smolewska et al., 2006; Evers et al., 2008) by referring to the DOES model (Aron, 2013) and considering the content of the items included in each component. The components are defined as three HSPS subscales: (1) *Emotional Reactivity* (ER); (2) *Sensing the Subtle* (StS); (3) *Overstimulation* (OvSt).

The Kolmogorov–Smirnov tests revealed that burnout symptoms did not meet the assumption of normality: p-value < 0.001 (for both exhaustion and disengagement). The normality of the distribution of sensory processing sensitivity was accepted with a p-value of 0.14 (5% significance level). In further analyses, the following statistical analyses were used: Spearman's test for bivariate correlation; Kruskal–Wallis tests and Mann–Whitney U tests to examine the mean differences between clusters and gender, respectively.

Cluster Analysis

The k-mean cluster analysis, which was defined for three clusters (low, medium, high sensitivity), was run for the three HSPS subscales: (1) ER – *Emotional Reactivity*; (2) StS – *Sensing the Subtle* (StS); (3) OvSt – *Overstimulation*. The ANOVA results are reported in **Table 2**. The names of the clusters refer to the flower metaphor introduced by Boyce and Ellis (2005) and Lionetti et al. (2018): *Dandelions* (low sensitivity), *Tulips* (medium sensitivity), and *Orchids* (high sensitivity). **Table 3** shows the differences in HSPS and each subscale's mean scores between clusters, and the number of observations in each cluster. **Figure 2** demonstrates the distributions of results in each HSPS subscale in the tested clusters.

Table 4 shows the results of the Kruskal–Wallis test (H test) of difference between independent samples, which revealed that the clusters differ significantly in the mean of general HSPS scores [$H(2) = 408.22$, $p < 0.001$, $\eta^2 = 0.79$]. In the general HSPS scores, each pair of compared clusters significantly differed from each other ($p < 0.001$). In the comparisons between clusters, in

TABLE 2 | K-Means cluster groups with ANOVA results for the three subscales of HSPS.

	Cluster		Error		*F*	*p*
	Mean square	df	Mean square	df		
ER	124.433	2	0.364	513	342.287	<0.001
StS	17.090	2	0.542	513	31.556	<0.001
OvSt	202.638	2	0.319	513	635.115	<0.001

ER, Emotional Reactivity; StS, Sensing the Subtle; and OvSt, Overstimulation.

TABLE 3 | Descriptive statistics M(SD) and number of observations for HSPS in the three clusters of sensitivity.

Sensory processing sensitivity	Low	Medium	High
HSPS	3.35 (0.41)	4.19 (0.30)	5.03 (0.38)
ER	3.12 (0.58)	4.24 (0.65)	5.05 (0.58)
StS	4.59 (0.79)	4.54 (0.71)	5.10 (0.73)
OvSt	2.67 (0.56)	3.85 (0.57)	5.09 (0.56)
Observations	*n* = 107 (21%)	*n* = 232 (45%)	*n* = 177 (34%)

HSPS, Highly Sensitive Person Scale; ER, Emotional Reactivity; StS, Sensing the Subtle; OvSt, Overstimulation.

particular the HSPS subscales, the only insignificant difference was observed between *Dandelions* and *Tulips* in the *Sensing the Subtle* subscale.

Further analysis explored the relationship between sensitivity and burnout symptoms. The findings show that general sensitivity positively correlates with burnout symptoms: *Exhaustion* (r_S = 0.33, p < 0.001) and *Disengagement* (r_S = 0.19, p < 0.001). However, investigating the different aspects of sensitivity led to an interesting observation: the strongest correlation was observed between *Emotional Reactivity* and *Exhaustion* (r_S = 0.42, p < 0.001) and *Disengagement* (r_S = 0.27, p < 0.001). A significant but weak positive correlation was detected between *Overstimulation* and both burnout symptoms (**Table 5**). Interestingly, the third HSPS subscale, *Sensing the Subtle*, shows the opposite direction: it negatively correlates with *Exhaustion* (r_S = −0.11, p < 0.05). Although this is a weak correlation, it shows a different pattern and a possible 'protective' aspect of sensitivity.

Table 6 shows the statistics for the regression models for burnout symptoms where exhaustion and disengagement are explained variables and components of sensitivity: *Emotional reactivity*, *Sensing the Subtle*, and *Overstimulation*, are the tested predictors. Multiple regression analysis revealed that burnout symptoms may be explained by some aspects of sensory processing sensitivity. The regression model for exhaustion with three components of sensitivity is significant [F(3,512) = 47.84, p < 0.001] and shows that *Emotional Reactivity* and *Sensing the Subtle* are important predictors for exhaustion (p < 0.001 and p < 0.01, respectively). The model explains 21% of the variance of the exhaustion outcomes. The regression model for disengagement with three components of sensitivity (ER, StS, OvSt) is weaker but significant [F(3,512) = 12.66, p < 0.001] and shows a similar pattern to *Emotional Reactivity* and *Sensing the Subtle* as important predictors of disengagement (p < 0.001 for both components). The model explains 6% of the variance of the disengagement outcomes.

When analyzing the differences between clusters (low, medium, and high sensitivity), significant differences were detected in both burnout symptoms: exhaustion and disengagement (**Figure 3**).

The Kruskal–Wallis test revealed that there were significant differences between the tested groups in the level of exhaustion with medium effect of 7% explained variance [H(2) = 40.35, p < 0.001, η^2 = 0.07]. Examination of the group means suggests that compared to medium and high sensitivity, the lowest sensitivity shows the lowest level of exhaustion. When investigating the differences between the clusters in terms of the level of disengagement, similar findings were observed: the Kruskal–Wallis test showed significant differences between groups with small effect of 4% explained variance [H(2) = 21.64, p < 0.001, η^2 = 0.04]; as compared to medium and high sensitivity, the lowest sensitivity shows the lowest level of disengagement (**Table 7**).

The analysis between the tested variables and the sociodemographic characteristics revealed interesting relationships. Age was associated with one significant observation: it correlated with the *Emotional Reactivity* subscale (r_S = −0.15, p < 0.001), whereas gender revealed more significant observations. **Table 8** shows the gender distribution in each cluster and in the general sample. In this study, a significant gender difference was observed: women revealed higher scores in sensitivity and in burnout symptoms.

Considering the HSPS subscales, higher scores in women were observed in *Emotional Reactivity*, *Sensing the Subtle*, and *Overstimulation* (**Table 9**). The results of the Mann–Whitney U test show that women and men significantly differ on each HSPS subscale, with large effect size for general HSPS scores (η^2 = 0.22). Additionally, a Mann–Whitney U test revealed that burnout symptoms were significantly higher among women as compared to men, with a small effect size for both *Exhaustion* (η^2 = 0.03) and *Disengagement*: (η^2 = 0.02).

Moderation Analysis

In the next step, moderation analysis was performed to evaluate the role of gender in explaining the relationship between the temperamental characteristics associated with sensory processing sensitivity and burnout symptoms. The type of model 1 (Hayes, 2018) was tested in numerous configurations in which sensitiveness (HSPS, ER, StS, OvSt) was an exposure variable, gender was a moderator, and burnout symptoms (*Exhaustion*, *Disengagement*) were an outcome variable. **Figure 4** presents a model [F(3,509) = 7.11, p < 0.001, R^2 = 0.04] in which gender (B = −0.54, t = −2.13, p = 0.034) and Sensing the Subtle (B = −0.20, t = −2.30, p = 0.022) were shown to be significant variables that explain *Disengagement*, but

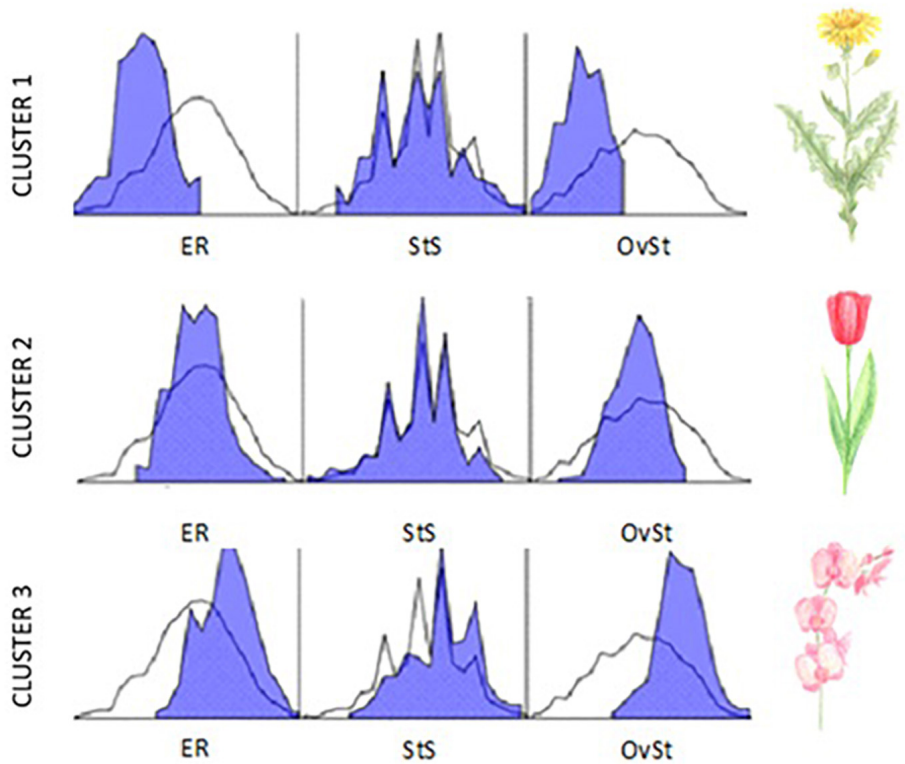

FIGURE 2 | The HSPS subscales' distribution in each cluster (axis *X* – scores in each subscale; axis *Y* – frequency; blue area presents the distribution for the cluster; white area presents the distribution for the general sample). ER, *Emotional Reactivity*; StS, *Sensing the Subtle*; OvSt, *Overstimulation*.

TABLE 4 | The results of the Kruskal–Wallis test on general sensitivity (HSPS scores) and HSPS subscales: *Emotional Reactivity*, *Sensing the Subtle*, and *Overstimulation*.

Sample 1–Sample 2	*n*	K–W test	Error standardized	Standardized K–W test	*p*	η^2	Effect size*
HSPS scores							
Dandelions–Tulips	339	−161.139	17.421	−9.250	< 0.001	0.55	Large
Dandelions–Orchids	284	−358.599	18.255	−19.644	< 0.001	0.70	Large
Tulips–Orchids	409	197.460	14.878	13.272	< 0.001	0.66	Large
Emotional reactivity							
Dandelions–Tulips	339	−170.148	17.416	−9.769	< 0.001	0.45	Large
Dandelions–Orchids	284	−309.628	18.250	−16.966	< 0.001	0.67	Large
Tulips–Orchids	409	139.481	14.874	9.378	< 0.001	0.31	Large
Sensing the subtle							
Dandelions–Tulips	339	3.712	17.381	0.214	0.831	0.00	–
Dandelions–Orchids	284	106.117	14.844	7.149	< 0.001	0.10	Medium
Tulips–Orchids	409	−102.404	18.214	−5.622	< 0.001	0.13	Medium
Overstimulation							
Dandelions–Tulips	339	−156.009	17.409	−8.962	< 0.001	0.48	Large
Dandelions–Orchids	284	−345.066	18.242	−18.916	< 0.001	0.70	Large
Tulips–Orchids	409	189.056	14.867	12.716	< 0.001	0.58	Large

Comparisons between pairs of clusters (N = 516).
**Interpretation of η^2: 0.01 – small, 0.06 – medium; 0.14 – large (Cohen, 1988).*

TABLE 5 | Descriptive statistics, Cronbach alpha, and the results of Spearman's rho correlation between the scores of the Oldenburg Burnout Inventory (OLBI) and the Highly Sensitive Person Scale (HSPS).

	Variable	*M*	*SD*	α	1	2	3	4	5	6
	OLBI									
1	Exhaustion	2.36	0.45	0.77	–					
2	Disengagement	2.35	0.45	0.70	0.52***	–				
3	**HSPS**	4.30	0.71	0.85	0.33***	0.19***	–			
4	ER	4.29	0.92	0.83	0.42***	0.27***	0.87***	–		
5	StS	4.74	0.78	0.61	−0.11*	−0.09	0.43***	0.15**	–	
6	OvSt	4.03	1.05	0.74	0.19***	0.16***	0.82***	0.56***	0.24***	–

ER, Emotional Reactivity; StS, Sensing the Subtle; OvSt, Overstimulation (N = 516).
**p < 0.05; **p < 0.01; ***p < 0.001.*

TABLE 6 | Multiple regression analysis for variables predicting exhaustion and disengagement (*N* = 516).

Model for exhaustion	***B***	***SE***	**Beta**	***t***	***p***	**95% confidence interval of the *B***		**Statistics of multicollinearity**	
Variables						**Lower**	**Upper**	**Tolerance**	**VIF**
Constant	1.848	0.127		14.591	< 0.001	1.599	2.097		
ER	0.243	0.024	0.501	10.307	< 0.001	0.197	0.290	0.645	1.551
StS	−0.085	0.023	−0.149	−3.691	< 0.001	−0.130	−0.040	0.942	1.062
OvSt	−0.031	0.021	−0.073	−1.463	0.144	−0.072	0.011	0.620	1.612
$R = 0.468$, $R^2 = 0.219$, Adj. $R^2 = 0.214$									
Model for disengagement	***B***	***SE***	**Beta**	***t***	***p***	**95% confidence interval of the *B***		**Statistics of multicollinearity**	
Variables						**Lower**	**Upper**	**Tolerance**	**VIF**
Constant	2.157	0.139		15.552	< 0.001	1.885	2.430		
ER	0.113	0.026	0.233	4.382	< 0.001	0.063	0.164	0.645	1.551
StS	−0.073	0.025	−0.127	−2.901	0.004	−0.123	−0.024	0.942	1.062
OvSt	0.013	0.023	0.029	0.545	0.586	−0.033	0.058	0.620	1.612
$R = 0.263$, $R^2 = 0.69$, Adj. $R^2 = 0.064$									

VIF, variance inflation factor.

no significant interaction effect was observed ($B = 0.08$, $t = 1.54$, $p = 0.125$).

This analysis shows that gender is not a significant moderator that could influence the relationship between selected aspects of sensory processing sensitivity and burnout symptoms.

DISCUSSION

The analyses were focused on exploring burnout syndrome by considering the characteristics of sensory processing sensitivity. Correlation analysis showed that high sensitivity is significantly correlated with burnout symptoms: high sensitivity (general score) is linked with higher levels of exhaustion and disengagement. This relationship is observed in two HSPS subscales: *Emotional Reactivity* (stronger positive correlation) and *Overstimulation* (weaker positive correlation). However, the Sensing the Subtle subscale indicates the opposite pattern: it correlates negatively with exhaustion; this correlation is significant but statistically weak. This result may indicate an interesting aspect in analyzing the role of high sensitivity in the work environment: the ability to perceive details and nuances may protect against employee exhaustion. An employee's ability to analyze more stimuli, both external and internal, may help them better understand their situation, thus resulting in more reflective and reasonable decisions. These research directions seem to have a potential for further analysis and verification. Secondly, this is the only sensitivity characteristic that demonstrates another pattern in relation to burnout syndrome; thus, it may indicate the advantageous effect of sensitivity. It is also important to emphasize that the StS subscale is weaker than the other HSPS subscales, so its relationships with burnout symptoms needs further analysis and confirmation.

The results of multiple regression analysis imply that high sensitivity is a significant predictor of burnout syndrome. It is especially linked with exhaustion, for which the amount of explained variance and beta coefficients indicate stronger associations with sensitivity. In both tested models (for exhaustion and disengagement), two aspects of high sensitivity were significant, *Emotional Reactivity* (ER) and *Sensing the Subtle*

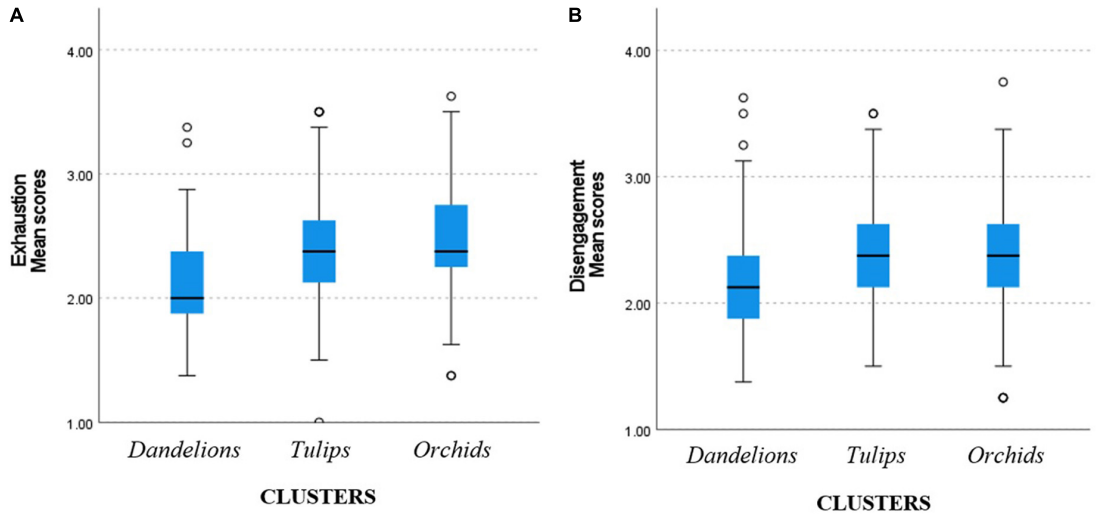

FIGURE 3 | Mean scores on burnout symptoms in clusters of low (*Dandelions*), medium (*Tulips*), and high (*Orchids*) sensitivity: **(A)** *Exhaustion*; **(B)** *Disengagement*.

TABLE 7 | The results of Kruskal–Wallis test on exhaustion and disengagement: Comparisons between pairs of clusters (N = 516).

Sample 1–Sample 2	*n*	K–W test	Error standardized	Standardized K–W test	*p*	η^2	Effect size*
Exhaustion							
Dandelions–Tulips	339	−80.733	17.358	−4.651	< 0.000	0.07	Medium
Dandelions–Orchids	284	−114.854	18.190	−6.314	< 0.000	0.13	Medium
Tulips–Orchids	409	34.122	14.824	2.302	0.021	0.01	Small
Disengagement							
Dandelions–Tulips	339	−69.497	17.354	−4.005	< 0.000	0.05	Small
Dandelions–Orchids	284	−80.145	18.185	−4.407	< 0.000	0.07	Medium
Tulips–Orchids	409	10.648	14.821	0.718	0.472	0.00	–

**Interpretation of η^2: 0.01 – small, 0.06 – medium; 0.14 – large (Cohen, 1988).*

(StS), which consequently demonstrate opposite effects: while ER seems to increase burnout symptoms, StS seems to have the opposite influence. In both models, *Overstimulation* (OvSt) was not shown to be a significant predictor of burnout symptoms. Thus, it may be concluded that high sensitivity may increase susceptibility to burnout symptoms, but it is linked mainly to one aspect of HSP, *Emotional Reactivity*, which is the strongest predictor of both exhaustion and disengagement. Considering the effects of the ability to perceive nuances and subtleties, *Sensing the Subtle* may be seen as a factor that protects against burnout symptoms.

TABLE 8 | Analysis of gender distribution among selected clusters and in the general sample.

		GENDER		Total
		Women	Men	
CLUSTER	*Dandelions*	16 (3.1%)	89 (17.2%)	105 (20.3%)
	Tulips	88 (17.0%)	143 (27.7%)	231 (44.8%)
	Orchids	132 (25.6%)	45 (8.7%)	177 (34.3%)
Total		236 (45.7%)	277 (53.7%)	513 (99.4%)

Three participants (0.6%) did not declare their gender.

In previous studies using the *Highly Sensitive Person Scale*, latent class analyses consequently suggested a three-factor solution which defined groups of *Dandelions*, *Tulips* and *Orchids* (Lionetti et al., 2018). This may suggest that the HSPS is reliable in culturally diverse samples and remains the most direct attempt to measure the level of sensitivity (May et al., 2020). In the presented study, we have confirmed three clusters of sensitivity whose reactivity, ability to perceive subtleties and nuances, and tendency to be overstimulated characteristics differ: low (*Dandelions*), medium (*Tulips*) and high (*Orchids*). *Orchids* show the highest scores on one general and three specific characteristics of HSP. *Dandelions* demonstrate the lowest scores on general HSPS and the subscales of *Emotional Reactivity* and *Overstimulation*; the *Tulips* are 'in the middle.' The results show only one insignificant pair of comparisons: the results of *Dandelions* and *Tulips* in the *Sensing the Subtle* subscale. When the differences in burnout symptoms between the distinguished sensitivity clusters are examined, it may be assumed that the group which has significantly lower levels of exhaustion and disengagement also has the lowest scores in sensitivity, i.e., *Dandelions*. The two other

TABLE 9 | Results of the Mann–Whitney *U* test when comparing the groups of women (n = 236) and men (n = 277).

	GENDER	Mean	SD	Mann–Whitney *U* test	*p*	η^2	Effect size*
HSPS	Women	4.66	0.61	−10.553			
	Men	4.01	0.64		<0.001	0.21	Large
ER	Women	4.68	0.82	−8.730			
	Men	3.96	0.87		<0.001	0.15	Large
StS	Women	4.94	0.71	−5.352			
	Men	4.58	0.80		<0.001	0.06	Medium
OvSt	Women	4.51	0.91	−9.715			
	Men	3.62	0.99		<0.001	0.18	Large
Exhaustion	Women	2.46	0.47	−4.179			
	Men	2.28	0.41		<0.001	0.03	Small
Disengagement	Women	2.42	0.47	−3.194			
	Men	2.29	0.43		0.001	0.02	Small

**Interpretation of η^2: 0.01 – small, 0.06 – medium; 0.14 – large (Cohen, 1988).*

groups, *Tulips* and *Orchids*, differ in the level of exhaustion but reveal similar levels of disengagement.

The obtained data indicate a similar sample distribution of the three groups of sensitivity as was reported by Lionetti et al. (2018): a low-sensitive group – 21% (Lionetti et al., 2018: 29%); medium-sensitive – 45% (Lionetti et al., 2018: 40%); and high-sensitive – 34% (Lionetti et al., 2018: 31%). It may be concluded that the medium-sensitivity group is the most representative; however – quite surprisingly – the second largest group was the high-sensitivity group; the lowest sensitivity group is the smallest group. This means that highly sensitive employees do not form a marginal group but may represent 1/3 of all workers. Considering the characteristics of this group and the correlations between high sensitivity and burnout symptoms, it seems that there should be a focus on understanding the needs and resources of highly sensitive employees.

When analyzing the structure of the *Highly Sensitive Person Scale*, we tested the three-factor structure of HSPS and revealed nearly the same structure as was reported by Smolewska et al. (2006). However, when analyzing the content of the questions of each HSPS component and labeling the components, we decided to refer to the DOES model of sensitivity. The inspiration for changing the components' labels came from doubt in the second component, which in Smolewska et al. (2006) is defined as *Aesthetic Sensitivity*. This component refers to perceiving subtleties and nuances; a rich and complex inner life; conscientiousness; and being moved by the arts and music. In our opinion, *Aesthetic Sensitivity* has connotations that are too narrow, whereas the StS subscale items refer to broader aspects of depth of processing and the ability to sense subtleties, which are the core elements of the DOES model of sensitivity (Aron et al., 2012; Aron, 2013). Therefore, when labeling the principal components we refer to the DOES model, which includes *depth of processing* (D), *overstimulation* (O), *emotional reactivity* (E), and *sensing the subtle* (S). Nevertheless, as the structure of HSPS components is nearly identical to the previous studies (Smolewska et al., 2006), we can conclude that the components extracted here refer directly to those defined by Smolewska et al. (2006): the component labeled as *Emotional Reactivity* (ER) refers to "Ease of Excitation" (EOE); *Sensing the Subtle* (StS) refers to "Aesthetic Sensitivity" (AES); and *Overstimulation* (OvSt) refers to "Low Sensory Threshold" (LST).

Interestingly, depth of processing seems to be located somewhere between the extracted components or it combines all the selected components as it refers to empathy, conscientiousness, rich imagination and inner life, thoughtfulness, and awareness of consequences. Depth of processing is associated with the "pause-to-check approach," which enables greater consideration or reflection (Aron, 2013). Analyzing the HSPS items seems to show that deep processing is linked with both emotional reactivity and the ability to perceive nuances, but depth of processing is a broader construct than this. In our opinion, this aspect of high sensitivity should be extended and detailed in another measure of the HSP construct.

Following previous findings that indicated higher levels of sensitivity among women (e.g., Jonsson et al., 2014; Şengül-İnal and Sümer, 2020), this study explores gender differences. The presented results confirm this tendency: women demonstrated higher scores on the general HSP scale and on each of the HSP subscales. Women revealed higher levels of all aspects of sensitivity (*Emotional Reactivity*, *Sensing the Subtle*, and *Overstimulation*). Women also demonstrated significantly higher levels of burnout symptoms. This outcome may have an important meaning in the context of improving well-being. The presented results may indicate why, in many studies on burnout, women are more exhausted at work. This has often been linked with sociodemographic characteristics, e.g., the necessity to take care of children and the problem of conflicting roles. This study shows that another aspect that should be considered in explaining the problem of burnout among women employees is sensitivity as an individual disposition. We did not found a moderating effect of gender in explaining the relationship between sensory processing sensitivity and burnout symptoms. However, referring to the results of Nocentini et al. (2018), it may be supposed that such moderating effect may be important in intervention programs against burnout.

One important aspect which is not precisely reflected on the *Highly Sensitive Person Scale* is depth of processing, which may be described in terms of reflexivity, intuition, wisdom resulting from caution, deliberate behavior, and the ability to take others' perspectives (Aron et al., 2012; Aron, 2013; Acevedo et al., 2014, 2017). Highly sensitive persons are described as "royal advisors" (Aron, 2013), which may create an attractive identity for those who perceive themselves as highly sensitive. In view of such HSP characteristics, there are some advantages in identifying oneself with HSP. Firstly, it definitely strengthens the self-esteem of people who – until they became acquainted with the concept of HSP – perceived themselves negatively in the contexts of maladjustment, shyness, and low sociability, all of which might lead to unfavorable consequences, e.g., low self-esteem. If high sensitivity is described not in terms of disadvantages but in terms of specific resources, this enables highly sensitive persons

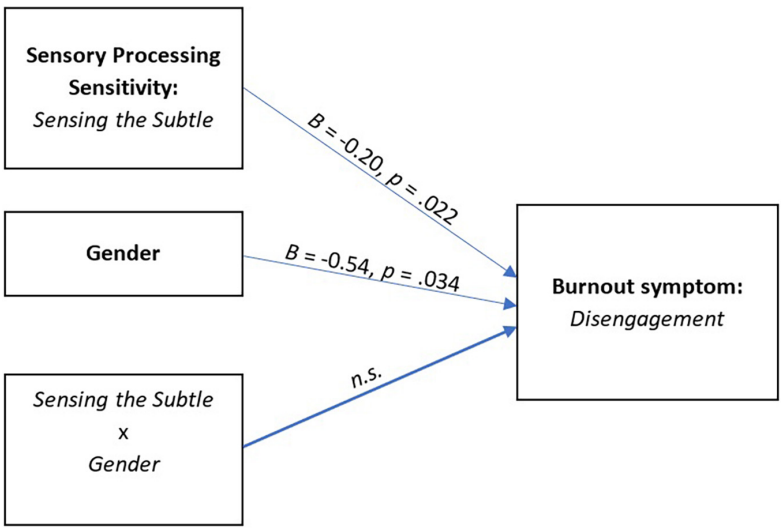

FIGURE 4 | Model of the relations between sensory processing sensitivity (*Sensing the Subtle* subscale) and burnout symptoms (*Disengagement* subscale), moderated by gender (*n.s.*, not significant).

to feel unique, to gain deeper self-knowledge, and to be willing to change their environment or circumstances according to their needs. This is particularly important in rigid organizations, which are characterized by a hierarchical structure, defined tasks, procedures, and regulations, and in which changes are difficult to implement.

Many psychological theories remain unknown to the wider public, despite the fact that they explain the essential mechanisms of individual and social functioning. This may happen due to dry scientific language which is not appealing to non-psychologists. An invaluable aspect of Aron and Aron's HSP concept (1997) is its application value: it explains how specific dispositions may influence mental and emotional states and the possible consequences of high sensitiveness in favorable and unfavorable environments. This concept provides specific 'guidelines' for coping strategies in working environments and has practical implications for self-psychotherapy tips, e.g., reformulation of one's own way of reacting to changes, assessing new situations, changing the external context, and using support, self-care, and enriching strategies in order to avoid overstimulation (Aron, 2012). Aron and Aron (1997); Aron et al. (2012), Acevedo et al. (2014), and Greven et al. (2019) indicate associations between HSP and temperamental and personality characteristics that indicate higher reactivity to the conditions of the surrounding environment. According to Aron and Aron (1997), high sensitivity is especially associated with the behavioral inhibition system (BIS; Gray, 1982) and is responsible for the 'pause-to-check' function. In the revised Reinforcement Sensitivity Theory (RST; Gray and McNaughton, 2000), it was assumed that BIS is activated by both positive and negative stimuli that accordingly activate the Behavioral Approach System (BAS) and the Flight, Fight and Freezing System (FFFS). In the context of the revised RST, it may be assumed that HSP is associated with higher sensitivity to both positive and negative environmental stimuli. This perspective may be of great significance in understanding the possible consequences of HSP characteristics in work environments. A highly sensitive person may not only be prone to overstimulation but may also be predisposed to reacting more strongly to positive stimuli that have great meaning in motivational processes.

From both an individual and an organizational perspective, it is particularly important to explore how to use this knowledge on high sensitivity in work environments to enhance well-being at work and prevent burnout among HSPs. When analyzing the practical implications of these findings, it should be emphasized that high sensitivity should not be simplified and treated as a direct and simple predictor of burnout. Some aspects of HSP are positively linked with burnout (ER), whereas others are linked negatively (StS). As compared to a non-sensitive individual, for a highly sensitive person unfavorable working conditions, such as work overload, conflicts, insufficient autonomy, etc., can have 'a double negative effect' and may result in further negative consequences. Significant relations between emotional reactivity and burnout symptoms, especially with exhaustion, should be considered when analyzing the further possible consequences of burnout (e.g., reduced well-being, depression and other health problems) and making recommendations for employee well-being. In this context, proper work design with a favorable work environment, adequate workload and sufficient support are of the highest significance. On the individual level, regulating strategies aimed at reducing emotional/psychophysiological arousal, awareness of the first symptoms of being overloaded, and the ability to respond to signs of overstimulation by taking breaks and limiting sources of distress may contribute to developing adequate and functional solutions. Evers et al. (2008) suggest that exhaustion, tiredness, irritation or frustration are natural reactions to overstimulation: they are not pathological. These researchers indicate that balance can be regained by practicing yoga, meditation, physical recreation, and sports. It is especially

significant to develop knowledge on one's dispositions and to increase one's sense of effective coping and controllability. This type of intervention not only allows highly sensitive people to function effectively in the work environment; it also generates profits in the workplace related to the specificity of highly sensitive persons' sensory processing, their ability to capture subtleties, and their reflective approach to problems.

Limitations

In the presented study, only general company profile information was collected. Future studies may focus on analyses of different types of jobs, exploring how specific tasks and the work environment influence the relationships between SPS and burnout symptoms. This would make is possible to determine whether the associations between SPS and burnout symptoms are universal or are also influenced by work context. These analyses could be extended to exploring other aspects of work, such as salary, sick days, promotions, or awards. Furthermore, it would be particularly important to investigate other individual outcomes of highly sensitive persons in their work environment. This should not be limited to negative consequences (e.g., health complaints, anxiety, depressive symptoms); it should also include positive outcomes, such as higher creativity, greater decision accuracy or better teamwork, thanks to higher reflectiveness and empathy which are linked with high SPS.

A deeper understanding of the mechanisms underlying the association between high sensitivity and burnout would be provided by additional analyses of, e.g., the temperamental variables that determine excitability and reactivity, emotional states (especially anxiety and depression), neuroticism, emotional style, reflectivity, resilience, and coping strategies. As has been indicated by other researchers (Acevedo et al., 2018; Greven et al., 2019), HSP should be further explored due to its association with other psychological constructs.

The instruments used in the study have satisfactory reliability coefficients, but the *Sensing the Subtle* subscale proved to be weak as it had a Cronbach alpha of 0.61. This indicates the need for further research on developing an instrument dedicated to this aspect of high sensitivity. A more reliable instrument would make it possible to determine whether special sensitivity to nuances and subtleties is a significant factor that reduces the risk of burnout.

CONCLUSION

Sensory processing sensitivity reveals significant relationships with burnout symptoms, i.e., higher emotional reactivity is linked to increased exhaustion and disengagement from work, while greater ability to sense the subtle shows the opposite effect and may be a protective factor against exhaustion. Thus, it seems particularly important to differentiate specific aspects of SPS which may have opposite effects on burnout symptoms. These results may indicate that two regulatory strategies may be useful for highly sensitive employees to reduce burnout: (1) dealing with emotional reactivity by regulating psychophysiological arousal; (2) strengthening the ability to sense the subtle by means of cognitive training and mindful attentional awareness.

Future Directions

Further research on the association between sensing subtleties and nuances, depth of processing and burnout syndrome is needed; this may be a very interesting perspective in which some aspects of sensitivity may be considered as protective factors against burnout symptoms. To explore this area, however, a more sensitive instrument for these aspects of sensitivity should be developed. In further research it could be valuable to include sensory processing sensitivity as an individual disposition that may significantly influence employees' outcomes.

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 Research Ethics Committee of the Institute of Applied Psychology, Jagiellonian University in Kraków. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

KG and BG substantially contributed to the conception and design of the work, acquisition, analysis, interpretation of data, drafting the work and revising it critically, final approval of the version to be published, and agreed to be accountable for all aspects of the work.

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Job Demands and Resources, Burnout, and Psychological Distress of Social Workers in China: Moderation Effects of Gender and Age

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Social work is a fast-growing profession in China, with the workforce numbering approximately 1.2 million in 2018. Studies have shown, however, that social workers in China experience high burnout rates and significant psychological distress. Analyzing data collected from 897 social workers in Chengdu, China, we applied the job demands and resources (JD-R) theory to examine the effects of JD-R on burnout and psychological distress in social workers, as well as whether these relations are moderated by gender and age. Results supported a dual process by which JD-R affected both social workers' burnout and psychological distress through health impairment and motivation processes. Job demands (JD) were associated with high burnout and psychological distress. Meanwhile, job resources (JR) were associated with reduced burnout and psychological distress. Results indicated that JR had greater effects on burnout and distress than did JD. Women and younger professionals appeared to be affected most by JD and psychological distress. The findings support a need for interventions that buffer the effects of JD-R on burnout and psychological distress in social workers in China, focusing on women and younger professionals.

Keywords: job demands, job resources, burnout, psychological distress, social workers, China

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INTRODUCTION

Social Work Development in China

Within the past century, social work in China has experienced major periods of emergence, suspension, and revival (Tang and Li, 2021). In response to growing social issues that accompanied the country's rapid economic development since the 1980s, China has seen significant expansions to its social work labor force and education programs. Peking University first began recruiting undergraduate social work students in 1989. By the end of 2018, over 500 undergraduate, master's, and Ph.D. programs had been established, together producing over 40,000 social work graduates each year. While the national social work labor force in China totaled 0.2 million in 2010, by 2018, it had grown to about 1.2 million (Li et al., 2012; Department of

Civil Affairs, 2019; Chan et al., 2020). These numbers indicate that social work in China has experienced an unprecedented scale of expansion in a short period of time. Yet, the development of social work across the country varies, mirroring the availability of resources by location. In urban centers (e.g., Shanghai, Beijing, Guangzhou, and Shenzhen), which have greater resource availability, the profession has experienced greater development, as compared to rural regions in western China (Liu et al., 2020). Regardless of the rural-urban divide, the future of this field in China is threatened by high burnout and turnover rates (Jiang et al., 2019; Su et al., 2020; Tang and Li, 2021).

Burnout and Social Work

Internationally, social workers and other human service workers experience substantial rates of burnout (Lizano, 2015; Sánchez-Moreno et al., 2015). The burnout and turnover rates for social workers are similarly high in China (Du, 2015; Zhu, 2015; Jiang and Wang, 2016; Wang et al., 2019). In 2014, 25% of social workers in Guangzhou had left their jobs (Zhu, 2015), and between 2008 and 2015, the percentage of social workers who left their positions in Shenzhen increased by approximately 10 percentage points, from 8.2 to 18.08% (Du, 2015). Meanwhile, in 2013, the turnover rate of social workers in Shenzhen was over 22% (Du, 2015). Cross-cultural research has supported that burnout is strongly associated with turnover (Abu-Bader, 2000; Barak et al., 2001; Lloyd et al., 2002; Evans et al., 2006; Kim and Stoner, 2008; Luo and Lei, 2021). This relation is prevalent among social workers in China as well (Wang et al., 2021). High rates of burnout and turnover have negative implications for the field of social work, its labor force, and its client populations. Social workers experiencing burnout may be unable to provide quality services to clients, which can harm the vulnerable populations that they serve. Moreover, high turnover rate may lead to increased job demands and workloads for those social workers who remain in the labor force, leading to further potential for burnout, which can in turn exacerbate the cycle of burnout and turnover. Although social workers in China are actively engaged in providing services to vulnerable populations across settings as diverse as schools, community centers, hospitals, and other social welfare organizations and agencies (Jiang et al., 2019; Chan et al., 2020), the profession's high burnout and turnover rates raise concerns about the ability of social workers to sustain the provision of quality services. As such, it is imperative that scholars investigate the factors that contribute to and mitigate burnout, and associated psychological distress, in social work professionals in China. This study thus applies the job demands and resources (JD-R) theory to examine how job demands (JD) and job resources (JR) affect job outcomes of Chinese social workers. The findings of this study can (1) build knowledge of work conditions and psychological distress faced by social workers in China, an emerging profession with high burnout rates, (2) contribute to understanding whether the JD-R theory applies to this vulnerable population, and (3) shed light on potential interventions and services to mitigate the burnout and psychological distress that jeopardize the well-being of social workers in China.

The Job Demands-Resources Theory, Burnout, and Psychological Distress

In the JD-R theory, proposed by Demerouti et al. (2001), working conditions are categorized into two groups, JD and JR, which differentially affect worker burnout and other occupational outcomes (Demerouti et al., 2001; Bakker and Demerouti, 2007; Lequeurre et al., 2013). JD include various aspects of the job (i.e., physical, social, or organizational) that require a sustained physical or mental effort. This effort comes at a physiological cost, such as exhaustion and fatigue. JR, on the other hand, are aspects of the job (i.e., psychological, social, or organizational) that can facilitate the achievement of work goals, mitigate the psychological cost of job demands, and/or stimulate personal growth and development (Demerouti et al., 2001). Resources are described as "health-protecting factors," which keep individuals healthy, even after facing a significant workload (Demerouti et al., 2001, p. 501). The JD-R theory posits that JD and JR affect burnout, then psychological well-being, *via* two processes: the health-impairment process (also called the energy-driven process) and the motivation-driven process. In the former, through JD, workers experience a gradual depletion of their energy, leading to burnout and psychological distress. In the latter (the lack of), JR can prevent employees from fulfilling their role or from meeting their responsibilities, which, in turn, leads to frustration, withdrawal, and, ultimately, burnout, and distress (Demerouti et al., 2001; Bakker et al., 2003).

JD-R and Burnout

Burnout, a psychological syndrome that involves emotional exhaustion, depersonalization, and a diminished sense of personal accomplishment, can occur while working in challenging situations (Maslach et al., 1996). Burnout has long been recognized as an occupational hazard for human service professionals (Aiken et al., 2002; Hakanen et al., 2006), including social workers (Travis et al., 2015). In fact, social workers are considered an occupational group that is at above-average risk of burnout (Soderfeldt et al., 1995).

Job demands and resources has been found to be important factors of burnout and job satisfaction in social workers and other human service professionals (Demerouti et al., 2001; Tang et al., 2017; Su et al., 2020). In studies with samples of Chinese social workers, including both newly recruited social workers and early stage professionals (Tang et al., 2017; Tang and Li, 2021), scholars have found evidence of a positive relation between JD and burnout and turnover, as well as a negative relation between JR and burnout (Su et al., 2020; Luo and Lei, 2021). Su et al. (2020), for example, applied the JD-R theory in an analysis of data from a nationally representative random sample of social workers ($n = 5{,}800$) and found that psychosocial resources, such as professional recognition and various types of social support, significantly reduced burnout. This relation has yet to be studied within the context of psychological distress, despite the possibility that burnout, as an experience of emotional exhaustion, depersonalization, and reduced sense of personal achievement (Maslach et al., 1996), may act as a stressor that precipitates psychological distress.

JD-R and Psychological Distress

When faced with a stressor or a demand that is difficult to cope with, individuals may experience psychological distress, an emotional state of deep discomfort (Ridner, 2004; Arvidsdotter et al., 2016). Characterized by symptoms of depression and anxiety (Ridner, 2004), psychological distress has been shown to be related to JD-R (Oshio et al., 2018; Ben-Ezra and Hamama-Raz, 2021). Cross-cultural studies in both Japan (Shimazu et al., 2010; Oshio et al., 2018) and Israel (Ben-Ezra and Hamama-Raz, 2021) have supported a positive correlation between JD and psychological distress. While Shimazu et al. (2010) and Oshio et al. (2018) studied samples of Japanese adults who worked in a vast array of occupations, Ben-Ezra and Hamama-Raz (2021) specifically studied social workers who were working during the COVID-19 pandemic ($n = 615$). Results indicated that JD had a significant direct effect on psychological distress among the social workers ($r = 0.233$, $p < 0.001$).

Studies such as these, which examine the antecedents of psychological distress, are essential given that psychological distress has been found to positively predict serious mental illness, alcohol and substance use, and negative work outcomes (Furukawa et al., 2003; Hardy et al., 2003; Kessler et al., 2010). Mood disorders and anxiety disorders, for example, have been found to be positively associated with psychological distress (Furukawa et al., 2003). This is supported across a wide variety of cultural contexts. Analysis of data drawn from samples in 14 countries similarly revealed that psychological distress was a predictor of serious mental illness (Kessler et al., 2010).

Though it has been well-established that psychological distress varies by gender and age (Kilkkinen et al., 2007; Wong and Shobo, 2016; Zhang et al., 2018; Horesh et al., 2020), the moderating effects of gender and age on the relation between psychological distress and its antecedents are relatively understudied. Given the socio-cultural and health contexts that accompany both gender and age, investigating the relation between burnout and psychological distress by these two demographic characteristics can provide a better understanding of how different subgroups of social work professionals are affected by JD-R. This is critical to our understanding of the underlying mechanisms of burnout and psychological distress among social workers in China.

In short, the JD-R theory has been widely tested in and supported by studies conducted across a plethora of disciplines, including human services, industry, and transportation (Demerouti et al., 2001; Bakker et al., 2003; Luo and Lei, 2021), and country contexts (Hakanen et al., 2006; Hu et al., 2011; Lequeurre et al., 2013; Bakker et al., 2014; Kwon and Kim, 2020). Similarly, the JD-R model has been applied in and supported by studies that examine work outcomes such as burnout, stress, work engagement, and health (Hakanen et al., 2008; Schaufeli et al., 2009; Ren et al., 2013; Schaufeli and Taris, 2014; Grover et al., 2017). Findings underscore that JD play a significant role in the health-impairment process and the development of burnout. Meanwhile, JR, through the motivation process, can be a significant protective factor against burnout. The findings also support that burnout mediates the effects of JD-R on work and health outcomes (Hakanen et al., 2008; Schaufeli et al., 2009). Empirical studies have shown that JD-R have profound consequences on burnout and individual well-being. However, few have centered on the well-being of social workers in China. Further, whether gender and age moderate the relation between burnout and well-being has yet to be investigated. Thus, we apply the JD-R theory to examine the effects of JD-R on burnout and psychological distress and whether this relation is moderated by gender and age in a sample of Chinese social workers.

HYPOTHESES

Based on the JD-R theory (Demerouti et al., 2001), we hypothesized a mediational pathway by which JD-R affects psychological distress *via* burnout. We also examined whether this pathway is moderated by gender and age, as past literature has indicated that distress varies by gender and age. Our hypotheses are as follows:

1. JD are positively associated with burnout, while JR are negatively associated with burnout.
2. Burnout and JD are positively associated with psychological distress, while JR are negatively associated with psychological distress.
3. Burnout is a mediator of the relation between JD, JR, and psychological distress.
4. The effects of JD and burnout on psychological distress are greater for women and younger social workers, compared with their respective counterparts.

MATERIALS AND METHODS

Data and Sample

The data for the present study came from an online anonymous survey administered to social workers in Chengdu, China, the capital of Sichuan province and a city that has seen rapid development in social work (Department of Civil Affairs, 2019; Chengdu Department of Civil Affairs, 2020). We randomly selected two districts from 22 districts in Chengdu, then contacted local social workers associations and agencies to recruit participants. Each district had around 600 social workers. All social workers in the two districts were invited to complete the survey on May 5, 2021. Reminders to participate in the survey were sent to social workers 7 and 14 days after the initial invitation. Around 915 social workers participated in the online survey between May 5 and May 29 in 2021. About 18 surveys had incomplete answers and were therefore excluded from the final analysis. Our final analytic sample contained data from 897 social workers, indicating a response rate of 75%. Over three-quarters (78.2%) of the sample was female. The average age of the sample was 31.8 ($SD = 7.3$). Over half had at least a college degree (54.6%) as well as a social work license (52.3%).

The research protocol was approved by the research review committee at one of the co-authors' university in China. An informed consent process was implemented prior to the survey. Respondents received 5 RMB (1 USD) as compensation for

their participation. Participants were informed that their participation was voluntary and that they could choose to stop completing the survey at any time.

Measures

Psychological Distress

The dependent variable, psychological distress, was assessed *via* the Kessler 6 Psychological Distress Scale (K6), developed by Kessler et al. (2003). The K6 has shown high validity and reliability in past studies (e.g., Kessler et al., 2010; Oshio et al., 2018; Twenge and Joiner, 2020). It consists of six questions that ask respondents about 30-day prevalence of psychological distress, such as nervousness, hopelessness, restlessness, depression, and worthlessness. Participants identified how frequently they felt each of these emotions, as well as how frequently they felt that "everything was an effort." Possible responses ranged from 0, "none of the time," to 4, "all of the time." Responses to all items were summed up. Total scores could range from 0 to 24. Following past calibration studies (Kessler et al., 2002, 2003; Furukawa et al., 2003; Fushimi et al., 2012), total scores corresponded with one of three levels of psychological distress, indicated by the following score ranges: 13–24 (high); 8–12 (moderate); and 0–7 (low). In this study, the Cronbach's alpha of the K6 scale was 0.94.

Burnout was assessed by the Maslach Burnout Inventory, Human Services Survey (MBI-HSS; Maslach et al., 1996). The survey consists of 22 items which measure a multidimensional concept of burnout. The psychometric soundness, reliability, and validity of the MBI-HSS have been verified in samples of working professionals of numerous occupations, languages, and countries (Naude and Rothmann, 2004; Aguayo et al., 2011; Chen et al., 2021). Zhang et al. (2006) used 22-item scale with a sample of approximately 4,850 Chinese police officers. Results of factor analysis showed that five items had high factor loadings across several multiple dimensions in the Chinese sample. These items were therefore removed from the scale. The remaining 17 items comprise the Chinese version of MBI-HSS, which has good reliability (Cronbach's alpha of 0.71; Zhang et al., 2006). We used the Chinese version of MBI-HSS in the present study. The score for each item ranges from 0 (never) to 6 (every day). We reversed the score of positive items so that higher scores indicated higher levels of burnout. Possible scores ranged from 0 to 102. The Cronbach's alpha of the Chinese version of MBI-HSS was 0.88 in this study.

We measured JD-R using a multidimensional scale from Questionnaire sur les Ressources et Contraintes Professionnelles (QRCP) of Lequeurre et al. (2013). Given the work of social workers in China, we focus on two dimensions of JD, workload and emotional workload, and two areas of JR, relationships with colleagues and information. Workload refers to the sense of having too much work to do in the time available, while emotional workload describes emotional JD that require respondents to expend energy to deal with job-related emotions (e.g., frustration regarding clients; vicarious trauma; Wilson, 2016) and/or organizationally desired emotions (e.g., staying neutral or calm; Bakker et al., 2008, 2010). Relationship with colleagues concerns the team atmosphere, including whether a respondent can rely on co-workers for help and social support. Lastly, information refers to the availability of feedback on respondents' work performance. Lequeurre et al. (2013) used four items to measure each dimension. The Cronbach's alpha was high, above 0.80 for each dimension (workload, 0.84; emotional load, 0.83; relationship with colleagues, 0.87; information, 0.86). All items were rated on a seven-point Likert scale ranging from 1 (never) to 7 (always). Higher scores in each item indicated higher levels of job demands or job resources. The total of item scores ranged from 4 to 28 for each dimension. The Cronbach's alpha was 0.87 for all 16 items in this study. For each individual dimension, the Cronbach's alpha values were 0.80, 0.68, 0.87, and 0.89 (workload, emotional load, relationship with colleagues, and information, respectively). We calculated the score of JD by summing up the item responses under workload and emotional workload. Meanwhile, we calculated JR by totaling item responses to the items in the relationships with colleagues and information subscales.

Several demographic and socioeconomic characteristics of the respondents were measured and included in our analytic model. These variables included gender (female = 1, male = 0), age (continuous, 20–50), marital status (never married = 1, other = 0), education (college degree or above = 1, below college education = 0), and social work license (yes = 1, no = 0).

Analytical Approach

We conducted descriptive and correlation analyses to first observe the sample characteristics and correlations among all variables. Then, we conducted ordinary least squares (OLS) regression analysis to estimate associations between JD, JR, burnout, and psychological distress and to test whether the above associations are mediated by burnout and moderated by gender and age (Hayes, 2017). Structural equation modeling (SEM) can also be used to test the mediation and moderation effects. We conducted SEM analysis, and the results (available upon request) were not different from the regression approach. The framework underlying this study posits that the extent of burnout and the extent of psychological distress experienced by social workers are each determined by JD-R and social workers' demographic characteristics. The specification of the analytic model is represented by the following equation:

$$Y_i = \alpha_i + \beta_1 * \chi_i + \varepsilon_i$$

where Y_i is burnout or psychological distress of the subject i; α_i is the individual constant; χ is a vector of JD-R and the demographic characteristics of subject i; β is a vector of regression coefficients; and ε_i is the cross-sectional error component. For the model, in which psychological distress was the dependent variable, psychological distress was regressed onto burnout. All analyses were conducted using STATA software 16.0.

RESULTS

Table 1 presents the descriptive statistics of the variables. On average, the sample had a psychological distress score of 7.2,

with a SD of 5.2. About 12% of social workers scored within the range for high psychological distress (i.e., above 13), and another 29% scored within the range for moderate psychological distress (i.e., between 8 and 12). In other words, 40% of the social workers sampled responded that they had experienced either moderate or high psychological distress within the past 30 days of completing the survey. Burnout scores averaged 53.9, with a SD of 16.5. The sample reported relatively high JD ($M = 38.5$, $SD = 6.5$) and JR ($M = 40.8$, $SD = 7.0$), on scales that ranged 8–56. This suggested that while the social workers experienced high JD at work, they also had access to many JR through support from the colleagues and available information at their agency.

The results of correlation analyses, shown in **Table 2**, were largely consistent with our hypotheses. JD was positively correlated with burnout ($r = 0.18$, $p < 0.001$), while JR was negatively correlated with burnout ($r = -0.37$, $p < 0.001$). JD and burnout were positively correlated with psychological distress ($r = 0.15$ and 0.52, respectively; both $p < 0.001$), while JR was negatively correlated with psychological distress ($r = -0.25$, $p < 0.001$). Age was negatively correlated with psychological distress and burnout. We did not find a significant correlation between gender and psychological distress. However, women in the sample tended to have low JD and burnout.

Table 3 presents the standardized estimates of burnout. The adjusted R-square of the model was 0.25. JD and JR had significant associations with burnout. A one SD increase in JR was associated with a decrease of 0.45 SDs in psychological distress. Meanwhile, an increase of one SD in JD was associated with an increase of 0.30 SDs in psychological distress. These findings support hypothesis 1. Female and older social workers reported low burnout ($B = -0.07$, $p < 0.05$ and $B = -0.10$, $p < 0.01$, respectively).

To test the moderation effects of gender and age on the relations between JD-R and psychological distress, we added the interaction variable between each of JD and JR with gender or age, into the regression model. To avoid multilinearity, only one interaction variable was added into the regression each iteration. The results of the four interaction regressions (JD*gender, JD*age, JR*gender, and JR*age) are presented in **Figure 1**. The interaction effect of JD and female on psychological distress was statistically significant ($B = 0.34$, $p < 0.05$), suggesting that the effect of JD on psychological distress was stronger for female social workers than for male social workers. No other interaction effect was found among the other interaction terms.

Table 4 presents the standardized estimates of psychological distress. Two models are presented. The first model included JD-R, along with the demographic characteristics. Burnout was added into the second regression model. The adjusted R-square of Model 1 was 0.13, while the adjusted R-square of Model 2 was 0.29. Increasing JD by one SD was associated with a 0.23-SD increase in psychological distress, and increasing JR by one SD was associated with a 0.31-SD reduction in psychological distress. Age appeared to have a negative association with psychological distress ($B = -0.13$, $p < 0.01$).

In Model 2, burnout had a strong positive effect on psychological distress ($B = 0.46$, $p < 0.001$). After the inclusion of burnout in

TABLE 1 | Descriptive statistics of key variables.

	Mean (S.D.)
1. Psychological stress (0–24)	7.2 (5.2)
High (13–24) [%]	11.6
Moderate (8–12) [%]	28.9
Low (0–7) [%]	59.5
2. Burnout (17–110)	53.9 (16.5)
3. Job demands (8–56)	38.5 (6.5)
4. Job resources (8–56)	40.8 (7.0)
5. Female [%]	78.2
6. Age (20–50)	31.8 (7.3)
7. Never married [%]	37.8
8. Education – College degree or above [%]	54.6
9. Social work license [%]	52.3

N = 897. Numbers in brackets show ranges of the variables.

TABLE 3 | Regression analysis of burnout.

	Beta	*b*	S. E.	*t*	*p*
Job demands	0.30	0.75	0.08	9.51	***
Job resources	−0.45	−1.06	0.07	−14.70	***
Female	−0.07	−2.98	1.19	−2.51	*
Age (20–50)	−0.10	−0.23	0.08	−2.77	**
Never married	0.05	1.79	1.24	1.44	
Education – College degree or above	0.04	1.21	1.05	1.15	
Social work license	−0.01	−0.06	1.01	−0.06	
Adjusted R-square	0.25				

N = 897. F(7, 889) = 42.89.
**p < 0.05; **p < 0.01; ***p < 0.001.*

TABLE 2 | Correlation analysis of key variables.

	1	2	3	4	5	6
1. Psychological stress	---					
2. Burnout	0.52***	---				
3. Job demands	0.15***	0.18***	---			
4. Job resources	−0.25***	−0.37***	0.30***	---		
5. Female	−0.04	−0.09*	−0.11**	−0.05	---	
6. Age	−0.14***	−0.17***	0.02	0.06	−0.04	---

N = 897.
p < 0.05; **p < 0.01;*p < 0.001.*

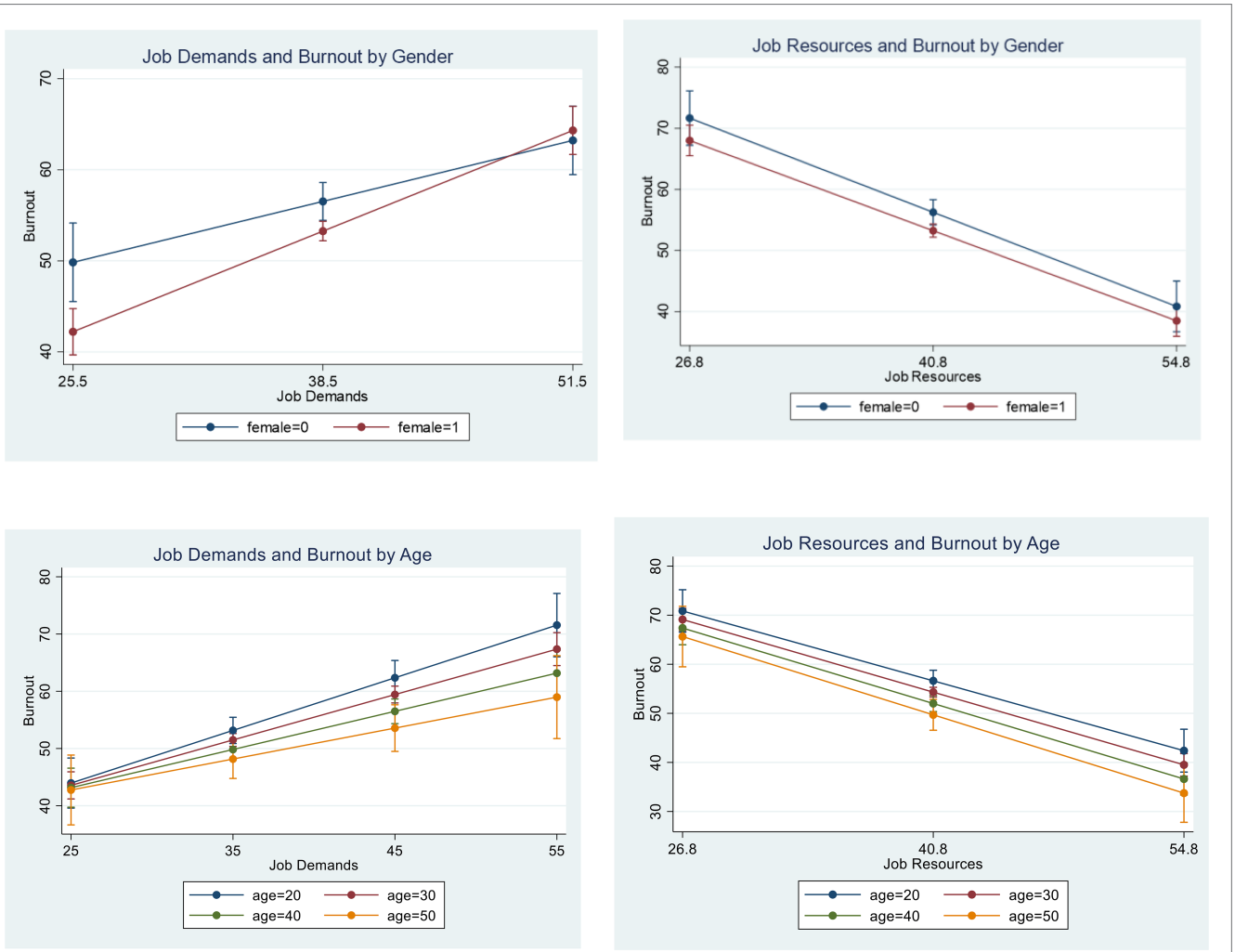

FIGURE 1 | Effects of job demands and resources (JD-R) on burnout, by gender and age. The graph was based on results from **Table 3**.

TABLE 4 | Regression analysis of psychological distress.

	Model 1			Model 2		
	Beta	**S. E.**	***p***	**Beta**	**S. E.**	***p***
Burnout	---	---		0.46	0.01	***
Job demands	0.23	0.03	***	0.10	0.03	**
Job resources	−0.31	0.02	***	−0.10	0.02	**
Female	−0.04	0.40		−0.01	0.37	
Age (20–50)	−0.13	0.03	**	−0.08	0.03	*
Never married	−0.02	0.43		−0.05	0.39	
Education – College degree or above	0.03	0.36		0.01	0.32	
Social work license	0.04	0.34		0.04	0.31	
Adjusted R-square	0.13			0.29		

N = 897.
*$p < 0.05$;**$p < 0.01$;***$p < 0.001$.

the model, the estimates of JD and JR reduced from 0.23 and −0.31 to about 0.10 and −0.10, respectively. These findings support hypothesis 2. After adding burnout into the model, the estimates of JD and JR both lowered substantially, suggesting that burnout is a mediator between JD, JR, and psychological distress. These findings confirm hypothesis 3.

The moderation effects of gender and age on the relation between burnout and psychological distress were then tested, and the results of the two interaction regressions (burnout*gender, burnout*age) are presented in **Figure 2**. The interaction between burnout and gender achieved statistical significance ($B = 0.08$, $p < 0.001$), suggesting that burnout had a larger effect on psychological distress for female social workers than for male social workers. The interaction between burnout and age achieved statistical significance as well ($B = -0.01$, $p < 0.05$), suggesting that burnout had less of an effect on psychological distress among older social workers. These findings support hypothesis 4.

DISCUSSION

Findings of descriptive analysis indicated that about 41% of the sampled social workers experienced moderate to high

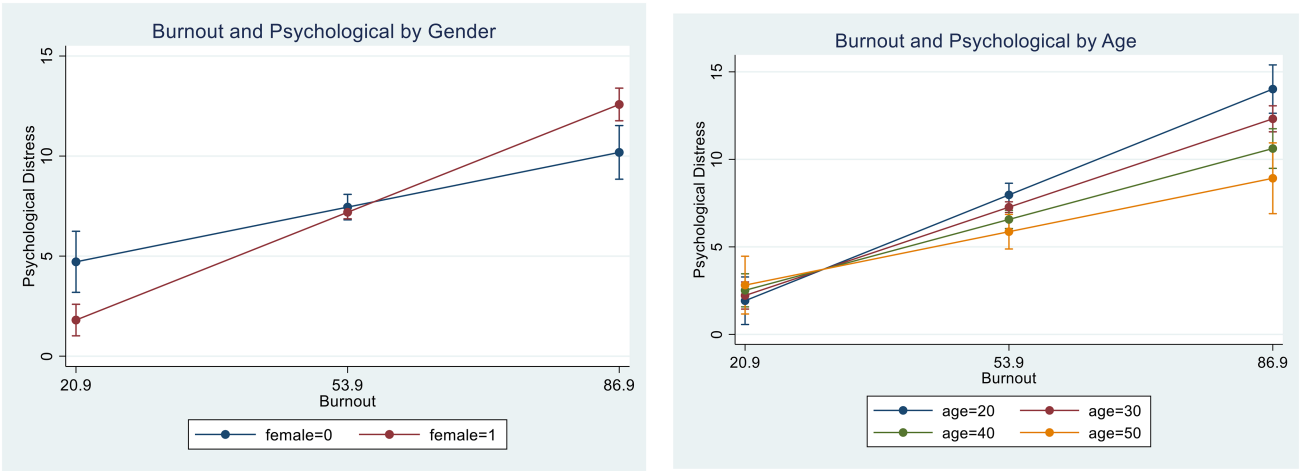

FIGURE 2 | Effects of burnout on psychological distress, by gender and age. The graph was based on results from **Table 4**.

psychological distress. As psychological distress is positively related to serious mental illness, alcohol and substance use, and negative work outcomes across cultural contexts (Furukawa et al., 2003; Hardy et al., 2003; Kessler et al., 2010), it is imperative to understand factors of psychological distress in social workers in China, as well as potential services or intervention to reduce this distress. The findings also show that social workers in China have high levels of burnout and JD. At the same time, they have relatively high JR available to them. Thus, the relations among JD, JR, burnout, and psychological distress are worthy of further examination.

Regression results first provided support for the hypothesized dual processes through which JD-R affect burnout in social workers in China. The health-impairment, or energy depletion, process was indicated by the positive association between JD and burnout, whereas the motivation process was indicated by JR's negative association with burnout. Thus, social workers who can draw upon JR are less likely to experience burnout. The magnitude of the estimates show that JR have a greater effect on burnout in Chinese social workers than JD. Meanwhile, moderation analyses showed a moderation effect of gender, whereby JD had a greater effect on female social workers' burnout than on male's counterparts.

The regression results for psychological distress showed that JD-R and burnout are important predictors of the social workers' psychological distress. Both estimates of JD-R, however, decreased substantially once burnout was included in Model 2, suggesting that burnout may mediate the relation between JD-R and psychological distress. Moderation analyses showed that the effects of burnout on psychological distress were moderated by gender and age. Female social workers with high burnout were more likely to have greater psychological distress than their male counterparts. Likewise, younger social workers with high burnout were more likely to have greater psychological distress than their older counterparts.

Taken together, the results are in line with and expand upon previous findings from other studies' application of the JD-R model to samples of professionals from other occupational groups (Demerouti et al., 2001; Bakker et al., 2003; Hakanen et al., 2008). This study expands past literature by providing support for the application of JD-R in studying burnout and subsequent psychological distress in social workers in China.

The findings of this study have practice, policy, and research implications. With respect to practice, given that this sample reported, on average, high JD, and given the positive relations between JD and burnout and JD and psychological distress, employers of social workers in China need to be cognizant of the JD projected onto their workers. More importantly, however, employers must make supportive services available to their social work employees to mitigate the effects of JD on burnout and psychological distress. In the current study, the sample of social workers reported high JR. Yet, it is imperative that these numbers are understood with respect to the urban context of these social workers. As previously mentioned, social work in China has developed rather unevenly, as resource availability varies by locale. Given that Chengdu is the capital of Sichuan province and one of the three most populous cities in western China, the relatively high availability of JR to the social workers in the study sample is consistent with past literature regarding the rapid development of social work in urban areas (Liu et al., 2020). Employers of social workers, ranging from social service agencies to hospitals and community centers, need to maintain the availability of sufficient JR to their workers. This may be a challenge for agencies that have limited resources to sustain their organization and practice, necessitating that federal, provincial, and local policies direct funding and resources to smaller agencies to support employees with burnout-reducing JR. For example, the strong positive effect of burnout on psychological distress suggests that reducing burnout can also reduce psychological distress and potential severe mental illness (Furukawa et al., 2003; Kessler et al., 2010). There is therefore a need to implement supportive services and interventions in organizations that employ social workers to buffer the effects of JD on burnout and psychological distress. For example, empirical studies have shown that mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT), and mindfulness-based interventions (MBI) all can

effectively reduce psychological distress and promote mental health and well-being (Zoogman et al., 2014; Lomas et al., 2018; Guidetti et al., 2019; Suleiman-Martos et al., 2020). In fact, MBSR and MBCT have specifically been implemented as interventions for employees such as physicians, teachers, and psychotherapists, and related outcomes included reduced emotional exhaustion and psychological distress (see Janssen et al., 2018 for review). In one study that tested the effects of MBSR on nurses, another helping profession, treatment group participants had significantly lower Maslach Burnout Inventory scores than their control counterparts (Cohen-Katz et al., 2005), highlighting the potential of implementing such interventions in the Chinese social worker population. The findings of moderation analyses in this study call for gender- and age-sensitive adaptations to such interventions and services for social workers in China.

The findings of this study also have implications for future research. These results provide support for further examination of the relations among JD-R, burnout, and psychological distress, as all three concepts contain multiple dimensions and may be measured and operationalized differently. JD-R can have multiple dimensions of JD and JR. For example, Demerouti et al. (2001) identified five JD dimensions (physical workload, time pressure, recipient contact, physical environment, and shift work) and six JR dimensions (feedback, rewards, job control, participation, job security, and supervisor support). Lequeurre et al. (2013), on the other hand, identified seven JD dimensions (pace and amount of work, mental load, emotional load, physical efforts, changes in tasks, ambiguities about work, and uncertainty about the future) and seven JR dimensions (information, communication, participation, relationship with colleagues, relationship with superior, remuneration, and independence in the work). Due to resource constraints, we only focused on two dimensions of each JD and JR, specifically those that have previously shown significant effects in other studies (Lequeurre et al., 2013). Future studies may examine the extent to which other JD-R dimensions affect burnout and psychological distress. Likewise, burnout and psychological distress can include multiple dimensions. It is likely that JD-R components may differentially affect the various dimensions of burnout and psychological distress each, warranting future studies that measure these multidimensional constructs more comprehensively.

The findings and implications of the present study must be considered within several limitations. First, our analyses were based on a cross-sectional dataset, which can only approximate associative relations among JD-R, burnout, and psychological distress. Future research can use a longitudinal design to better approximate the causal relations of these variables. Second, unobserved variables, which were not included in this study, could have had effects on JD-R, burnout, and psychological distress. Such variables may include job type and personal traits. While all respondents were social workers, the roles that social workers play across China vary greatly. Our sample may have consisted of direct practitioners, who work closely with vulnerable populations, as well as administrative staff, who work within the bounds of macro-level practice (e.g., policy and advocacy). Further, psychological health is affected by personal traits like mindfulness, grit, and resilience (Zoogman et al., 2014; Suleiman-Martos et al., 2020). These were not measured in our study and may explain variations in social workers' psychological distress. The absence of these unobserved variables may have effects on the estimates reported in this study. Third, data gathered on JD-R, burnout, and psychological distress were from self-reports of the subjects. Self-reporting leaves our data subject to unintended and intended reporting errors. Social desirability bias, for example, may lead respondents to underreport their JD and psychological distress, while overreporting JR. Future studies might consider using data triangulation through colleague reports and employer reports. Finally, the findings of this study are based on data from social workers in two districts in Chengdu, the capital city of Sichuan province in China. While the sample size and response rate support our confidence in these results, the extent to which these findings can be generalizable to all Chinese social workers is unknown and requires further research.

CONCLUSION

This study analyzed data collected from 897 social workers in Chengdu, China, to investigate the extent to which JD-R affects burnout and psychological distress in social workers in China. It also investigated whether these relations are moderated by gender and age. The findings of this study support past findings from cross-cultural research, which have indicated that JD-R affects burnout and health outcomes through a dual process. The findings expand upon this research by providing evidence to support JD-R's dual process in a sample of Chinese social workers. The results underscore the importance of reducing JD and increasing JR for social workers in China, an emerging profession with a high turnover rate. They also emphasize that burnout may serve as a mediator in the relation between JD-R and psychological distress, necessitating gender- and age-sensitive interventions to mitigate burnout and psychological distress among social workers in China.

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 Review Committee, Research Institute of Social Development, Southwestern University of Finance & Economics. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

XX and CH: conceptualization and resources. XX, CH, SC, YZ, and JF: methodology and software, validation,

formal analysis, and writing – original draft preparation. XX, CH, YZ, and JF: investigation and data curation. All authors contributed to the article and approved the submitted version.

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School Principals' Stress Profiles During COVID-19, Demands, and Resources

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The present study examined latent profiles of school principals' stress concerning students', teachers', parents', and principals' own ability to cope during the COVID-19 pandemic. In addition, the role of job demands (workload, remote work stress, difficulty to detach from work, COVID-19 crisis, COVID-19 infections at school, impact of COVID-19 on future teaching), resources (buoyancy, effective crisis leadership, social appreciation, successful transition to remote teaching), and occupational well-being (measured as job burnout and engagement) in predicting the latent profiles of stress sources was examined. The participants were 535 (59% women) school principals across Finland, who answered to a questionnaire concerning their sources of stress and occupational well-being during spring 2020. Three latent profiles were identified according to principals' level of stress: *high stress* (41.4% of the school principals), *altered stress* (35.9%), and *low stress* (22.7%) profiles. Work burnout, workload, COVID-19 related concerns, and difficulty to detach from work increased the probability of principals belonging to the high or altered stress profile rather than to the low stress profile. Work engagement, buoyancy, and social appreciation increased the probability of principals belonging to the low rather than to the high or altered stress profile.

Keywords: stress, latent profile analysis (LPA), school principals, COVID-19, demands and resources

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INTRODUCTION

At the beginning of 2020, SARS-CoV-2 (COVID-19) virus spread across the world and disrupted teaching and learning of millions of students across the globe. At the onset of the pandemic school principals had to respond to school closures and fundamental shifts in education rapidly, one of the major changes being shifting from regular in-person learning to remote learning and teaching (Weiner et al., 2021). At schools and different educational institutions principals were leading the transitions to remote teaching and learning, and they were tasked with helping teachers and staff, students, and their parents to adjust to the new continuously changing environment (Weiner et al., 2021). Simultaneously, increasing concerns about the spread of the virus and concerns about family members, friends, colleagues, and students and their families getting sick were present, which might have altered school principals' level of stress. Previous research has indicated that such concerns related to the school community are often among the most prevalent stressors in school principals' work (Elomaa et al., 2020, 2021), and high stress may limit principal effectiveness in times of crisis (DeMatthews et al., 2021). However, even less studied, it is possible that individual differences exist in school principals experiences of stress concerning the school society's ability to cope with the

pandemic. For example, it is possible that during COVID-19 subgroups of principals experienced high/altered/low stress concerning the school community's ability to cope with the COVID-19 crisis (see also Innanen et al., 2014; Salmela-Aro et al., 2019). These differences can be captured with person-oriented research, such as latent profile analysis (LPA). Moreover, due to COVID-19, principals had to face several new demands (e.g., remote work demands, impact of COVID-19 on future teaching) related to the unexpected situation, which may have altered their stress concerning the school community's ability to cope. Consequently, using the job demands-resources framework (Demerouti et al., 2001; Bakker and Demerouti, 2006, 2017), the present study examines latent profiles of principals' stress concerning the school community's (e.g., students, teachers, parents, principals) ability to cope during COVID-19 pandemic, and the associations between the latent profiles and principals' job demands (e.g., workload, remote work stress, difficulty to detach from work, COVID-19 crisis, COVID-19 infections at school, impact of COVID-19 on future teaching), resources (e.g., buoyancy, crisis leadership, social appreciation, schools' adaptation to remote learning), job burnout and engagement.

Principals' Stress Concerning the School Community's Ability to Cope With COVID-19 Pandemic

Even job satisfaction among school principals is often high, many principals simultaneously experience altered levels of occupational stress (Darmody and Smyth, 2011). One of the main sources of their stress is principals' concerns about students, school climate (Darmody and Smyth, 2011), and interpersonal-, and health concerns (Elomaa et al., 2021, see also Dicke et al., 2018a). For example, principals who work in schools where over a quarter of students report altered emotional/behavioral problems experience higher occupational stress compared to schools where such problems are less prevalent (Darmody and Smyth, 2011). Spread of COVID-19, and psychological and financial strain that the pandemic caused among many families likely increased principals' concerns about the school community and how students, parents, and teachers were coping with the unexpected situation. In Finland most schools were closed nearly 2 months during the initial phase of COVID-19 in spring 2020. Social interactions were heavily reduced and lockdowns, quarantines, and physical distancing measures took place, causing several turmoil in many people's lives. Students were not able to meet with their peers, and both teachers and students were forced to switch to remote learning following a rapid schedule. School principals were leading these sudden changes in the school, responding to changing regulations the government proposed, and helping the school community to adjust to the continuously changing environment. All these changes combined with worries about the spread of the virus and the psychological impact of the pandemic likely altered principals' concerns about the school community's ability to cope. Even less studied, some individual differences may also take place in principals' experiences of stress. For example, it is possible that among some principals concerns about students' coping were highlighted, whereas other principals were more concerned about teachers' and parents' ability to cope. Thus, the present study was among the first to examine latent profiles of principals' stress concerning the coping of the school community during COVID-19.

Job Demands and Resources

The demands-resources (JD-R) model (Demerouti et al., 2001; Bakker and Demerouti, 2006, 2007, 2017), describes various demands and resources which are present at workplace, and often antecede employees' experiences of job-related stress. Both demands and resources can be described in terms of personal, social, and job environmental aspects of work. Job demands require sustained physical/psychological effort and include related costs (Demerouti et al., 2001). In school principals' job, workload is a typical demand, which is characterized by completing multiple tasks, and requires extended mental effort. During COVID-19, multiple unprecedented personal demands (remote work stress, strain caused by the COVID-19 crisis) and social demands related to the school community (COVID-19 infections at school, impact of COVID-19 on future teaching) emerged due to the rapid changes in the school environment. Due to the altered concerns about the school community's coping with the pandemic and intensification of new work demands, some principals might have found it also difficult to detach from work while attempting to respond to the crisis situation. Psychological detachment from work describes individuals' ability to disengage during off-work hours, which is an essential part of recovery (Sonnentag, 2012). Inability to detach and "switch off" from work during leisure time can later manifest as altered occupational stress (Sonnentag, 2012).

Job resources, in turn, help employees to face the challenges presented by job demands and reduce the related physiological/psychological costs, function as a tool to aspire work-related goals, and stimulate one's personal growth and development (Demerouti et al., 2001). Job resources are often beneficial for one's job-related well-being and help in reducing job-related stress (de Jonge et al., 2008; Upadyaya et al., 2016; Upadyaya and Salmela-Aro, 2020). One important personal resource is buoyancy, which refers to one's beliefs on how much control they have over their work and the work environment (Bakker and Demerouti, 2017), and how able one is to successfully overcome challenges and setbacks that occur at work (Martin and Marsh, 2008b; Parker and Martin, 2009). Individuals who have high personal resources often have faith in their own capabilities to face unforeseen events (Bakker and Demerouti, 2017), such as sudden changes at work related to a pandemic. During the pandemic principals' crisis leadership as a personal resource, as well as school community's adaptation to remote learning and appreciation of principals' work (social resources) became highlighted. At the onset of COVID-19, a rapid response from school principals was essential for effective crisis management, which included quick assessment of the situation, fast decision making under uncertain circumstances, creating new strategies, and making radical changes in the school community (Fernandez and Shaw, 2020). Fast adaptation to the remote teaching and learning facilitated the continuation of schooling, and social support from the school community

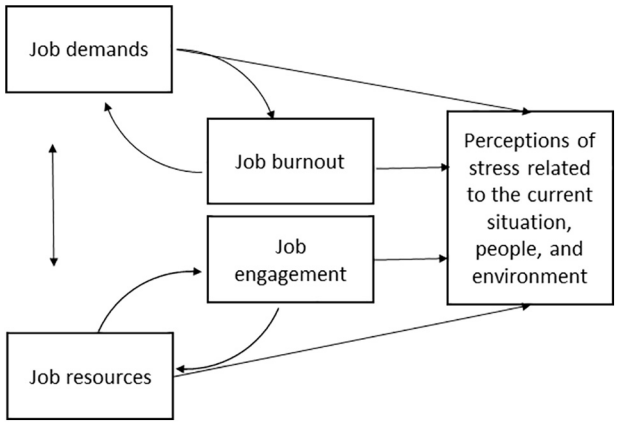

FIGURE 1 | Model of the associations between job demands, resources, occupational well-being and current stressors.

may have buffered against the negative influence of job demands (Bakker et al., 2007), and protected principals against higher levels of stress.

In addition to demands and resources, occupational well-being may have affected the level of stress principals experienced during the pandemic. Occupational well-being is a broad construct covering multiple dimensions and definitions (Kowalski and Loretto, 2017). In the present study, occupational well-being was described in terms of job burnout (e.g., exhaustion, cynicism and feelings of inadequacy at work) and engagement (e.g., absorption, energy, and dedication at work), a definition often used studies within the job demands-resources framework (Schaufeli et al., 2002; Näätänen et al., 2003; González-Romá et al., 2006; Dicke et al., 2018b). According to the JD-R theory (Bakker and Demerouti, 2007, 2017), these well-being factors affect the level of job demands and job resources, which, thus, suggests that they predict the level of perceived stress raising from various sources. Consequently, it is possible that together with job demands and resources occupational well-being factors such as job burnout and engagement predict employees' perceptions concerning stressors related to the current situation (as presented in **Figure 1**). The present study examined further the associations between demands, resources, well-being, and principals' stress concerning the school community's coping during the COVID-19 pandemic.

AIMS

The present study aimed at investigating the following research questions:

1) What kind of distinct latent profiles (e.g., groups of homogeneous subjects) can be identified according to principals' stress about students', teachers', parents', and principals' own ability to cope during COVID-19? Due to the explorative nature of the analysis, we have to be cautious about precisely formulating hypotheses on the number of latent profiles. However, based on previous research (Innanen et al., 2014; Salmela-Aro et al., 2019), we expect to find at least two distinct profiles, one representing school principals who report high stress, and another profile representing a low stress profile.
2) To what extent principals' demands (workload, remote work stress, difficulty to detach, COVID-19 crisis, COVID-19 infections at school, impact of COVID-19 on future teaching), resources (buoyancy, crisis leadership, social appreciation, adaptation to remote learning), and job well-being (burnout and engagement) are associated with principals belonging to different stress profiles? Based on some previous research findings (Upadyaya et al., 2016; Salmela-Aro et al., 2019), we expect that job demands are positively associated with principals belonging to higher stress profiles, and that resources are associated with principals belonging to lower stress profiles.

MATRIALS AND METHODS

Participants

This study is part of the school principal barometer, which follows up school principals annually across Finland. The present study uses data from the second wave which was collected in spring 2020 during the COVID-19 pandemic. An online survey was distributed to 1,200 school principals (response rate 54%) via email concerning their job-related stress, demands, resources, and well-being. Altogether 535 (59% women) principals participated the study. Most principals had a Master's degree (95.6%). The age range of the participants was 29–40 (11%), 41–50 (35%), 51–60 (45%), and 61–66 (9%) years old. Participation in the study was voluntary and the research project was approved by the Ethical Review Board of the University of Helsinki and the research protocol followed their guidelines.

Measures

Stress sources were measured with four questions (adapted from Dicke et al., 2018a) concerning school principals' stress over the school community's ability to cope with the COVID-19 crisis ("The following questions concern stressors at your leadership position. Please estimate how stressful the following factors have been for you during the past 3 months." "Students'. . .; teachers'. . .; parents'. . . my own ability to cope."). The scale anchors were 1 = minor source of stress; 10 = significant source of stress.

Job demands were measured in terms of *workload, difficulty to detach from school* (see also Dicke et al., 2018a), *COVID-19 crisis* ["On a scale 1–10, please estimate how stressful the following factors have been during the past 3 months: (a) workload, (b) COVID-19 crisis, (c) difficulty to detach from school community."; 1 = minor source of stress; 10 = significant source of stress], *remote work stress, COVID-19 infections at school, and impact of COVID-19 on future learning* ["On a scale 0–10: (a) how much remote work has increased your stress?, (b) how concerned you are about the COVID-19 infections at your school community, (c) how much you think COVID-19 will

affect teaching after the pandemic?; 0 = not at all; 10 = a lot; see also Dicke et al., 2018a].

Job resources were measured in terms of *buoyancy* (3 items (Martin and Marsh, 2008a), "I am good at dealing with work pressures."; 1 = not at all true; 7 = very much true; Cronbach's α = 0.85), principals' *COVID-19 crisis leadership efficacy* (C-LEAD; 6 items, "Think about your actions during the COVID-19 crisis. What do you think about the following statements? – I can make decisions even under extreme deadlines."; 1 = completely disagree; 5 = completely agree; Cronbach's α = 0.85; Hadley et al., 2011), school community's *adaptation to remote learning* (6 items; "How well did your school/teachers/students/parents/schools' food supply/special education succeeded in the transition to remote learning?"; 1 = very poorly; 5 = very well; Conbach's α = 0.85), and *social appreciation* (3 items; "Does your schools' personnel/executive team/municipals' educational administration value the work you do as a leader in the face of the COVID-19 crisis?";1 = always; 4 = never (reversed); Cronbach's α = 0.72). All sum scores were formed with the mean function.

Job well-being was measured in terms of job burnout and engagement. *Job burnout* was measured with the Bergen Burnout Inventory (Näätänen et al., 2003; Salmela-Aro et al., 2004, 2011) which consists of 15 items measuring exhaustion at work (e.g., "I feel overwhelmed by my work,") cynicism (e.g., "I feel lack of motivation in my work and often think of giving up,") and sense of inadequacy (e.g., "I often have feelings of inadequacy in my work.") The scale anchors were (1 = completely disagree; 6 = completely agree). A mean score was formed to concern principals' overall burnout (Cronbach's α = 0.90) (see also Schaufeli et al., 2002). *Job engagement* was measured with a short version of the Utrecht Work Engagement Scale, UWES-S (Schaufeli et al., 2002; see also Schaufeli et al., 2006; Toth-Kiraly et al., 2021a,b). The scale consists of 9 items measuring energy (e.g., "When I work, I am bursting with energy,") dedication (e.g., "I am enthusiastic about my work"), and absorption (e.g., "Time flies when I'm working"). The responses were rated on a 7-point scale (1 = never; 7 = daily). A mean score was formed to measure principals' overall engagement at work (Cronbach's α = 0.94) (see also Schaufeli et al., 2006).

Analysis Strategy

To be able to identify the homogeneous latent groups of school principals with different levels of stress sources (e.g., stress about students', teachers', parents', and principals' own ability to cope with the situation) during the COVID-19 pandemic, the results were analyzed by means of latent profile analysis (LPA; Muthén and Muthén, 1998–2021), which is a type of finite mixture analysis that assesses heterogeneity through the identification of homogeneous subgroups (i.e., latent profiles) of participants with similar indicator means (e.g., principals' stress sources) within the latent profiles. The advantage of LPA compared with traditional cluster analysis is that it is model-based and provides fit indices for different latent profile solutions, which can then be compared in order to determine the final solution which fits the data the best (see also Mäkikangas et al., 2018). The latent profile analyses were carried out in two phases. First, to be able to identify naturally occurring latent profiles of principals' stress concerning the school community's ability to cope in the data, LPAs for different latent groups were carried out first, and the fit indices and class frequencies were compared. The variances were estimated equal between the classes by default. The estimation was performed step by step, starting from one-class solution to estimate the parameters for 2,3,. . ., *k*-class solutions. The solution that best fitted the data in accordance with the indicators and that was also deemed reasonable in terms of interpretation was chosen as the final latent profile model. Second, in order to identify the possible antecedents of principals' stress profiles, job demands (e.g., workload, remote work stress, difficulty to detach from work, COVID-19 crisis, COVID-19 infections at school, impact of COVID-19 on future teaching), resources (e.g., buoyancy, crisis leadership, social appreciation, schools' adaptation to remote learning), and job burnout and engagement were added into the final model as covariates using multinomial logistic regression via the R3STEP command (Asparouhov and Muthén, 2014). The R3STEP provides information whether the antecedent variables are related to a higher probability of the participants belonging to each profile rather than the others (see **Table 1** for means, standard deviations, and correlations).

All the analyses for the LPAs were performed with the Mplus statistical package (version 8; Muthén and Muthén, 1998–2021). Missing data was deleted listwise, which was the default for this type of analysis (Muthén and Muthén, 1998–2021). The model parameters were estimated by means of maximum likelihood robust (MLR) estimator, which produces standard errors and a chi-square test statistic for missing data with non-normal outcomes by means of a sandwich estimator and the Yuan-Bentler T2 test statistic (Muthén and Muthén, 1998–2021). Five criteria were used to decide the final number of classes: (a) the Bayesian information criterion (BIC), and (b) the Akaike information criterion (AIC), according to which the model with the smallest value is considered the best model; (c) the Vuong-Lo-Mendell-Rubin (VLMR) test of fit, which compares solutions with different numbers of profiles (a low *p*-value indicates that the *k* model has to be rejected in favor of a model with at least $k + 1$ profiles); (d) entropy values, which determine classification quality (values close to 1 indicate clear classification) (Celeux and Soromenho, 1996); and (e) the clarity and interpretation of the profiles.

RESULTS

The analyses were begun by performing LPAs with different numbers of latent profiles. **Table 2** shows the different fit indices for the compared latent profile solutions. Comparison of the fit indices and profile frequencies showed that the fit indices of three and four profile solutions were quite similar and both solutions would fit the data well. However, a closer examination of the profiles indicated that in the only difference between three- and four profile solutions was that in the four profile solution the largest group split in two smaller groups which were highly similar in terms of principals' stress concerning the school community's ability to cope. Thus, the three-profile solution was

TABLE 1 | Correlation coefficients, means, and standard deviations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Students' coping																
2. Teachers' coping	0.61***															
3. Parents' coping	0.52***	0.62***														
4. Principals' coping	0.30***	0.55***	0.32***													
5. Job burnout	0.18***	0.35***	0.17***	0.58***												
6. Job engagement	−0.08	−0.18***	−0.03	−0.38***	−0.61***											
7. Buoyancy	−0.16***	−0.28***	−0.12**	−0.51***	−0.58***	0.46***										
8. Crisis leadership	−0.12**	−0.12**	−0.02	−0.09*	−0.14***	0.21***	0.26***									
9. Social appreciation	0.04	−0.16**	0.01	−0.19***	−0.39***	0.42***	0.29***	0.27***								
10. Adaptation to remote learning	−0.10*	−0.12**	−0.05	−0.15***	−0.23***	0.24***	0.22***	0.20***	−0.32***							
11. Workload	0.20***	0.40***	0.21***	0.57***	0.48***	−0.27***	−0.36***	−0.09*	0.21***	−0.09*						
12. Remote work stress	0.20***	0.26***	0.28***	0.35***	0.24***	−0.12**	−0.18***	−0.10*	0.13**	−0.15***	0.37***					
13. Difficulty to detach	0.15***	0.27***	0.18***	0.51***	0.53***	−0.25***	−0.47***	−0.11*	0.15***	−0.07	0.41***	0.31***				
14. COVID-19	0.15***	0.16***	0.20***	0.17***	0.14**	−0.05	−0.10*	−0.02	0.06	−0.08	0.13**	0.27***	0.15***			
15. COVID-19 infections	0.11*	0.18***	0.20***	0.17***	0.13**	−0.00	−0.08	0.01	0.10*	−0.06	0.11*	0.20***	0.14**	0.76***		
16. Impact of COVID-19 on future teaching	0.16***	0.19***	0.19***	0.20***	0.14**	−0.08	−0.09*	0.02	0.00	−0.06	0.09*	0.21***	0.15***	0.30***	0.31***	
M	5.49	6.97	5.20	5.65	2.72	5.16	4.89	3.88	1.73	4.03	7.42	4.72	3.97	6.01	6.43	6.37
SD	2.41	2.18	2.58	2.74	0.78	1.01	1.17	0.57	0.48	0.50	2.28	2.99	2.75	2.58	2.21	2.27

****p < 0.001; **p < 0.01; *p < 0.05; Response scales, 1–4 social appreciation; 1–5 COVID-19 crisis leadership efficacy, adaptation to remote learning; 1–7 job burnout and engagement, buoyancy; 0–10 remote work stress, COVID-19 infections at school, impact on teaching; 1–10 students', teachers', parents', principals' coping, difficulty to detach, workload, COVID-19 crisis.*

TABLE 2 | Fit indices for the compared latent profiles.

Number of profiles	BIC	aBIC	AIC	Entropy	VLMR	Difference in the number of parameters	*p*-value	Latent class proportion%
1	9983.39	9957.10	9949.14	–	–	–		
2	9383.76	9342.50	9328.09	0.88	−4966.57	5	0.00	70/30
3	9215.92	9158.79	9138.84	0.82	−4651.05	5	0.00	41/36/23/
4	9140.56	9067.55	9042.07	0.83	−4551.42	5	0.00	35/23/22/20
5	9131.26	9042.38	9011.35	0.80	−4498.04	5	0.08	26/22/21/20/11

BIC, Bayes information criteria; aBIC, Adjusted Bayes information criteria; AIC, Akaike information criteria; VLMR, Vuong–Lo–Mendell–Rubin.

considered the most distinctive and meaningful solution. The final three-profile solution is presented in **Figure 2**.

The first latent profile (41.4% of the principals) was characterized by a high level of stress related to parents, teachers, and principals' own ability to cope during COVID-19, and altered level of stress related to students' ability to cope (**Figure 2**). The second latent profile (35.9% of the principals) was characterized by an altered level of stress related to parents, teachers, and principals' own ability to cope, and average level of stress related to students' ability to cope. The third latent profile (22.7%) was characterized by a low level of all the variables. The latent profiles were labeled as *high, altered, and low stress* profiles.

Next, to investigate the role of covariates in predicting the latent profiles, principals' job resources (e.g., buoyancy, crisis leadership, social appreciation, schools' adaptation to remote learning), job demands (e.g., workload, remote work stress, difficulty to detach from work, COVID-19 crisis, COVID-19 infections at school, impact of COVID-19 on future teaching), and job burnout and engagement were added in the final model. The results for the covariates (**Table 3**) showed that school principals who reported having high job resources (e.g., buoyancy, social appreciation) more often belonged to low rather than high or average stress profiles. In addition, principals who thought the transition to remote learning was successful at their school more often belonged to the average rather than to the high stress profile. Principals who experienced they were able to perform their leadership tasks well during the COVID-19 crisis more often belonged to the average rather than to the two other profiles. Concerning demands, principals who experienced high job and personal demands (e.g., workload, stress related to remote work, difficulty to detach from work), more often belonged to the high or average stress profiles rather than the low stress profile, or to high rather than to the average stress profile. Further, principals who experienced high stress related to COVID-19 pandemic, infections spreading at school, and concerning the impact of COVID-19 on future teaching more

TABLE 3 | Antecedents of school principals stress source profiles (logistic regression coefficients).

	High vs. Low	High vs. Average	Average vs. Low
Job well-being			
Burnout	1.34***	0.25	1.09***
Engagement	−0.48**	0.01	−0.49***
Resources			
Buoyancy	−0.74***	0.10	−0.68***
Social appreciation	−0.70*	0.24	−0.73*
COVID-19 leadership	−0.00	−0.60**	0.60*
Adaptation to remote learning	−0.27	−0.57*	0.30
Demands			
Workload	0.49***	0.17**	0.31***
COVID-19 crisis leadership	1.56***	1.28***	1.21***
Remote work stress	0.27***	0.19***	0.08
Difficulty to detach from school	0.29***	0.07	0.23***
COVID-19	0.19***	0.16**	0.03
COVID-19 infections at school	0.26***	0.16**	−0.10
Impact of COVID-19 on future teaching	0.25***	0.14*	0.11

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.

often belonged to the high rather than to the low or average stress profiles. Moreover, principals who experienced high job burnout more often belonged to the high or average stress profile rather than to the low stress profile, whereas principals who experienced high work engagement more often belonged to the low stress rather than to the high or average stress profiles.

DISCUSSION

The present study examined latent profiles of stress among Finnish school principals during an unprecedented time of global COVID-19 pandemic, when in many countries lockdowns, school closures, and social distancing took place, resulting as increased levels of stress, anxiety, and loneliness among students (Bu et al., 2020; Zheng et al., 2021), which had detrimental effects on some students' well-being (Loades et al., 2020; Salmela-Aro et al., 2021). Teachers and school principals were forced to engage in a dramatically different way, and shift from in-person to remote work (Weiner et al., 2021). Some (mainly primary) schools faced another shift at the end of the spring 2020, when after the initial closures schools went back to in-person teaching, which continued also during the next school term starting in autumn 2020. School principals were facing unexpected challenges and leading rapid shifts between in-person teaching and virtual teaching and learning, while concerns about students', teachers', parents', and principals' own ability to cope with the situation were simultaneously present. This study examined latent profiles of principals' stress concerning the school community's ability to cope during the pandemic in association with multiple job demands and resources during COVID-19.

Latent Profiles of Principals' Stress

Three distinct latent profiles concerning school principals' stress related to students', teachers', parents', and their own ability to cope during COVID-19 were identified, namely high, average, and low stress profiles. The two largest profiles were the high (41.4%) and average (35.9%) stress profiles, which were characterized by a high/average level of stress related to parents, teachers, and principals' own ability to cope, and altered/average level of stress related to students' ability to cope. The third "low stress" profile (22.7%) was characterized by an overall low level of stress. These alarming results indicated that during COVID-19, 77% of the principals were experiencing high or altered levels of stress concerning the school community's ability to cope with the pandemic.

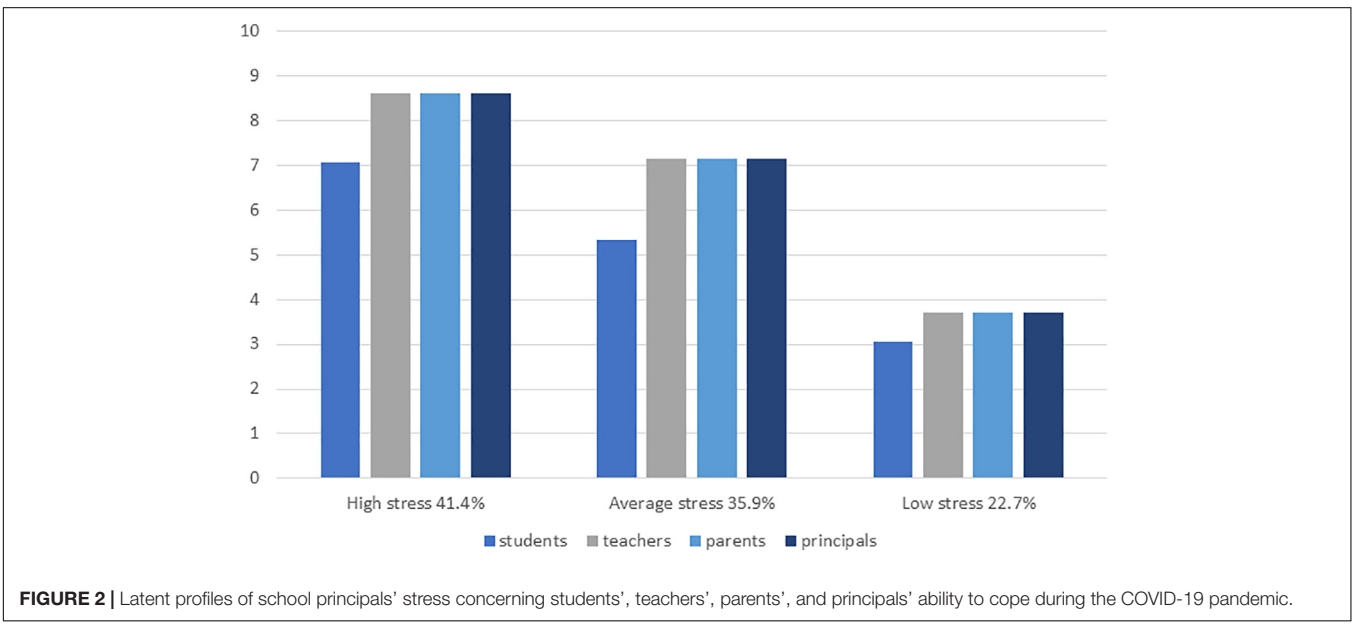

FIGURE 2 | Latent profiles of school principals' stress concerning students', teachers', parents', and principals' ability to cope during the COVID-19 pandemic.

The pandemic has altered the nature of school principals' work, and principals are extending their roles to create safe school settings for now and future education, provide tools and support for virtual teaching (managing physical distance, establishing effective communication strategies, motivating staff, establishing trust), and answer to the concerns and worries of the school community (Pollock, 2020). Teachers' and principals' work intensified especially at the beginning stages of the pandemic when the present study was also conducted. Due to the school- and workplace closures, many parents had to supervise their children's schooling at home while simultaneously managing their own work remotely, and many students reported increasing anxiety and loneliness (Bu et al., 2020; Zheng et al., 2021). All these sudden turmoils in school community manifested as altered levels of stress among school principals.

According to the appraisal approach, stressors are not direct precipitating causes of stress reactions, it is rather the person's appraisals of the stressors which determine their responses (Storch et al., 2007; Giancola et al., 2009; Webster et al., 2011). Acute stress typically increases engagement and coping with the stressful event or situation which is the cause (Von Dawans et al., 2012). However, the strain is likely to cease once the exposure to the stressors are removed, or, if the situation persists, people will continue to experience strain and other negative reactions such as sustained fatigue (Webster et al., 2011). In the current situation it is difficult to quantify the possible consequences of the pandemic on student achievement and well-being (Kuhfeld et al., 2020), as well as the possible long-term effects on education. It is likely that principals' stress about school community's ability to cope continues for some time, however, it is possible to promote school communities' resilience already during the pandemic, for example, by addressing the possible inequalities and decreases in well-being early (Sahlberg, 2021).

Interestingly, within each profile, principals were slightly less concerned about students' ability to cope compared to adults, which may reflect the burden teachers, parents, and principals were facing while managing online teaching of the students. However, it is possible that when the pandemic prolonged, and school societies became more aware of the negative effects of the pandemic on student well-being (Bu et al., 2020; Zheng et al., 2021), related concerns increased. On the other hand, as the crisis continued, students, teachers, parents, and principals acquired new skills and found better ways to adapt, which may also have showed as decreases in principals' stress. More studies would be needed to examine the possible changes in principals' stress profiles during different phases of the ongoing pandemic further.

Demands and Resources Associated With Principals' Stress

The results indicated that high buoyancy as a personal resource was associated with lower levels of school principals' stress concerning the school community's ability to cope. Buoyancy refers to one's "everyday" resilience, and capacity to overcome challenges at work, and is often associated with high well-being among employees (Martin and Marsh, 2008a,b; Parker and Martin, 2009). Capability to lead school effectively during the pandemic was associated with average stress, probably because times of crisis are always stressful. Too high or low levels of stress may hinder effective crisis leadership (see also DeMatthews et al., 2021). Similarly, principals who felt their school's transition to remote learning went well more often belonged to the average rather than to the high stress profile. Further, principals who experienced high social appreciation more often belonged to the low stress profile compared to the other two profiles. Social support from the school community is often associated with lower levels of occupational stress, and principals who experience social support feel more connected to school community (Beausaert et al., 2016). In addition, occupational well-being in terms of job burnout and engagement was associated with high/altered stress or low stress, respectively.

Job/personal (workload, remote work stress, strain caused by the COVID-19 crisis) and social demands (COVID-19 infections at school, impact of COVID-19 on future teaching) were associated with high or altered levels of stress concerning the school community's ability to cope. In the crisis situation, principals were rapidly taking new tasks, such as creating effective and safe learning environments for students and teachers, which likely increased their workload. Simultaneously other aspects of COVID-19 crisis (concerns and fears about the virus spreading, reduced social contacts, multitasking with remote work and family duties) were present, manifesting as altered stress. Further, these results indicated that it was not only COVID-19 related social demands which altered principals' stress, but also other job/personal demands, such as workload and remote work stress, which increased principals' stress concerning their school community's ability to cope. The pandemic has altered the nature of school principals' work, and principals are extending their roles to create safe school settings for now and future education, provide tools and support for virtual teaching (managing physical distance, establishing effective communication strategies, motivating staff, establishing trust), and answer to the concerns and worries of the school community (Pollock, 2020). Teachers' and principals' work intensified especially at the beginning stages of the pandemic when the present study was also conducted.

LIMITATIONS

This study has some limitations which should be taken into account when generalizing the findings. First, the study design was cross-sectional, which made it not possible to examine the development of principals' stress across the pandemic. Due to the multiple changes in the school environment, it is possible that increases/decreases occurred in principals' stress. Such development should be examined in future studies using longitudinal designs. Second, this study concerned Finnish school principals whose job is characterized by high

independency and flexible accountability (Aho et al., 2006). It is possible that the results would have turned different in some other cultural contexts and occupational groups, and more studies would be needed to examine such differences further. Third, some variables which were not examined in this study might have affected the results (e.g., students' disruptive behaviors, job-related self-efficacy) (Upadyaya et al., 2016; Bottiani et al., 2019). Moreover, besides job burnout and engagement, principals' occupational well-being covers multiple other constructs (Kowalski and Loretto, 2017), such as job satisfaction, which were not examined in the present study. In the future studies, it would be important to examine multiple types of demands, resources, and indicators of well-being in association with principals' stress profiles.

CONCLUSIONS

Compared to teachers, principals are more likely to experience occupational stress (Darmody and Smyth, 2011). The present study showed some concerning results by indicating that during COVID-19, most school principals (77%) experienced high or altered levels of stress related to the school community's ability to cope with the COVID-19 crisis. Principals' job/personal/social demands and resources, burnout and engagement were associated with their experiences of stress. Especially buoyancy and social support (appreciation) from school community were beneficial in protecting principals against high stress. These results are important, as principals' stress, well-being, and leadership style can be associated with workplace buoyancy among teachers (Collie et al., 2016), and thus, have manifold influence in the school community. Social support is an important job resource which may further manifest as high well-being and connectedness, and buffer against the negative impact of job demands (Bakker et al., 2007; Beausaert et al., 2016). Social support also helps in taking care of work burden in daily tasks (Beausaert et al., 2016). Poor social support, in turn, is often associated with higher levels of occupational stress among principals (Darmody and Smyth, 2011). Principals' experiences of stress concerning the school society's coping with the pandemic are unique in a sense that principals are the ones who are responsible of leading the school, responding to the changes in the crisis situation, and providing the necessary measures for the school community's adjustment. As the pandemic is still ongoing, and principals are continuously required to respond to the new regulations, and build safe environments to school communities, it would be important to simultaneously promote principals' personal and social resources, and reduce their job demands. For example, in order to reduce principals' stress and workload, it would be possible to share some of principals' job responsibilities with other colleagues or an administrative team (Beausaert et al., 2016). Principals' job demands have been steadily increasing, and the unpredicted changes the pandemic caused created new demands and stress, as the effort required to meet demands cannot always be effectively directed, or the quantity of demands is high (Beausaert et al., 2021). Promoting collegiality and collaboration in principals' work would help in creating social capital, which support principals' well-being (Beausaert et al., 2021). Coaching and mentoring may also provide social support, help principals to feel less isolated, and mitigate the overload principals may experience during crisis situation (Bauer and Brazer, 2013).

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 University of Helsinki Ethics Committee. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

KU contributed to the writing of the manuscript and performed the statistical analyses. KS-A contributed to the design of the study, data collection, and writing of the manuscript. HT contributed in editing and writing the manuscript. All authors contributed to the article and approved the submitted version.

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The Mediator Role of Feelings of Guilt in the Process of Burnout and Psychosomatic Disorders: A Cross-Cultural Study

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Burnout was recently declared by WHO as an "occupational phenomenon" in the International Classification of Diseases 11th revision (ICD-11), recognizing burnout as a serious health issue. Earlier studies have shown that feelings of guilt appear to be involved in the burnout process. However, the exact nature of the relationships among burnout, guilt and psychosomatic disorders remains unclear. The purpose of this study was to investigate the mediator role of feelings of guilt in the relationship between burnout and psychosomatic disorders, and perform a cross-cultural validation of the multi-dimensional model by Gil-Monte in two samples of teachers (Portuguese vs. Spanish). The study sample was composed of 1,266 teachers, 1,062 from Spain, and 204 from Portugal. Burnout was measured by the Spanish Burnout Inventory. Hypotheses were tested together in a path model. The results obtained provide empirical evidence for the mediator role of guilt in the relationship between the Burnout syndrome and psychosomatic disorders in the sample of teachers from Spain and Portugal, and they contribute to the empirical validation of the model by Gil-Monte. The results indicate that guilt should be incorporated as a symptom of burnout in order to identify individuals affected by burnout and profiles or types of burnout to differentiate it from other pathologies like depression.

Keywords: burnout, feelings of guilt, psychosomatic disorders, occupational stress, teachers

INTRODUCTION

Burnout is a psychological response to chronic work-related stress. Edelwich and Brodsky (1980) have defined burnout as "a progressive loss of idealism, energy, and purpose experienced by people in the helping professions as a result of the conditions of their work." It is a process that progresses from enthusiasm to stagnation, frustration and, finally, apathy. Price and Murphy (1984) defined burnout as a disordered or unsuccessful process of adaptation to a stressful work situation that progresses from shock and disorganization to volatile emotions (e.g., irony), guilt and loneliness. However, the definition of burnout that is more accepted is the one advanced by

Maslach and Jackson (1981), who defined burnout symptoms as: (a) reduced efficacy or personal accomplishment, (b) emotional exhaustion, and (c) depersonalization (or cynicism).

Recently burnout was included in the 11th Revision of the International Classification of Diseases (ICD-11) as an occupational phenomenon (World Health Organization [WHO], 2018).

The research has identified physiological and psychological symptoms associated with burnout among teachers, as cortisol dysregulation (Katz et al., 2016), depressed affect (Szigeti et al., 2017; Martínez et al., 2020), a more negative perception of the general state of health (Simbula, 2010), and cognitive failures that lead to increased distraction, poor performance and inhibition errors (van der Linden et al., 2005), thus affecting the learning environment and interfering with the achievement of educational goals.

Taking into consideration the literature on burnout, it is necessary to continue studying the structure of this phenomenon and the processes underlying the concept of burnout (Cox et al., 2005). Process models on the relationships among the dimensions or symptoms of burnout are confusing and a handicap to the early recognition of burnout. Another gap in the literature is the scarcity of cross-cultural studies (Pines, 2004; Lucchetti et al., 2017).

According to Hofstede and McCrae (2004), culture is the collective programming of the mind that distinguishes one group or category of people from another. The authors highlight that culture is a collective attribute that is not directly visible; it is manifested by behaviors and shared by some people, but not all. For Moreno et al. (2003), cross-cultural studies are essential in psychology, given that they have shown the importance of cultural factors in social and psychological processes. According to Gil-Monte (2008b), there is a danger that theories accepted by part of the world will become universal, leading to their erroneous use in other parts of the globe. Studies on burnout are not exempt from cultural biases.

Although the model of the Maslach Burnout Inventory (MBI; Maslach and Jackson, 1981) has been the dominant paradigm in research on the processes underlying burnout, some alternative models (AMs) have hypothesized different types of burnout that coincide more closely with the clinical experience (Vanheule et al., 2003). In some of these models, feelings of guilt have been identified as one of the most destructive factors in staff burnout (Price and Murphy, 1984). Farber and Miller (1981) identified feelings of guilt as a symptom of teacher burnout. Gil-Monte (2005, 2012) integrated feelings of guilt into a theoretical model to explain different profiles of burnout, in order to reach a more complete diagnosis, identify individuals affected by the syndrome, and recognize the syndrome's influence on health-related disorders.

Feelings of guilt have also been identified as a symptom of depression. Some studies have concluded that burnout and depression are not separate entities (Bianchi and Brisson, 2017). However, some individuals who display severe burnout also present a depressive disorder (Bianchi et al., 2013). Depressive symptoms, such as dysfunctional attitudes, ruminative responses, pessimistic attributions (Bianchi and Schonfeld, 2016), and attentional and behavioral alterations (Bianchi and Laurent, 2015), have also been observed in individuals with burnout. Consequently, Bianchi et al. (2013) concluded that burnout could be considered equivalent to depressive symptoms in work life. Burnout and depressive symptoms have been found to be inseparably linked, increasing or decreasing together over time (Bianchi et al., 2015).

Nevertheless, the distinction between burnout and depression is partly supported by empirical research (Bianchi and Schonfeld, 2018). Although burnout and depression are positively correlated, they seem to be two distinct constructs (Leiter and Durup, 1994), and distinct phenomena (Toker and Biron, 2012), with job burnout representing a separate diagnostic entity rather than a form of depression (Tement et al., 2016; Parker and Tavella, 2021). Burnout may be a phase in the development of work-related depression, it can co-occur with anxiety and, in the later stages, be accompanied by depressive symptoms (Melamed et al., 2006).

Conclusions about burnout as a form of depression rather than as a differentiated type of pathology have mainly been reached by evaluating burnout levels with the MBI (e.g., Bianchi et al., 2013; Ahola et al., 2014) or the Burnout Measure (BM; Shirom and Ezrachi, 2003). However, as noted by Schaufeli (2003), "the MBI is neither grounded in firm clinical observation nor based on sound theorizing," and "the BM is inadequate for differentiating burnout from the related but distinct affective states of anxiety and depression" (Shirom and Ezrachi, 2003). Recent studies suggest that the burnout–depression relation is not static but relates to sample and methodological characteristics of examined studies (Meier and Kim, 2021). Koutsimani et al. (2019) indicate that they are different and robust constructs, in this sense, no conclusive overlap between burnout and depression and burnout and anxiety are found.

In addition, different studies have recommended differentiating profiles (Gil-Monte, 2012), types (Farber, 2000), or groups (van Dam, 2016) of burnout to carry out an adequate diagnosis and identify differences between burnout and other clinical disorders such as depression. Gil-Monte, after conducting out clinical interviews to diagnose burnout in nursing professionals (Gil-Monte, 2005) and teachers (Gil-Monte, 2008a), concluded that feelings of guilt is a variable that influences the chronicity of the burnout process, and he differentiates between two profiles of burnout: Profile 1 is less severe, with low levels of guilt, and Profile 2 is more severe, with high levels of guilt.

The aim of the present research is to analyze the mediator role of feelings of guilt in the process of burnout and the relationship with psychosomatic disorders, according to the Gil-Monte (2012) model, and test the model's invariance in samples of teachers from two countries, i.e., Spain and Portugal. In addition, we investigate the roles of both work overload and autonomy as relevant variables to explain teacher burnout. The findings could contribute to understanding the processes underlying this phenomenon, improving early recognition and to helping to prevent burnout.

The following sections outline teacher burnout and the relationships between work overload, autonomy and the

burnout dimensions. In addition, the literature on feelings of guilt and burnout is reviewed, and the role of feelings of guilt in the process of burnout is described according to the model by Gil-Monte (2005). Based on this information, the research hypotheses and the path analysis model are then presented.

Review studies on burnout carried out with teachers suggest that burnout levels among these professionals are high and may be positively associated with poor health (García-Carmona et al., 2019). The research has identified physiological and psychological symptoms associated with burnout among teachers, such as a more negative perception of one's general state of health and psychosomatic disorders.

Previous studies have identified work overload and autonomy as relevant variables to explain teacher burnout (Alarcon, 2011). According to the Job Strain Model by Karasek (1979), psychological strain results from the interaction between job demands, i.e., work overload- and job decision latitude, i.e., job decision latitude or autonomy. Psychological strain occurs when job demands are high and job decision latitude is low. In a similar vein, the Job Demand-Resource Model of burnout proposes that the interaction between job demands (e.g., work overload) and job resources (e.g., autonomy) is important for the development of job burnout (Demerouti et al., 2001; Demerouti and Bakker, 2011; Bakker and de Vries, 2020).

Work Overload and Burnout

Work overload is present when the task demands exceed the worker's capacity to carry them out, that is, when there is an imbalance between what is asked of the worker and what he/she can fulfill, e.g., having large amounts of work, having to work fast, or working under time pressure. Work overload is defined in terms of misfit between the person and the environment. This consideration stipulates that a misfit between demands and abilities in itself does not necessarily constitute overload. Instead, excessive demands produce stress only if the demands have been internalized as goals of the teacher, as when role expectations are accepted by professionals as guidelines for their own behavior. Work overload can be quantitative or qualitative and it has been pointed out in different studies as one of the most intense sources of stress in the professional collective of teachers (Kerr et al., 2011). Various studies with teachers have concluded that work overload is one of the most important predictors of burnout in this collective and strongly related to the emotional component of the syndrome (Salmela-Aro et al., 2019).

Autonomy and Burnout

Resources in the work environment, such as autonomy, can improve personal growth and the fulfillment of objectives (Demerouti et al., 2001). Many studies have shown that autonomy allows employees to cope with job demands (van der Doef and Maes, 1999), and that it also has motivational potential (Hackman and Oldham, 1980). Recent studies confirm that autonomy might buffer the development of burnout in teachers (Skaalvik and Skaalvik, 2017, 2020).

Feelings of Guilt and Burnout

Guilt is conceptualized as the unpleasant and remorseful feelings associated with the recognition that one has violated, or is capable of violating, a moral standard. In contrast to shame, wherein the focus of attention is a negative evaluation of the global self, guilt involves a negative evaluation of a specific behavior (Tangney and Tracy, 2012). From an interpersonal approach (Baumeister et al., 1994), guilt is described as a social emotion linked to communal relationships. It is an emotion deeply rooted in two basic affective reactions: empathic activation and anxiety in the face of rejection by others. The origins, functions and process of guilt have important interpersonal aspects, as it is a variable that reinforces ties in relationships. Guilt has the symbolic role of reaffirming commitment toward the other person and the responsibility of taking care of him or her. Feelings of guilt have prosocial effects, as they motivate people to make amends to others, correct their errors and apologize. These interpersonal actions reduce feelings of guilt, and make it possible to alleviate the distress produced by a lack of balance in emotional states resulting from social exchanges (Baumeister et al., 1994). Friberg (2009) states that feelings of guilt would put pressure on an individual that can be reduced through his or her work by helping others.

Although guilt has pro-social effects, because it motivates people to make amends to others (Cohen et al., 2013), excessive or inappropriate levels of guilt can produce a dysfunctional and disruptive experience, as well as psychological and somatization symptoms in some cases (Pineles et al., 2006). Different studies have obtained positive and significant relationships between guilt, anxiety and somatization (Pineles et al., 2006; Cândea and Szentagotai-Tăta, 2018), and physical and mental health disorders (Spillers et al., 2008; Luck and Luck-Sikorski, 2020). Quiles and Bybee (1997) obtained positive and significant correlations between guilt and anxiety and somatization, and they concluded that chronic feelings of guilt could be an indicator of the use of inappropriate coping strategies and the failure of the individual to regulate his/her emotions. Ghatavi et al. (2002) found that individuals with depression problems had a history of feelings of guilt, and in their conclusions they suggest that guilt may be a variable that predisposes individuals to illness.

Guilt appears to be involved in the burnout syndrome (Farber and Miller, 1981; Maslach, 1982; Price and Murphy, 1984). According to Farber and Miller (1981) "the symptomatic manifestations of teacher burnout are anger, anxiety, irritability (. . .) cynicism, guilt. . ." One of the frequent causes of feelings of guilt in professionals is the existence of negative thoughts about others and the negative and cynical way they have treated them. Some professionals underestimate the influence of situations on behavior, and interpret their experiences as reflecting some personality malfunction, leading them to blame themselves for not performing their job adequately. As a result, they

develop a sense of failure and loss of self-esteem (Maslach, 1982, pp. 5, 10–12).

On the other hand, these professionals could feel they are becoming cold and dehumanized, and this experience leads them to reaffirm their commitment toward other people and the responsibility of taking care of them (Baumeister et al., 1994), and feel higher levels of burnout. Chang (2009) considers that for many teachers guilt is an unpleasant emotion caused by emotional labor and poor relationships with the students.

Several studies on the process of burnout have included feelings of guilt as a stage in the development of this process. Price and Murphy (1984) state that "a typical burnout victim is a professional full of idealism and a sense of mission." Staff burnout would progress in seven phases: shock, disorganization, volatile emotions, guilt, loneliness, relief, and re-establishment. These authors consider that feelings of "guilt are among the most destructive factors in the stress syndrome that so often, and so wastefully, results in staff burnout." According to Burisch (2006, pp. 25–27), burnout would progress in seven stages, and due to low engagement (stage 2), some individuals could develop emotional reactions such as feelings of guilt (stage 3).

In addition, feelings of guilt could explain different types of burnout, considering the role of guilt feelings in the relationship between burnout and its consequences, such as psychosomatic disorders. For example, Vanheule et al. (2003) differentiated two types of high burnout scorers (Type 1 vs. Type 2) taking into consideration how the professionals feel it is their responsibility to fulfill other people's needs and desires. In this line, Tops et al. (2007) distinguished between burnout individuals with high basal prolactin levels -prolactin profile- vs. low basal prolactin levels. According to the study results, the low prolactin burnout participants scored higher on state negative affect measures, suggesting an important role of decreased dopaminergic functioning in burnout. This role is similar to the relationship between depression and dopamine deficiency (Bloomfield et al., 2019). Contemporary burnout theories have stated that physiological changes in the dopaminergic/motivational system due to overriding fatigue for prolonged periods of time may be fundamental in disorders like burnout (Boksem and Tops, 2008).

A Model of Burnout

Burnout can be defined as a psychological response to chronic work-related stress that appears in professionals in service organizations who work in direct contact with the clients or users of the organization. It is a non-psychiatric syndrome characterized by cognitive deterioration (i.e., loss of enthusiasm toward the job), emotional deterioration (i.e., psychological exhaustion), and attitudes and behaviors of indifference, withdrawal and, sometimes, abusive attitudes toward the client (i.e., indolence). In addition, in some cases, negative attitudes on the job, especially toward the people with whom the worker establishes work relationships, lead to high feelings of guilt (Gil-Monte, 2005).

Enthusiasm toward the job is a cognitive variable defined as the individual's desire to achieve goals at work as a source of personal pleasure. This variable is similar to the Personal accomplishment subscale from the MBI (Maslach and Jackson, 1981), but it does not include an indicator of self-efficacy. Psychological exhaustion is defined as the appearance of emotional and physical exhaustion due to the fact that the individual must deal daily with people at work who present problems. This variable is similar to the Exhaustion subscale from the MBI (Maslach and Jackson, 1981), but it includes an aspect of physical exhaustion (i.e., *I feel physically tired at work*). Indolence is the appearance of negative attitudes of indifference and cynicism toward the organization's clients, such as students and relatives (Richmond et al., 2009, pp. 149–150). This symptom is similar to the Depersonalization subscale from the MBI (Maslach and Jackson, 1981). Guilt is conceptualized as the appearance of feelings of guilt about negative attitudes developed on the job, especially toward the people with whom the individual establishes work relationships. These four symptoms have been brought into a process model on the relationships among the dimensions of burnout (Gil-Monte, 2005, 2012). The "Spanish Burnout Inventory" (SBI; Gil-Monte et al., 2010) was developed to assess these four aspects of burnout. Previous studies have obtained appropriate values of concurrent validity between the SBI and the MBI (Figueiredo-Ferraz et al., 2013).

Gil-Monte (2005) concluded that burnout progresses in a parallel way from low Enthusiasm toward the job and Psychological exhaustion to Indolence. The model states that the burnout process can be understood in terms of the stress-strain-coping framework. Indolence is considered as a dysfunctional, rather than effective, coping strategy that is tried after the reappraisal stage. This approach takes into consideration the model of attitudes and attitude change developed by Eagly and Chaiken (1993), and it integrates the role of cognitive, i.e., Enthusiasm toward the job – and emotional, i.e., Psychological exhaustion – experiences as mediators in the relationship between perceived job stress and behavioral/attitudinal outcomes.

Taking this into account, Gil-Monte (2005) proposes two profiles of workers in the process of developing burnout (see **Figure 1**). On the one hand, we have the workers for whom strategies of distancing are helpful in order to be able to face disillusionment with work and psychological deterioration. These strategies often include laziness and cynical behavior toward customers, leading to deterioration in the quality of the service provided and causing complaints from customers. However, these workers are usually comfortable with this situation, because it means that they can remain in their jobs for many years, without suffering any real consequences to their health. This profile is called Profile 1.

On the other hand, Profile 2 indicates workers for whom these coping strategies have not proved to be effective in handling problems. These workers feel guilty for the treatment they give to the clients of the organization. As noted above, guilt has a high interpersonal component. In these cases, workers feel that they are violating the ethical norms of the organization, often leading them to develop negative consequences to the point where they acquire medical leave rather than go to work. These consequences, derived from guilt, as presented above, can cause more severe manifestations of burnout, and health-related

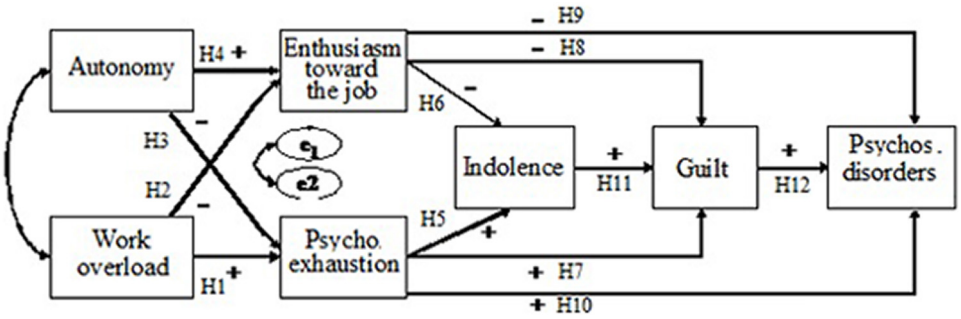

FIGURE 1 | Hypothesized model.

disorders (Guidetti et al., 2017) such as anxiety, psychosomatic problems and depression (Gil-Monte, 2012) and inclination toward absenteeism (Rabasa et al., 2016).

The Present Study

The aim of this study was to investigate the mediator role of guilt feelings in the relationship between burnout and psychosomatic disorders, based on the Gil-Monte (2012) burnout model, and analyze the cross-national invariance, i.e., Spanish sample vs. Portuguese sample- of the hypothesized model. Based on previous research, we hypothesized twelve relationships among the variables included in the study. These hypotheses (H1 to H12) were tested together in a path model to determine the mediator role of guilt -as a symptom of burnout- in the development of the burnout process, and its relationship with levels of psychosomatic disorders (**Figure 1**).

To test the cross-national validity of the model, Hypothesis 13 was formulated: There will be no significant differences in the degree of fit of the path analysis models, or in the size of the relationships among the variables in the model, based on the nationality of the sample (Portugal vs. Spain).

MATERIALS AND METHODS

Participants

The total sample in the study was composed of 1,266 participants. As this study has a cross-cultural nature, the description of the sample will be carried out separately by country.

The Portuguese sample consisted of 204 teachers. In all, 250 questionnaires were distributed non-randomly in different schools in northern Portugal. The response rate in the study was 81.8%. Regarding the sociodemographic variables considered for the study, the composition was the following. In terms of sex, 59 participants were men (29%), and 145 women (71%). Regarding the number of years in the profession, the mean was 17.5 (*sd* = 9.7, max. = 37, min. = 0). The mean age of the sample was 41.3 (*sd* = 9.2, max. = 68, min. = 23).

The Spanish sample was composed of 1,062 teachers. In all, 1,600 questionnaires were distributed non-randomly in different schools. The study response rate was 66.38%. Regarding the sociodemographic variables considered for the study, the composition is the following. In terms of sex, 294 participants were men (27.7%), 762 women (71.8%), and 6 participants did not answer this question (0.6%). Regarding the number of years in the profession, the mean was 18.1 (*sd* = 10.2, max. = 46, min. = 0). The mean age of the sample was 41.7 (*sd* = 9.6, max. = 68, min. = 21).

Instruments

Work overload was evaluated with the Work overload subscale from the UNIPSICO questionnaire (Gil-Monte, 2012, 2016a), composed of 6 items (Portugal: α = 0.67; Spain: α = 0.72; e.g., "*When you are working, do you encounter especially difficult situations?*"). Autonomy (5 items; Portugal: α = 0.74; Spain: α = 0.83) was evaluated with the Autonomy Scale from the UNIPSICO questionnaire (Gil-Monte, 2016b). The items refer to the discretion given to the worker in managing his/her work and rest time. The employee is asked about the choice of work rhythm, the freedom to alter it if he/she so desires, independence in making decisions, etc. (e.g., "*In this job, I have the freedom to decide how to do it*").

Burnout was measured by the SBI (Gil-Monte, 2011; Figueiredo-Ferraz et al., 2013; Olivares et al., 2018). This instrument contains 20 items distributed into four dimensions called: (1) Enthusiasm toward the job: the individual's desire to achieve goals at work because it is a source of personal pleasure (5 items, Portugal: α = 0.87; Spain: α = 0.89); (2) Psychological exhaustion: the appearance of emotional and physical exhaustion due to the fact that he or she must deal daily with people at work who present problems (4 items, Portugal: α = 0.82; Spain: α = 0.85); (3) Indolence: the appearance of negative attitudes of indifference and cynicism toward the organization's clients (6 items, Portugal: α = 0.75; Spain: α = 0.72); and (4) Guilt: the appearance of feelings of guilt about negative attitudes developed on the job, especially toward the people with whom he or she establishes work relationships (5 items, Portugal: α = 0.76; Spain: α = 0.83). Low scores on Enthusiasm toward the job, together with high scores on Psychological Exhaustion, Indolence, and Guilt, indicate high levels of burnout.

Psychosomatic disorders were measured by the UNIPSICO subscale (9 items, Portugal: α = 0.90; Spain: α = 0.86; Gil-Monte, 2016a). Items include different work-related psychosomatic disorders (e.g., headaches, musculoskeletal pain, sleep quality,

anxiety, and sickness; e.g., "*Do you have a headache?*"). Participants answered the items on all scales on a 5-point frequency scale ranging from "Never" (0) to "Very frequently: Every day" (4).

Procedure

For data collection, contact was first made with the administration of the teaching institutions, and the aim of the study was presented in order to obtain authorization and support for applying the instruments. The instruments were handed to the teachers personally. Teachers and principals of the teaching institutions were informed about the research, which would not have any individual and/or institutional assessment effects, and the answers would be anonymous and confidential. The participants were selected in a non-random manner, and the participation was voluntary. The questionnaire was self-administered; it was handed to teachers at the beginning of their working day and they were asked to return the completed questionnaire at the end of the day by dropping it in a box in the teachers' room. The study was approved by the Ethics Committee of the University of Valencia, Spain.

Data Analysis

To test the model, structural equation analysis was performed with the AMOS 25.0 program. Taking into consideration the moderate size of the Portuguese sample, path analysis, rather than SEM, was used to test the hypothesized model. The Maximum likelihood estimation method was used to test the model. Various indices are suggested to test the model's fit, such as the χ^2 statistic and associated probability level. Because of the sensitivity of the statistic χ^2 to the sample size, we propose other fit indices. The *Goodness of Fit Index* (GFI) is a measure of the relative amount of variance and covariance explained by the model. The *Adjusted Goodness of Fit Index* (AGFI) adjusts the GFI based upon degrees of freedom. The *Normed Fit Index* (NFI) and the *Comparative Fit Index* (CFI) indicate the amount of variation and covariation accounted for by a particular model by comparing the relative fit of the given model with the fit of a baseline model. Some authors have recommended at least values above 0.90 for these indices as indicators of a good fit of the model (Bentler, 1992; Hoyle, 1995). The *Root Mean Square Error of Approximation* (RMSEA) estimates the overall error amount in the model. Values between 0.05 and 0.08 indicate an adequate fit of the model (Hu and Bentler, 1999).

Bootstrapping, with the number of bootstrap samples set at 5,000, was carried out to estimate 95% confidence intervals. Preacher and Hayes (2008) have recommended bootstrapping for testing mediation, as it does not require normality of the sampling distribution of the indirect effects.

RESULTS

Table 1 shows the means, standard deviations, range, skewness, kurtosis, and internal consistencies of all the scales included in this study. All scales showed good reliabilities, with Cronbach's alpha coefficients. **Table 2** shows the correlations between all the scales included in this study.

The Hypothesized model yielded a significant χ^2 value for the two samples: Portugal [$\chi^2_{(7)} = 19.13$, $p < 0.05$] and Spain [$\chi^2_{(7)} = 72.90$, $p < 0.05$], which indicates an insufficient model fit. However, some of the values obtained for other fit indices were acceptable for the two samples: GFI = 0.975, AGFI = 0.900, NFI = 0.932, CFI = 0.954 for the Portuguese sample; and GFI = 0.981, AGFI = 0.925, NFI = 0.957, CFI = 0.960 for the Spanish sample. The values obtained in the Spanish sample for RMSEA = 0.094 and for the Portuguese sample, RMSEA = 0.092, indicate that the hypothesized model presented a mediocre fit in the two study samples.

A review of the parameter estimations for the relationships indicated that two relations in the hypothesized model were not significant in either sample: the relation between Enthusiasm toward the job and Guilt (Spain, $\beta = -0.01$, $p = 0.590$; Portugal, $\beta = -0.06$, $p = 0.340$; Hypothesis 8); and the relation between Enthusiasm toward the job and Psychosomatic problems (Spain, $\beta = -0.04$, $p = 0.130$; Portugal, $\beta = -0.02$, $p = 0.030$; Hypothesis 9).

Considering these results, an alternative model (AM) was evaluated, eliminating the non-significant relationships in both samples. The modified model yielded a significant χ^2 value for the two samples: Portugal, $\chi^2_{(9)} = 20.20$, $p < 0.05$; and Spain, $\chi^2_{(9)} = 75.46$, $p < 0.05$, which indicates an insufficient model fit. However, for the two samples, it showed a good fit to data according to: GFI = 0.973, AGFI = 0.917, NFI = 0.929, CFI = 0.957 for the Portuguese sample, and GFI = 0.981, AGFI = 0.940, NFI = 0.954, CFI = 0.959 for the Spanish sample. The fit to data was adequate according to RMSEA = 0.078 (Portugal), 0.083 (Spain). All the hypothesized relationships in the revised model were confirmed (Hypothesis 1 to Hypothesis 7; and Hypothesis 10 to Hypothesis 12; **Figure 2** for the Spanish sample and **Figure 3** for the Portuguese sample).

In the Spanish sample, based on bootstrapping the standardized indirect effect of Indolence on Psychosomatic disorders was 0.08 ($p < 0.001$; bias corrected 95% CI:0.044 to 0.122). In line with Hypothesis 11 and Hypothesis 12, the relationship between Indolence and Psychosomatic disorders was mediated by feelings of guilt. However, the direct effect of Indolence on Psychosomatic disorders was significant (0.170, $p < 0.001$; bias corrected 95% CI:0.073 to 0.240), which indicates a partial mediation effect of the Guilt variable (**Figure 4**).

In the Portuguese sample, the standardized indirect effect of Indolence on Psychosomatic disorders was 0.123 ($p < 0.001$; bias corrected 95% CI:0.056 to 0.214). In line with Hypothesis 11 and Hypothesis 12, the relationship between Indolence and Psychosomatic disorders was mediated by feelings of guilt. Moreover, the direct effect of Indolence on Psychosomatic disorders was no longer significant (0.170, $p > 0.05$ bias corrected 95% CI:0.000 to 0.359), which indicates a total mediation effect of the Guilt variable (**Figure 5**).

To test Hypothesis 13, an analysis of invariance was performed. The invariance of the AM was shown in both samples, adding a series of restrictions on some parameters (Byrne, 1998). All of the relations between variables and the covariances

TABLE 1 | Means, standard deviations, range, skewness, kurtosis and internal consistencies (Cronbach's alphas), for the two study samples.

	Mean		*Sd*		Range	Kurtosis		Skewness		Alpha	
	Sp	Pt	Sp	Pt		Sp	Pt	Sp	Pt	Sp	Pt
1. Work overload	1.79	1.86	0.67	0.60	0–4	−0.27	0.22	0.16	0.24	0.72	0.67
2. Autonomy	2.57	2.73	0.59	0.62	0–4	−0.09	−0.36	−0.43	−0.12	0.83	0.74
3. Enthusiasm toward the job	2.97	2.87	0.72	0.70	0–4	0.42	−0.62	−0.66	−0.30	0.87	0.87
4. Psychological exhaustion	1.87	1.87	0.84	0.84	0–4	−0.30	−0.29	0.21	0.24	0.82	0.82
5. Indolence	1.20	1.22	0.60	0.62	0–4	0.28	−0.19	0.55	0.39	0.75	0.75
6. Guilt	0.96	0.94	0.63	0.60	0–4	0.53	−0.26	0.62	0.44	0.76	0.76
7. Psychosomatic disorders	1.14	0.98	0.73	0.82	0–4	0.29	−0.05	0.74	0.78	0.90	0.90

Sp, Spanish sample; Pt, Portuguese sample.

TABLE 2 | Correlations between variables of the study.

	1	2	3	4	5	6	7
1. Work overload	1	−0.17*	−0.29**	0.47**	0.34**	0.35**	0.36**
2. Autonomy	−0.26**	1	0.29**	−0.24**	−0.14*	−0.20**	−0.14
3. Enthusiasm toward the job	−0.23**	0.41**	1	−0.42**	−0.35**	−0.15*	−0.17*
4. Psychological exhaustion	0.59**	−0.22**	−0.33**	1	0.42**	0.36**	0.47**
5. Indolence	0.27**	−0.07*	−0.31**	0.35**	1	0.41**	0.23**
6. Guilt	0.28**	−0.07*	−0.19**	0.31**	0.43**	1	0.29**
7. Psychosomatic disorders	0.43**	−0.19**	−0.21**	0.51**	0.19**	0.21**	1

***p < 0.01, *p < 0.05.*
The correlations for the Spanish sample are in the lower part of the diagonal, and those for the Portuguese sample are in the upper part.

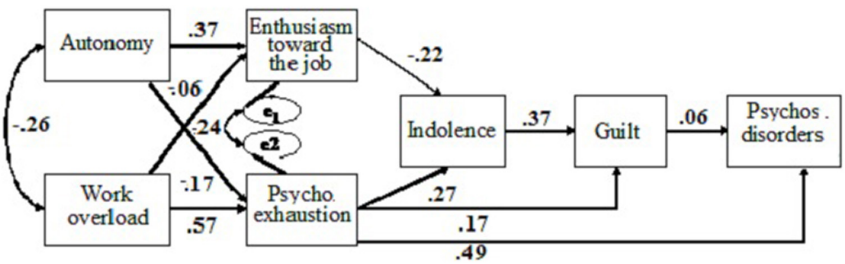

FIGURE 2 | Standardized coefficients for the modified model, taking into consideration feelings of guilt as predictor of psychosomatic disorders for the Spanish sample.

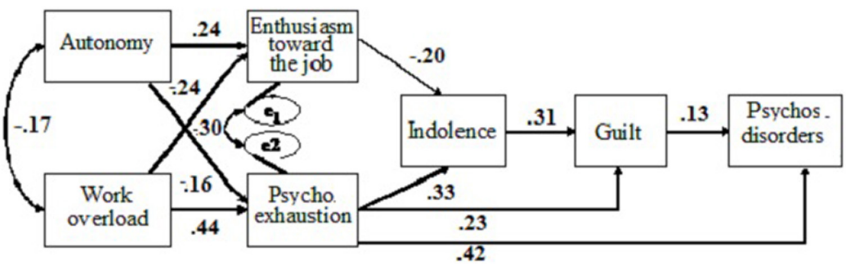

FIGURE 3 | Standardized coefficients for the modified model, taking into consideration feelings of guilt as predictor of psychosomatic disorders for the Portuguese sample.

between the errors were balanced in the two samples. In this case, the unrestricted model obtained a value $\chi^2_{(18)} = 95.677$ and the completely restricted model $\chi^2_{(25)} = 109.319$, with a difference of $\chi^2_{(7)} = 13.642$, $p > 0.05$. The model was invariant regardless of the origin of the sample (Spanish vs. Portuguese).

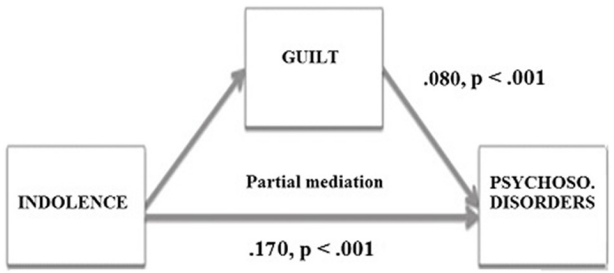

FIGURE 4 | Mediation of the variable Guilt in the relationship between the SQT and Psychosomatic disorders in the Spanish sample.

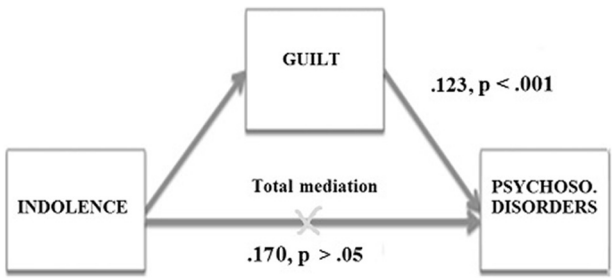

FIGURE 5 | Mediation of the variable Guilt in the relationship between the SQT and Psychosomatic disorders in the Portuguese sample.

Differences in the relations between the variables in the two models were analyzed to find out whether there were significant differences according to where the sample was from **Table 3**. No significant differences were found in the relations that explain the burnout development process based on the origin of the sample. This result indicates that the model is invariant for all the hypothesized relationships in the AM.

In addition, because sex is a sociodemographic variable that explains significant differences in burnout (Purvanova and Muros, 2010), and because the number of women in both samples was higher than the number of men, the sex invariance of the AM was tested. The model yielded a significant χ^2 value for the two samples: Women, $\chi^2_{(9)} = 78.02$, $p < 0.05$; and men, $\chi^2_{(9)} = 19.68$, $p < 0.05$, which indicates an insufficient model fit. However, for the two samples, it showed a good fit to data according to: GFI = 0.977, AGFI = 0.927, NFI = 0.945, CFI = 0.951 for the women's sample, and GFI = 0.984, AGFI = 0.952, NFI = 0.960, CFI = 0.977 for the men's sample. The fit to data was adequate according to RMSEA = 0.092 (women) and 0.058 (men). All the hypothesized relationships in the revised model were confirmed, with the exception of H2 (Work overload-Enthusiasm toward the job relationship, $\beta = -0.04$, $p = 0.429$) and H3 (Autonomy-Psychological exhaustion relationship, $\beta = -0.08$, $p = 0.073$) in the men's sample.

An analysis of invariance was performed. The unrestricted model obtained a value $\chi^2_{(18)} = 97.682$, and the completely restricted model $\chi^2_{(25)} = 120.808$, with a difference of $\chi^2_{(7)} = 23.126$, $p < 0.01$. The model was not invariant, regardless of the sex of the participants. Significant differences were found in the relations between Work overload – Enthusiasm toward the job ($z = -2.99$, $p < 0.001$; $\beta = -0.23$, $p < 0.001$ in the women's sample, and $\beta = -0.04$, $p > 0.05$ in the men's sample), Guilt – Psychosomatic disorders ($z = -1.90$, $p < 0.05$; $\beta = 0.08$, $p < 0.05$ in the women's sample, and $\beta = 0.19$, $p < 0.001$ in the men's sample), and Psychological exhaustion – Psychosomatic disorders ($z = 3.46$, $p < 0.001$; $\beta = 0.50$, $p < 0.001$ in the women's sample, and $\beta = 0.29$, $p < 0.001$ in the men's sample).

In the women's sample, based on bootstrapping, the standardized indirect effect of Indolence on Psychosomatic disorders was 0.07 ($p < 0.001$; bias corrected 95% CI:0.039 to 0.094). However, the direct effect of Indolence on Psychosomatic disorders was significant (0.138, $p < 0.001$; bias corrected 95% CI:0.076 to 0.198), which indicates a partial mediation effect of the Guilt variable. In the men's sample, similar results were obtained. The standardized indirect effect of Indolence on Psychosomatic disorders was 0.11 ($p < 0.001$; bias corrected 95% CI:0.061 to 0.157); and the direct effect of Indolence on Psychosomatic disorders was significant (0.157, $p < 0.001$; bias corrected 95% CI:0.070 to 0.242), which indicates a partial mediation effect of the Guilt variable.

DISCUSSION

The purpose of this study was to analyze the mediator role of feelings of guilt in the relationship between burnout and psychosomatic disorders and test the invariance of the model based on the origin of the sample (Spain vs. Portugal). The results indicate that the hypothesized model (i.e., Indolence → Guilt →Psychosomatic disorders) is a good representation of the burnout process and its relationship with psychosomatic disorders, and they provide support for the mediator role of feelings of guilt in the relationship between burnout (i.e., levels of indolence) and psychosomatic disorders. As zero was not in the confidence interval (CI:0.044 to 0.122) for the Spanish sample or the Portuguese sample (CI:0.056 to 0.214), we can conclude that the indirect effect is different from zero. Therefore, in our study, higher levels of indolence were associated with higher levels of guilt, which were in turn associated with higher levels of psychosomatic disorders. Comparing the model according to the origin of the sample, its invariance is confirmed (i.e., Indolence → Guilt → Psychosomatic disorders), which means the model is a good representation of the development of the burnout syndrome in teachers in these two countries.

Previous studies have obtained construct validity for the SBI in Portuguese (Figueiredo-Ferraz et al., 2013) and Spanish (Gil-Monte, 2011), but until this study was carried out, there were no cross-cultural evaluations of the theoretical model of the burnout process derived from the SBI psychometric model. Culture is an important variable in the evaluation of psychological problems such as burnout syndrome. Wierzbicka (1995) indicates the need to take into account that emotions are specific to each culture, and that some English terms referring to emotions may not have semantic equivalents in other languages, which can lead to evaluating different concepts even when attempting to evaluate

TABLE 3 | Parameters for the relationships among the variables, *Z* value for the differences and significance level.

			Spanish sample		Portuguese sample		
			Values	***p***	**Values**	***p***	***Z* value**
Autonomy	→	Enthusiasm toward job	γ = 0.449	0.000	γ = 0.275	0.000	2.61**
Work overload	→	Psychological exhaustion	γ = 0.715	0.000	γ = 0.620	0.000	2.24*
Work overload	→	Enthusiasm toward job	γ = −0.147	0.000	γ = −0.286	0.000	1.90
Autonomy	→	Psychological exhaustion	γ = −0.089	0.014	γ = −0.221	0.008	1.76
Psychological exhaustion	→	Indolence	β = 0.197	0.000	β = 0.248	0.000	−0.70
Enthusiasm toward job	→	Indolence	β = −0.182	0.000	β = −0.181	0.003	−0.01
Indolence	→	Guilt	β = 0.392	0.000	β = 0.301	0.000	1.35
Psychological exhaustion	→	Guilt	β = 0.130	0.000	β = 0.168	0.000	−0,51
Guilt	→	Psychosomatic disorders	β = 0.073	0.024	β = 0.174	0.050	-1.33
Psychological exhaustion	→	Psychosomatic disorders	β = 0.426	0.000	β = 0.410	0.000	0.25

$^{**}p < 0.01$ and $^{*}p < 0.05$.

the same one. The central concept in this study is guilt and its role in the burnout development process. Guilt is a cultural emotion, and it is often difficult to find equivalent concepts, depending on the geographic zone or the religion. The results of the study suggest that this is not true in the case of the Spanish and Portuguese samples, and for the burnout syndrome development process.

The results obtained present various similarities in the two samples in the study (Spain vs. Portugal). The descriptive analysis shows that the highest mean was obtained for the variable Enthusiasm toward the job, and the lowest mean was found for the variable Guilt in both samples. The analysis of the Pearson r correlations indicates that the most intense correlations were obtained between the same variables in both samples, i.e., Psychological exhaustion – Work overload, Psychological exhaustion – Psychosomatic disorders, and Indolence – Guilt. These similarities are also present in the results of the hypothesized path analysis model. In both samples, 10 of the 12 study hypotheses were confirmed, and in both studies, Hypotheses 8 (Enthusiasm toward the job – Guilt) and 9 (Enthusiasm toward the job – Psychosomatic disorders) were not confirmed. Together, the similarities in the results of both samples for the path analysis model made it possible to confirm study Hypothesis 13, which hypothesized the invariance of the model.

Taking into consideration the gender of the participants in the study, an adequate fit of the model to the data was obtained for the sample of men and for the sample of women. Empirical support was also obtained for the partial mediation of Guilt in the relationship between Indolence and Psychosomatic disorders. However, the model was not invariant when comparing the results for the two samples. The relationship between Work overload and Enthusiasm toward the job, and between Psychological exhaustion and Psychosomatic disorders, was significantly more intense in the sample of women than in the sample of men, whereas the relationship between Guilt and Psychosomatic disorders was significantly more intense in the sample of men than in the sample of women. Coinciding with the results obtained in previous studies (Purvanova and Muros, 2010; Tement et al., 2016; Marchand et al., 2018), our results suggest that it is necessary to consider gender differences when studying the relationships between the predictors of burnout and its symptoms, and between the symptoms and their consequences. However, the burnout syndrome development process, according to the hypothesized model, i.e., the relationship among its symptoms and between the symptoms and health problems- is similar for men and women.

Our results have replicated the results of the Gil-Monte (2012) study, as they show that it seems appropriate to establish a relationship from both enthusiasm toward the job and psychological exhaustion to indolence and from indolence to guilt. In addition, the results contribute to supporting the specification of the burnout process according to the model designed by Gil-Monte (2005), taking into consideration the model of attitudes and attitude change (Eagly and Chaiken, 1993) to explain the relationship among the burnout dimensions (enthusiasm toward to indolence; psychological exhaustion to indolence). The study contributes to understanding the processes underlying the burnout concept (Cox et al., 2005). We can conclude that burnout progresses in a parallel way from enthusiasm toward the job and psychological exhaustion to indolence.

The results of the study support the mediator role of the levels of guilt feelings about negative attitudes and behaviors at work in the relationship between burnout and its health-related consequences. They indicate that guilt feelings contribute to explaining the existence of different forms of the evolution of burnout linked to the development of guilt (Gil-Monte, 2012; Rabasa et al., 2016); thus, different types of burnout (Vanheule et al., 2003; Tops et al., 2007; Boersma and Lindblom, 2009) could be explained by considering the role of guilt feelings in the relationship between burnout and its consequences.

Based on the theoretical model underlying the SBI (Gil-Monte, 2005, 2012), it is possible to distinguish two profiles in the development of burnout. In both profiles, indolence can be understood as a coping strategy that arises to handle the perception of low enthusiasm toward the job and high psychological exhaustion levels. While for some teachers,

i.e., Profile 1- this coping strategy is sufficient for them to manage the levels of strain, other teachers, i.e., Profile 2- feel remorse and reaffirm their commitment toward students and relatives as a restorative behavior to alleviate emotional distress. Professionals who develop aggression blame others for difficulties and problems, and resentment toward them is less restrained (Maslach, 1982, p. 12), in contrast to professionals who develop feelings of guilt and depression because they blamed themselves.

The feelings of guilt would put pressure on an individual that can be reduced through his or her work by helping others. Taking this suggestion into consideration, Profile 2, according to the SBI, could explain why in some cases burnout levels are higher in individuals distinguished by high commitment and outstanding performance. Individuals fitting Profile 2 will develop high commitment in their jobs helping others as a way to reduce feelings of guilt (Baumeister et al., 1994) and alleviate the emotional distress resulting from taking responsibility for causing others' suffering. However, as stressful working conditions do not change, there is a loop over time that produces a dysfunctional and disruptive experience, and later psychosomatic disorders.

According to Chang (2009), guilt appears to contribute to teacher burnout in terms of prolonged stressors, and Quiles and Bybee (1997) concluded that chronic feelings of guilt could be an indicator of the failure of the individual to regulate his/her emotions. In addition, physiological changes related to decreased dopaminergic functioning due to prolonged periods of stress (Bloomfield et al., 2019) could explain Profile 2 and the relationship between excessive feelings of guilt and psychosomatic disorders (Pineles et al., 2006). Different studies have obtained positive and significant relationships between guilt, anxiety and somatization (Cândea and Szentagotai-Tăta, 2018) and physical and mental health disorders (Spillers et al., 2008), and some of them suggest that guilt could be a variable that predisposes individuals to illness (Ghatavi et al., 2002).

LIMITATIONS AND FUTURE RESEARCH

This study has some limitations. First, the cross-sectional nature of the data does not provide answers about the direction of causality between guilt and psychosomatic disorders, and mediated effects estimates can be biased. Longitudinal studies are needed to reach conclusions on this issue. Second, the study only focuses on teachers, which restricts the generalizability of the results. Therefore, we suggest that other organizational contexts be studied in future research. Third, the data derived entirely from self-report questionnaires, which increased the likelihood of common method variance effects. We used several methods to minimize the impact of these biases (Podsakoff et al., 2003): (a) participants' confidentiality was guaranteed; (b) participants did not know which items belonged to which scales; (c) back-translation minimized item ambiguity; (d) taking into consideration the scale length, predictor and criterion variables were included in the questionnaire, together with other scales evaluating different constructs (e.g., work overload, autonomy), and they were placed in different positions in the questionnaire; and (e) Harman's single factor test was performed in both samples, and the first factor did not account for the majority of the variance in the items (Portuguese sample, 29.18%; Spanish sample, 29.08%), suggesting that common method variance is not of great concern. Fourth, the Spanish sample is larger than the Portuguese sample, and this difference could lead to a statistically significant bias in favor of the larger sample. Five, participant selection was non-random. However, designing a study of these characteristics with a random sample can lead to a very low response rate, and the data collection time would be excessively long, questioning the stability of the environmental conditions at the moment when the sample was gathered.

Future research should continue to investigate the processes through which guilt generates positive effects, and when it does not. Some studies suggest that there are differences in the relationship between chronic vs. pre-dispositional guilt and indices of depression and mental health (Quiles and Bybee, 1997). It would be interesting to analyze which individual and situational factors cause guilt in the process of burnout and burnout Profile 2. In addition to the mediator effects of feelings of guilt, moderator effects of this variable in the relationship between indolence and health complaints should also be tested.

CONCLUSION AND PRACTICAL IMPLICATIONS

This study contributes to understanding the processes underlying the burnout phenomenon (Cox et al., 2005), and it highlights the importance of the role of guilt in the development of burnout in Spanish and Portuguese teachers.

The results of the present study recommend incorporating the evaluation of guilt as a symptom of burnout, in order to reach a more complete diagnosis, discriminate among individuals affected by the syndrome, and recognize the syndrome's influence on health-related disorders. More recently, according to the existence of the different Burnout profiles, Leiter and Maslach (2016) point out the importance of identifying multiple person-centered profiles along the burnout-commitment continuum.

Moreover, they recommend considering the existence of burnout profiles (Gil-Monte, 2012), types (Farber, 2000), or groups (van Dam, 2016) as a strategy to differentiate burnout from other pathologies, such as depression. Based on the model by Gil-Monte (2005, 2012), it is possible to identify a burnout profile that does not overlap with depression (Profile 1) and a profile that is closer to depression (Profile 2). The development process of both profiles does not match the development of depression (Gil-Monte, 2008a). Thus, it seems more reasonable that, in the later stages of some types of burnout, i.e., Profile 2-, symptoms appear that are also found in other pathologies (Melamed et al., 2006), as in the case of feelings of guilt.

We agree that burnout and depression are distinct health disorders (Toker and Biron, 2012), with job burnout representing a separate diagnostic entity rather than a form of depression (Tement et al., 2016). Although many interesting and rigorous studies have concluded that the current state of science suggests that burnout is a form of depression rather than a differentiated

type of pathology (Ahola et al., 2014; Bianchi et al., 2015; Schonfeld and Bianchi, 2016), their conclusions have been drawn without taking the burnout profiles into consideration and using the MBI as the instrument to evaluate burnout. These limitations should be addressed in future studies.

The study may be an important point of reference for clinicians and therapists, facilitating both the diagnosis and treatment of different types of burnout.

Although our study has been carry out in a sample of teachers, burnout also affects members of other helping professions. The health deterioration process described above may experience an increase when people have to take care of someone suffering from a chronic disease, or when professionals have to do their work in extreme situations, such as taking care of victims of natural disasters. The study provides a useful addition to the tools for the diagnosis of burnout. Making diagnoses in the initial stages of burnout could avoid the increase in intensity of the symptoms and make it possible for an earlier recovery.

On the other hand, the keys to intervening in order to reduce work stress and to prevent negative consequences for the teachers and for the organization reside in two fundamental methods: prevention and adequate training (Iancu et al., 2017).

Learning to cope with stress can prevent the occurrence of more serious consequences, such as the development of burnout and acute health problems.

This study could also be useful in detecting the need for intervention programs to eliminate sources of stress and the need to train teachers in techniques for dealing with stress. Regarding results, managers might consider how a person's proneness to guilt differs depending on contextual sources related to, for example, how well resources are managed, and carry out programs to prevent Profile 2. Alternatively, they can help to promote collaborative relationships for teachers reporting high burnout, increase teacher autonomy, and enhance skills and capacities related to efficacious teaching (Gil-Monte, 2019).

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 University of Valencia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

HF-F and PG-M were substantially involved in planning and conducting the study; made a substantial contribution to the concept or design of the work and acquisition, analysis, or interpretation of data; drafted the article or revised it critically for important intellectual content; approved the version to be published; and have participated sufficiently in the work to take public responsibility for appropriate portions of the content. EG-A and BR were substantially involved in conducting the study and made a contribution to analysis or interpretation of data; drafted the article or revised it critically for important intellectual content; approved the version to be published; and have participated sufficiently in the work to take public responsibility for appropriate portions of the content. All authors contributed to the article and approved the submitted version.

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The Relationship Between Long Working Hours and Stress Responses in Junior High School Teachers: A Nationwide Survey in Japan

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Background: Long working hours and mental health problems among teachers are a concern in Japan. More specifically, it has been reported that junior high school teachers tend to work overtime. In this study, examined the working hours of junior high school teachers in public schools and investigated the association between overtime work and stress responses across job titles.

Methods: From June to December 2018, 54,772 teachers in public junior high schools completed a web-based nationwide survey regarding occupational stress and submitted self-evaluated working hours per day of the previous month. Psychological and physical stress responses were assessed using the Brief Job Stress Questionnaire.

Results: Results showed that 59.6% of the participants worked 11 h or more per day. Additionally, the length of working hours significantly differed across job titles (χ^2 (30) = 5295.8, $p < 0.001$, Cramér's $V = 0.14$). With respect to tenured teachers, sex (female), age, taking charge of the class, number of working years in the same school, working hours of 10 to 11 h, 11 to 12 h, 12 to 13 h, and 13 h or more were significantly associated with high stress, compared to those who worked less than 9 h per day. Moreover, for fixed-term teachers, sex (female), age, working hours of 9 to 10 h, 10 to 11 h, 11 to 12 h, 12 to 13 h, and 13 h or more were related with more stress as compared to those who worked less than 9 h per day. On the other hand, there was no significant relationship between long working hours and stress response among vice-principals, even though they tended to work the longest hours.

Conclusion: We verified that Japanese junior high school teachers work long hours. Long working hours were associated with stress responses in both tenured and fixed-term teachers, but not in vice-principals. However, vice-principals work the longest hours among teachers, and we suggest that these long working hours may be a hidden problem that is often overlooked.

Keywords: occupational health, mental health, stress response, overtime work, school teachers, job title

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INTRODUCTION

In Japan, the percentage of public school teachers on leave from work due to mental disorders reached 0.59% in 2019, according to the Ministry of Education, Culture, Sports, Science and Technology (MEXT) (Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2020). This was the second-highest percentage ever recorded and the number of teachers on leave has remained high in recent years. The MEXT analyzed related data and reported that these leaves of absence due to mental illness were caused by increased and more complicated workloads and by problems in interpersonal relationships in the workplace. Other possible causes of absence from work may be long working hours and workload (Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2020). It is well known that teachers in Japan, especially those in junior high schools, work long hours (Organization for Economic Cooperation and Development [OECD], 2018). In 2018, the Teaching and Learning International Survey (TALIS) conducted by the OECD surveyed the working environment of secondary school teachers in 48 member countries and regions. It was reported that teachers in Japan work 56 h per week, the longest work week among the countries surveyed (Organization for Economic Cooperation and Development [OECD], 2018). In Japan, Article 32 of the Labor Standards Law stipulates that working hours should be no more than 8 h per day and 40 h per week (Ministry of Justice, Japan, 2012). Work performed beyond these working hours is considered overtime. The upper limit for overtime work is 360 h per year, which cannot be exceeded unless there are special circumstances. In addition, overtime of 80 h or more per month is regarded as a benchmark for sudden death from overwork because it significantly increases the risk of developing cardiovascular disease (Araki and Iwasaki, 2005; Takahashi, 2019). However, according to the TALIS report, teachers in Japan work an average of 56 h per week, which results in 16 h of overtime per week and a cumulative average of 64 h of overtime per month (Organization for Economic Cooperation and Development [OECD], 2018). Because these circumstances imply that many teachers are working overtime beyond the benchmark for death from overwork, the impact of long working hours on teachers' health has gained attention in Japan.

Several models of teachers' stress have been presented by researchers, mainly in Europe and the United States (DeFrank and Stroup, 1989; Borg et al., 1991; Bottiani et al., 2019). Over 30 years ago, Borg et al. (1991) investigated teacher stress among primary school teachers and found that teachers' occupational stress consisted of four aspects: pupil misbehavior, time/resource difficulties, professional recognition needs, and poor relationships. Interestingly, time management difficulty forms part of the model of occupational stress among teachers, even in Western countries (Borg et al., 1991). Over the last decade, it has been reported that long working hours are associated with depressive symptoms, psychological distress, or insomnia in Japanese teachers (Bannai et al., 2015a,b; Nomoto et al., 2015; Hori et al., 2020). Long working hours shorten sleep duration and reduce the rest needed to recover from fatigue, which can lead to serious health problems. Furthermore, long working hours not only cause insufficient sleep, prevent recovery from fatigue, and lead to chronic insomnia and/or psychosomatic complaints (von Bonsdorff et al., 2017; Nagaya et al., 2018; Ogawa et al., 2018), but may also reduce communication among faculty members and contribute to a decline in social support.

Conversely, there are various positions and roles within the teaching profession such as principal, tenured teacher, or nursing teacher. The work of these individuals is diverse, and they may have different ways of experiencing occupational stress. However, to the best our knowledge, no reports have examined the relationship between long working hours and stress responses across job titles or professions. Moreover, there are no reports on the results of a nationwide comparative study on the working hours of Japanese teachers. Therefore, the purpose of this study was to investigate the working hours of public junior high school teachers in Japan by job title, and to clarify the relationship between long working hours and psychological and physical stress responses from the results of a nationwide survey. First, we hypothesized that teachers' working hours would differ depending on their job title. Second, we predicted that teachers in positions with long working hours would have a close relationship between working hours and stress responses.

MATERIALS AND METHODS

We used data from the Stress Check Program conducted between June and December 2018 by the Public School Teachers' Mutual Aid Association on behalf of the Board of Education of each local self-government, such as prefecture, city, and town. The survey was conducted through a web-based questionnaire related to occupational stress, and assessed participant characteristics, job employment status, self-evaluated working hours per day, and work-related stress. The Stress Check Program was introduced by the Japanese government in 2015 following the revision of the Occupational Health and Safety Law in 2014, and requires implementation once a year in workplaces with 50 or more employees (Kawakami and Tsutsumi, 2016). The main purpose of the Stress Check Program is to prevent the occurrence of mental health problems. It is thought that by understanding the level of stress among employees, encouraging them to become aware of their own stress, and improving stressful work environments to create comfortable workplaces, the occurrence of mental health problems can be prevented (Kawakami and Tsutsumi, 2016).

We obtained information regarding sex, age, the number of years of continuous employment at the current school, responsibility for taking charge of the class, and job title (principal, vice-principal, tenured teacher, fixed-term teacher, nursing teacher, diet, and nutrition teacher).

The participants were 59,278 teachers and clerical workers working at junior high schools in 40 out of the 46 prefectures in Japan. Of these, 54,772 teachers with no missing data (female = 23,504, 42.9%) were included in the statistical analysis, excluding clerical workers. The percentage of eligible data was 92.4%. Of the teachers included in the analysis, 2,475 were principals (4.5%), 2,865 were vice-principals (5.2%), 40,869 were

tenured teachers (74.6%), 5,442 were fixed-term teachers (9.9%), 2,609 were nursing teachers (4.8%), and 512 were diet and nutrition teachers (0.9%). Participating teachers belonged to 2,959 public junior high schools. In the Japanese education system, the designations of principal and vice-principal are administrative positions. In public schools, tenured teachers are registered teachers who have been accepted after passing the prefectural examination for teaching positions. Fixed-term teachers are generally appointed on a temporary basis and their contracts need to be renewed annually. A nursing teacher is a teacher who provides not only first aid in the nurse's office but also advice on health management for the entire school. Their main duties include administering first aid to students who are injured or sick, conducting water and air tests, providing education on illness and injury prevention, managing health check-ups, and providing health room consultation. Diet and nutrition teachers are responsible for the operation of the school lunch program. They also provide students with accurate knowledge about nutrition and dietary habits.

The Ethics Committee of the Kinki Central Hospital of the Mutual Aid Association of Public School Teachers reviewed and approved the research aims, designs, and procedures of the internet-based survey (Approval number: 412). This study used existing data for the research. These data were already completely anonymized and untraceable; they will never be used to identify personal information. In addition, the subjects used their discretion and willingly responded to the questions, and the questions did not cause psychological distress to the subjects. Therefore, the ethics committee judged that informed consent was not required for this study.

Measurements

Working Hours

We collected data about the number of working hours per day of the previous month, with seven response options as follows: (1) less than 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.

Psychological and Physical Stress Responses

We used the Brief Job Stress Questionnaire (BJSQ) to assess whether the teachers were experiencing high levels of stress. The BJSQ is widely used in the field of occupational health in Japan and is an established questionnaire to identify high-stress workers (Wada et al., 2013; Inoue et al., 2014). The BJSQ has also been shown to have adequate reliability, internal consistency, and validity (Shimomitsu et al., 1999). It is a 57-item scale that is designed to assess the following three aspects of work: psychological job demands and job control (17 items), psychological and physical stress responses (29 items), and buffering factors such as social support at the workplace (11 items). In the present study, the total score of the psychological and physical stress responses (29 items) was used as an indicator of high-stress workers. Each item is rated on a four-point Likert-type scale (1 = almost never, 2 = sometimes, 3 = often, 4 = almost always), with higher scores indicating higher stress. In this study, scores could range from 29 to 116. Of the 29 items, 18 were concerning psychological stress responses requiring responses on the following five dimensions: liveliness (3 items; e.g., "I have been very active"), irritability (3 items; e.g., "I have been felt irritable"), fatigue (3 items; e.g., "I have been extremely tired"), anxiety (3 items; e.g., "I have felt worried or insecure"), and depression (6 items; e.g., "I have been depressed"). The physical stress response is assessed by 11 questions on physical complaints (e.g., "I have felt dizzy"). The total score of psychological and physical stress responses exhibited high internal consistency (Cronbach's $\alpha = 0.90$).

Statistical Analysis

Percentages were computed for categorical variables. Concerning the variable of characteristics, age was grouped into the following categories: (1) 29 years old and below, (2) 30 to 39 years, (3) 40 to 49 years, (4) 50 to 59 years, and (5) 60 years and above. We divided the participants into two groups based on the number of years of continuous employment at the current school as follows: (1) less than 3 years, and (2) more than 3 years.

The chi-square test was used to compare the percentages between the groups. For the between-group comparisons in this study, we calculated the Cramér's V to evaluate the effect size. Cramér's V can be classified into weak (less than 0.1), moderate (0.1 to 0.3), and strong (0.3 or more) effect sizes.

In the statistical analysis, the stress response score was divided into quartiles and the group with the highest score was defined as the high-stress group, according to the classification protocol in a previous study (Wada et al., 2013). Multiple logistic regression analysis was conducted to examine the relationship between the hours of work per day and psychological and physical stress responses, adjusting for the effects of sex, age, classroom teacher status, and years of working at the current school. Due to the small number of teachers working less than 8 h, the teachers working less than 8 and 9 h were combined into a group for the multivariate analysis.

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY, United States), and $p < 0.05$ was considered statistically significant (two-tailed).

RESULTS

Table 1 shows the characteristics of the participants, and **Table 2** presents the results of comparing the work hours per day across job titles of public junior high school teachers. **Table 3** shows the results of the relationship between the number of working hours and physical and mental stress responses of each job tile of public junior high school teachers.

As shown in **Table 1**, it was most common for teachers to work more than 11 h but less than 12 h a day (22.4%). Teachers who worked between 12 and 13 h a day comprised the second-largest group, and those who worked more than 13 h a day comprised the third-largest group. Teachers who worked more than 11 h a day accounted for 59.6% of the total.

Table 2 shows the results of the comparison of working hours by job title. The results revealed statistically significant differences in the length of daily work hours by job title (χ^2 (30) = 5295.8,

$p < 0.001$). Cramér's V was 0.14, indicating a moderate effect size of difference. First, vice-principals generally worked longer hours, with 31.7% of them working more than 13 h a day. Second, tenured teachers worked long hours, with 18.8% of them working more than 13 h a day. Third, 13.4% of fixed-term teachers worked long hours. On the other hand, there were also statistically significant differences in sex (χ^2 (5) = 6634.1, $p < 0.001$, Cramér's V = 0.35) and age (χ^2 (20) = 11732.2, $p < 0.001$, Cramér's V = 0.23), with principals and vice-principals more likely to be male and over 50 years old.

Since there was a significant difference in the number of working hours by job title, sex and age, multiple logistic regression analysis was conducted to determine the association between the number of working hours and psychological and physical stress responses, adjusting for the effects of sex, age, and other variables. The results of the multiple logistic regression analysis are shown in **Table 3**, which aimed to examine the relationship between work hours and psychological and physical stress responses. For principals, sex (odds ratio [OR] = 3.16 with 95% confidence interval [CI] = 1.90–5.25, $p < 0.001$), age (OR = 0.94, CI = 0.89–1.00, $p = 0.044$), and working more than 12 h and less than 13 h (OR = 3.36, CI = 1.77–6.38, $p < 0.001$) were associated with psychological and physical stress responses.

Regarding vice-principals, there was no statistically significant relation between working hours and psychological and physical stress responses.

Regarding tenured teachers, sex (OR = 1.58, CI = 1.50–1.67, $p < 0.001$), age (OR = 1.00, CI = 1.00–1.01, $p = 0.030$), taking charge of the class (OR = 1.09, CI = 1.03–1.16, $p = 0.003$), number of working years in the same school (OR = 0.93, CI = 0.88–0.99, $p = 0.017$), and working hours were associated with psychological and physical stress responses. In particular, working 10 to 11 h (OR = 1.25, CI = 1.10–1.42, $p = 0.001$), 11 to 12 h (OR = 1.47, CI = 1.30–1.66, $p < 0.001$), 12 to 13 h (OR = 1.64, CI = 1.45–1.85, $p < 0.001$), and 13 h or more (OR = 2.43, CI = 2.14–2.75, $p < 0.001$) were significantly associated with psychological and physical stress responses.

For fixed-term teachers, sex (OR = 1.56, CI = 1.33–1.83, $p < 0.001$), age (OR = 0.99, CI = 0.98–0.99, $p < 0.001$), and working 9 to 10 h (OR = 1.59, CI = 1.18–2.14, $p = 0.002$), 10 to 11 h (OR = 1.88, CI = 1.40–2.52, $p < 0.001$), 11 to 12 h (OR = 1.65, CI = 1.24–2.20, $p = 0.001$), 12 to 13 h (OR = 2.64, CI = 1.98–3.51, $p < 0.001$), and 13 h or more (OR = 3.60, CI = 2.69–4.82, $p < 0.001$) were related with psychological and physical stress responses.

For nursing teachers, age (OR = 0.98, CI = 0.97–0.99, $p = 0.001$), working 11 to 12 h (OR = 1.95, CI = 1.34–2.84, $p = 0.001$), and 12 to 13 h (OR = 2.95, CI = 1.79–4.86, $p < 0.001$) were associated with psychological and physical stress responses.

As for diet and nutrition teachers, the number of years of working in the same school (OR = 1.66, CI = 1.02–2.70, $p = 0.041$), working 9 to 10 h (OR = 1.95, CI = 1.02–3.74, $p = 0.043$), and 11 to 12 h (OR = 2.12, CI = 1.00–4.49, $p = 0.049$) were associated with psychological and physical stress responses.

In the association between working hours and stress response, the odds ratio tended to increase with longer working hours compared to those who worked less than 9 h for all job titles except vice-principal.

TABLE 1 | Characteristics of junior high school teachers.

Demographic characteristics	*n*	%
Sex		
Male	31,268	57.1%
Female	23,504	42.9%
Age		
≤29	10,728	19.6%
30–39	12,195	22.3%
40–49	11,556	21.1%
50–59	16,957	31.0%
≥60	3,336	6.1%
Number of years worked in same school		
<3 years	23,933	65.0%
≥3	12,908	35.0%
Job title in school		
Principal	2,475	4.5%
Vice-principal	2,865	5.2%
Tenured teacher	40,869	74.6%
Fixed-term teacher	5,442	9.9%
Nursing teacher	2,609	4.8%
Diet and nutrition teacher	512	0.9%
Taking charge of the class		
Yes	26,636	48.6%
No	28,136	51.4%
Working hours, per day		
Less than 8 h	1,995	3.6%
8 to less than 9 h	3,234	5.9%
9 to less than 10 h	8,113	14.8%
10 to less than 11 h	8,824	16.1%
11 to less than 12 h	12,252	22.4%
12 to less than 13 h	10,893	19.9%
13 h and more	9,461	17.3%

DISCUSSION

The purpose of this study was to investigate the working hours of public junior high school teachers through a nationwide survey. In addition, we explored the relationship between long working hours and psychological and physical stress responses across job titles.

Working Hours of Japanese Public Junior High School Teachers

In Japan, overtime work of more than 720 h per year is illegal, with penalties related to Japan's Labor Standards Law. However, this law did not apply to teachers in public schools as of 2020 (Ministry of Justice, Japan, 2012). Working more than 11 h a day is one of the benchmarks for long working hours, as it is equivalent to working more than 720 h overtime a year if continued for a year. In addition, Hayashi et al. (2019) revealed that overtime work of 60 h or more per month significantly

TABLE 2 | Comparisons of working hours per day by job title in junior high school teachers.

	Principal		Vice-principal		Tenured teacher		Fixed-term teacher		Nursing teacher		Diet and nutrition teacher		Total				
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	χ^2	*p*	Effect size
Sex																	
Male	2,307	93.2%	2,543	88.8%	23,692	58.0%	2,693	49.5%	15	0.6%	18	3.5%	31,268	57.1%			
Female	168	6.8%	322	11.2%	17,177	42.0%	2,749	50.5%	2,594	99.4%	494	96.5%	23,504	42.9%			
Age																	
≤49	11	0.4%	400	14.0%	27,809	68.0%	4,364	80.2%	1,518	58.2%	377	73.6%	34,479	63.0%			
50–59	2,007	81.1%	2,367	82.6%	10,951	26.8%	586	10.8%	927	35.5%	119	23.2%	16,957	31.0%			
≥60	457	18.5%	98	3.4%	2,109	5.2%	492	9.0%	164	6.3%	16	3.1%	3,336	6.1%			
Hours of working per day																	
Less than 8 h	57	2.3%	28	1.0%	1,126	2.8%	659	12.1%	89	3.4%	36	7.0%	1,995	3.6%	5295.8	<0.001	0.14
8 to less than 9 h	265	10.7%	44	1.5%	2,028	5.0%	393	7.2%	398	15.3%	106	20.7%	3,234	5.9%			
9 to less than 10 h	659	26.6%	151	5.3%	5,546	13.6%	810	14.9%	809	31.0%	138	27.0%	8,113	14.8%			
10 to less than 11 h	571	23.1%	270	9.4%	6,372	15.6%	841	15.5%	659	25.3%	111	21.7%	8,824	16.1%			
11 to less than 12 h	569	23.0%	540	18.8%	9,511	23.3%	1,086	20.0%	470	18.0%	76	14.8%	12,252	22.4%			
12 to less than 13 h	279	11.3%	924	32.3%	8,600	21.0%	922	16.9%	136	5.2%	32	6.3%	10,893	19.9%			
13 h and more	75	3.0%	908	31.7%	7,686	18.8%	731	13.4%	48	1.8%	13	2.5%	9,461	17.3%			

Effect size was calculated by Cramér's V.

TABLE 3 | Relationship between working hours per day and psychological and physical stress responses, in public junior high school teachers.

	Principal			Vice-principal			Tenured teacher		
	OR	**95% CI lower – upper**	***p***	**OR**	**95% CI lower – upper**	***p***	**OR**	**95% CI lower – upper**	***p***
Sex (Ref. Male)	3.16	1.90 – 5.25	<0.001***	1.26	0.88 – 1.79	0.201	1.58	1.50 – 1.67	<0.001***
Age	0.94	0.89 – 1.00	0.044*	0.97	0.94 – 1.00	0.088	1.00	1.00 – 1.01	0.030*
Taking charge of the class (Ref. No)	0.31	0.03 – 3.01	0.315	0.33	0.04 – 2.61	0.291	1.09	1.03 – 1.16	0.003**
Number of years worked in same school (Ref. <3 years)	1.37	0.89 – 2.11	0.148	1.37	0.96 – 1.94	0.079	0.93	0.88 – 0.99	0.017*
Working hours, per day (Ref. <9 h)									
9 to less than 10 h	0.89	0.46 – 1.72	0.736	0.53	0.20 – 1.37	0.188	1.12	0.98 – 1.28	0.091
10 to less than 11 h	1.37	0.72 – 2.61	0.335	0.71	0.32 – 1.61	0.418	1.25	1.10 – 1.42	0.001**
11 to less than 12 h	1.16	0.61 – 2.20	0.652	0.73	0.35 – 1.56	0.422	1.47	1.30 – 1.66	<0.001***
12 to less than 13 h	3.36	1.77 – 6.38	<0.001***	0.77	0.37 – 1.59	0.485	1.64	1.45 – 1.85	<0.001***
13 h and more	2.47	0.96 – 6.39	0.062	1.32	0.64 – 2.68	0.452	2.43	2.14 – 2.75	<0.001***

	Fixed–term teacher			Nursing teacher			Diet and nutrition teacher		
	OR	**95% CI lower – upper**	***p***	**OR**	**95% CI lower – upper**	***p***	**OR**	**95% CI lower – upper**	***p***
Sex (Ref. Male)	1.56	1.33 – 1.83	<0.001***	1.42	0.33 – 6.06	0.635	0.50	0.16 – 1.53	0.227
Age	0.99	0.98 – 0.99	<0.001***	0.98	0.97 – 0.99	0.001**	0.99	0.97 – 1.01	0.530
Taking charge of the class (Ref. No)	1.09	0.93 – 1.29	0.297	2.16	0.62 – 7.48	0.226			
Number of years worked in same school (Ref. <3 years)	0.86	0.64 – 1.15	0.309	1.03	0.80 – 1.32	0.827	1.66	1.02 – 2.70	0.041*
Working hours, per day (Ref. <9 h)									
9 to less than 10 h	1.59	1.18 – 2.14	0.002**	1.22	0.85 – 1.74	0.285	1.95	1.02 – 3.74	0.043*
10 to less than 11 h	1.88	1.40 – 2.52	<0.001***	1.18	0.81 – 1.71	0.385	1.86	0.96 – 3.60	0.066
11 to less than 12 h	1.65	1.24 – 2.20	0.001**	1.95	1.34 – 2.84	0.001**	2.12	1.00 – 4.49	0.049*
12 to less than 13 h	2.64	1.98 – 3.51	<0.001***	2.95	1.79 – 4.86	<0.001***	2.04	0.79 – 5.27	0.142
13 h and more	3.60	2.69 – 4.82	<0.001***	1.71	0.71 – 4.11	0.229	2.48	0.54 – 11.37	0.241

*– OR: Odds ratio; 95% CI: 95% of confidence interval; *p < 0.05; **p < 0.01; ***p < 0.001.*

increases the risk of developing cardiovascular disease (Hayashi et al., 2019). However, 59.6% of the teachers worked for 11 h or more per day (overtime of more than 3 h per day). Furthermore, overtime work of more than 80 h per month is considered a benchmark for death from overwork, because it increases the incidence of acute myocardial infraction (Araki and Iwasaki, 2005). A total of 37.2% teachers were working more than 12 h or more per day (overtime of more than 4 h per day). Takahashi (2019) conducted analyses of compensated claims for overwork-related cerebrovascular and cardiovascular disease and mental disorders that were recognized between 2010 and 2015, and revealed that long working hours were the principal factor for overwork-related cerebrovascular and cardiovascular disease. Long working hours reduce the amount of sleep and rest needed to recover from fatigue, which can lead to chronic sympathetic hyperactivity, which can consequently lead to serious health problems. Nevertheless, in the field of education, necessary occupational safety and health policies were not implemented until 2020. Additionally, working hours differed by job title: 64.0% vice-principals, 39.8% tenured teachers, 30.3% fixed-term teachers, 14.3% principals, 8.8% diet and nutrition teachers, and 7.0% nursing teachers worked 4 h or more overtime per day. Specifically, our results suggest that the teachers with the position of vice-principal are at high-risk of occupational health problems. This study also revealed the problematic situation of junior high school teachers working overtime in Japan.

Long Working Hours and Stress Responses

The associations of working hours with stress response were examined across job titles; the number of working hours was significantly related to high stress response. Somatic symptoms in teachers are often caused by long working hours and other unfavorable working conditions (Van der Hulst, 2003). It has also been reported that long working hours among teachers is associated with mental health problems such as depressive symptoms, psychological distress, and insomnia

(Bannai et al., 2015a,b; Nomoto et al., 2015; Hori et al., 2020). However, the present study revealed that the relationship between long working hours and stress differs depending on the teacher's position. Long working hours among tenured teachers and fixed-term teachers are particularly closely associated with their stress responses; working 12 h or more per day (overtime of 4 h per day) among tenured teachers was associated with a 1.64-fold higher risk of being in the high-stress group compared to those working less than 9 h per day. Additionally, the number of fixed-term teachers who worked 12 h or more per day was 2.64 times higher in the high-stress group compared to those who worked less than 9 h per day. The duties of a teacher in Japan are diverse and include not only academic teaching, but also providing guidance regarding students' daily lives, handling students who are absent from school, guiding students on their future career paths, and instructing students on club activities outside of the classroom. This large number of work responsibilities is thought to be the cause of teachers' long working hours. In addition, fixed-term teachers must work at different schools every few years, because their contracts are renewed annually. They need to receive a good evaluation in a short period of time to be rehired the following year. Besides, since they are non-permanent positions, their wages are lower than those of tenured teachers. Worry about employment for the following year and poor employment conditions may contribute to their psychological strain, increasing their stress responses. In recent years, the number of fixed-term teachers has been on the rise in Japan, and the worsening employment conditions and heavy workload may be causing unclear career prospects among candidates for teaching positions, and keeping talented people away from the field of education. Stress responses of fixed-term teachers has been an ignored issue, and may become an important research topic to be addressed in the future.

Because the working hours of vice-principals were longer than teachers in other positions, we predicted that long working hours would be associated with higher stress responses in vice-principals as well. However, contrary to our expectation, there was no statistically significant relationship between working hours and stress responses in vice-principals. Workaholism is a possible explanation for why working hours and stress response were not related in this case. Workaholism is defined as a compulsive devotion to work that significantly impairs other areas of an individual's life (Selinger, 2007). Teaching is one of the occupations most prone to struggling with workaholism (Reysen et al., 2014), and vice-principals who work excessively long hours possibly tend to have difficulty recognizing their own stress due to workaholic symptoms. Moreover, it is possible that vice-principals themselves no longer regard long working hours as a problem, because overtime work among vice-principals has become extremely common. However, we believe that the lack of association between working hours and stress responses of vice-principals does not prove that there is no harm to health. The reason for this is the fact that the number of demotions based on the requests of vice-principals themselves has been increasing in recent years (Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2017). Additionally, vice-principals are usually older than tenured teachers and fixed-term teachers, and aging is an important risk factor for myocardial infarction and cerebrovascular disease. Therefore, it is necessary to mention that the current situation of vice-principals engaging in excessive long work hours without awareness of overwork and a lack of sleep is problematic.

For teachers such as principals, nursing teachers, and diet and nutrition teachers, there was a significant association between working hours and stress responses. However, there was no clear trend that the frequency of teachers with high stress increased as working hours increased. There are some possible reasons why working hours were only marginally associated with stress response. First, the data may be influenced by the fact that the percentage of teachers who work long hours is smaller than that of tenured and fixed-term teachers. Second, it may be related to the fact that teachers in each of these positions have a definitive job description. Principals are responsible for school administration and children's safety, school nurses for children's health and hygiene, and nutrition teachers for nutritional guidance. Being able to contribute their expertise in their work is considered to be a protective factor against occupational stress. Third, several previous studies have reported the influence of buffering factors on work stress (Hultell and Gustavsson, 2011; Boström et al., 2019; Slišković et al., 2019). Worthwhile and motivational attitude may also moderate the relationship between the number of work hours and stress responses. These factors that are potentially associated with occupational stress should be considered in the future while exploring the relationship between working hours and stress responses.

Limitations

We mention several limitations of this study. First, because a cross-sectional research design was adopted, we cannot deduce causality of the relationship between long working hours and stress responses. Second, we believe that there are some variables that moderate the relationship between working hour and stress responses. Previous research revealed that job control and social support moderate teachers' well-being (Ibrahim et al., 2021). In addition to these variables, work engagement (Hultell and Gustavsson, 2011), work environment (Boström et al., 2019), and social support (Steptoe, 2000; Slišković et al., 2019) might be also related to stress responses among teachers. These factors may modify the relationship between long working hours and stress responses. If possible, future studies should examine a model which incorporates these variables applying structural equation modeling. Therefore, more research is needed to better understand the factors associated with teachers' work environments, as well as factors that buffer the stress responses. Research on how to improve the industry hygiene of teachers would be a worthy topic for future study.

Conclusion

In summary, this research explored the working environment and the relationship between long working hours and stress

responses in public junior high school teachers in Japan. Results revealed the problematic situation of long working hours for these teachers. Specifically, vice-principals work the longest hours among teachers, which might be a hidden problem that is often overlooked, even by themselves. Furthermore, working hours of tenured and fixed-term teachers are closely related to stress responses requiring effective and sustainable solutions. For sustainable action, it is essential to investigate the causes of long working hours and analyze factors related to stress responses in tenured and fixed-term teachers in the future.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of participant privacy. Requests to access the datasets should be directed to SY, yamamura_s@kich.itami.hyogo.jp.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Kinki Central Hospital of the Mutual Aid Association of Public School Teachers (Approval number: 412). The ethics committee waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

MM and SY conceptualized the study. MM analyzed the data and wrote the manuscript. SY supervised the study. Both authors contributed to manuscript revision and approved the submitted version.

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Education Level, Underemployment, and Health

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Under the dual background of underemployment and health inequality, this study empirically analyzes the impact of education level on underemployed workers' health based on data from the 2016 China Labor-force Dynamics Survey. The results show that underemployment is significantly related to the decline of self-rated health, increased depressive tendencies, and the prevalence of illness over a certain period. The results indicate that underemployment can significantly reduce the health level of workers in both low and high education level groups. However, underemployment appears to have no significant impact on workers' health in the middle education level group. This result holds even if the measurement method of the indicators is adjusted and endogeneity is considered; this indicates that the research conclusions are robust. Moreover, this kind of health inequality mainly comes from the economic and leisure effects of underemployment for workers with different educational levels. Although underemployment significantly reduces the economic level of workers in each education level group, it brings a positive leisure effect to workers with a middle education level and a negative leisure effect to workers with a low education level. This study provides empirical support for increasing labor protection mechanisms for underemployed people and reducing the health inequality caused by differences in education level.

Keywords: education, underemployment, health, endogeneity, labor

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INTRODUCTION

For the vast majority of people, obtaining income through employment is the primary and principal means of survival. Employment status is related to the income level of workers as well as to their physical and mental health. This raises the question whether the problem of underemployment in the labor market (a state of "employment but not full employment") will affect workers' health. Under the influence of the COVID-19 pandemic and the global economic environment, the underemployment problem for workers may deteriorate further. However, it remains unclear whether the deterioration will hinder the implementation of the "Healthy China" initiative to any extent.

Although underemployment is present across all classes of society, the problem of underemployment is more evident in some groups than in others (Maynard and Feldman, 2012; Heyes and Tomlinson, 2021). As two significant components of human capital, the complementary relationship between health and education has always attracted the attention of the academic community. Previous research shows that workers with a good educational background not only have inherent advantages in access to health care knowledge, medical resources, health resources, and service accessibility (Glied and Lleras-Muney, 2008; Xie, 2009) but also have a relatively healthy lifestyle (Wang, 2012). Moreover, compared to workers with a low level of education, highly educated workers can feel a sense of fulfillment and value in the work process, and their ability to

regulate their life and health conditions is also more robust (Ross and Mirowsky, 2010). Therefore, how does education affect workers' health in the labor market? What is the role of education in the employment of workers? Will education level affect the health of workers through the channel of "underemployment?" This study aims to answer these questions by taking underemployment as the object of analysis. Further, it discusses the impact of underemployment on workers' health based on education level to provide practical support for developing targeted programs to improve workers' health.

LITERATURE REVIEW AND THEORETICAL ANALYSIS

Literature Review

Underemployment and Health

Compared to the impact of education, existing studies generally believe that employment status is one of the main factors affecting workers' health. Most empirical studies focus on the impact of unemployment and over-employment on workers' health; only a few studies have used cross-sectional data to analyze the relationship between underemployment and workers' health. Some studies have pointed out that an unsatisfying new job is worse than continuing to be unemployed (Warmath et al., 1994), and employees who are satisfied with their jobs show higher self-esteem, more life satisfaction, and fewer depressive tendencies than those who are unsatisfied with their jobs or unemployed (Winefield et al., 1991). As the working hours are too short to meet the workers' social, psychological, and economic needs (Wu, 2016; Mousteri et al., 2020), underemployment is significantly associated with lower goals (e.g., lower pay), subjective career success (e.g., lower job satisfaction), and poor mental health (Angrave and Charlwood, 2015; Otterbach et al., 2016). A significant correlation between underemployment and the psychological pressure of workers was found in a survey of government employees (Jones-Johnson and Johnson, 1992). Compared with fully employed people, underemployed ones are more likely to show depressive symptoms (Kaur et al., 2020). However, some studies have pointed out that there is no correlation between underemployment and workers' health and well-being. They believe that even bad job is better than unemployment (Jahoda, 1981). As stated above, more empirical research is needed on the impact of underemployment on health. This study will further confirm that underemployment is a severe social problem through empirical research on the relationship between underemployment and workers' health.

Education and Underemployment

The education level of workers does not match the job requirements in the labor market. Education is an essential part of ability; therefore, this mismatch may cause underemployment and a high degree of state dependence (Clark et al., 2017). However, the research results on the impact of education on the underemployment of workers are complex. Previous studies have shown that a person's education level may affect their ability to find a job (Leana and Feldman, 1995). Additionally, a low level of education is more likely to be related to underemployment (Wilkins and Wooden, 2011). In contrast, underemployment is not evident in highly educated professionals (Cam, 2014). However, some studies have pointed out a positive correlation between an individual's educational level and underemployment because workers with higher educational levels are more likely to engage in jobs that are not commensurate with their educational level (Weststar, 2009; Green and Henseke, 2021). Consequently, more empirical research is needed on the impact of education on underemployment. Therefore, this study takes education as the primary explanatory variable rather than as a control variable to further answer this practical problem.

Theoretical Analysis

Underemployment is defined as when an individual works under 35 h per week but hopes to work longer (Wilkins, 2007). Generally, the labor force groups are mostly in the two states of "money without leisure" and "leisure without money"; that is, most high-income earners have limited leisure time ("money without leisure"), whereas the vast majority of low-income groups have relatively abundant leisure time ("with leisure but no money") (Jackel and Wollscheid, 2007). Improving the economic situation of workers can increase their ability to pay and also reduce their family's budget constraints (Acemoglu et al., 2013), which, in turn, can promote economic investment in health. Additionally, underemployment increases workers' leisure time and investment in health, thus having a positive impact on health (Miller et al., 2009). Therefore, the impact of underemployment on workers' health can be explained from the following two aspects: the leisure effect and the economic effect.

Leisure Effect

Health is an investment (Mushkin, 1962). Given external conditions such as the level of social and economic development, a person's level of health depends on their investment in health, including the acquisition of goods, money, time, and energy. Since the working hours of underemployed people are relatively short, underemployment will increase leisure time and time invested in health, which is beneficial to health. Workers with different education levels face different physical, mental, and psychological loads in different jobs. Comparatively speaking, workers with high education levels face high mental and psychological loads, whereas workers with low education levels face high physical loads (Wu, 2016). Therefore, the leisure effect of underemployment during and after working hours is different for workers with different education levels, and the time and energy for investment in health is also likely to be different.

Economic Effect

Health is a consumer product (Grossman, 1972), and people can buy specific health products using money. Generally, low-income workers often do not have sufficient healthcare expenditure. Owing to the existence of "low income when working long hours" and "high income in short-term work" in the labor market (Sum and Khatiwada, 2010), underemployed workers usually have different income levels (Koltai et al., 2018). Even

in underemployment, those with high education levels may have high incomes that will increase their health care expenditure. Higher expenditure on health care further widens the health disparity among workers with different levels of education.

Hypotheses

Underemployment reduces the working hours of workers, and voluntary short-term workers are a minority. Short-term work cannot meet the social, psychological, and economic needs of workers. Therefore, it is perceived that underemployment will likely harm the health of workers.

The pay and returns are different given the same working hours for workers with different levels of education. For underemployed people, there are certain differences in the leisure and economic effects perceived by workers with different levels of education. Can workers with a high level of education still get a higher income even in a state of underemployment, thereby reducing the impact of underemployment on their health? Or, because of the impact of the workload, will workers with more education not increase their leisure time? Thus, it is crucial to explore the mechanism that can affect workers' health.

For all the reasons described above, we hypothesized the following:

Hypothesis 1: Underemployment will reduce the health of workers when other conditions remain unchanged.

Hypothesis 2: The impact of underemployment on the health of workers with different education levels is different when other conditions remain unchanged.

METHODOLOGY

Data Sources

The data for this study were obtained from the 2016 "China Labor-force Dynamics Survey" (CLDS) conducted by the Center for Social Survey of Sun Yat-sen University. A probability sampling method that was multi-stage, multi-level, and proportional to the size of the labor force was utilized, covering 29 provinces in China. The samples were screened according to the needs of the research excluding those who are generally outside of the labor market: students, housekeepers, retirees, and people with no work experience. Moreover, the labor age was limited to the legal working-age population (men aged 16–60 and women aged 16–55), excluding the labor force of other age groups. Finally, we deleted the extreme values and outliers. The final sample included a total of 10,563 observations.

Model Setting and Variable Selection

This study used logit and ologit models to analyze the impact of underemployment on the health of workers:

$$Health_{ip} = \alpha_0 + \alpha_1 Underemployment_{ip} + \alpha_2 X_i + \beta_p + \varepsilon_{ip}$$

$Health_{ip}$ is the dependent variable, which represents the health status of individual i of a laborer in province p, and it is a binary variable where healthy = 0 and unhealthy = 1. $Underemployment_{ip}$ indicates whether individual i of workers in province p is in a state of underemployment. X_i indicates individual characteristics, including economic, living habits, work, and insurance characteristics. β_p represents the fixed effects of provinces and cities, and the problem of possible missing variables was solved by controlling the fixed effects. ε_{ip} are random disturbance items.

Explained Variable

The dependent variable analyzed in this study was the health status of workers. As is stated above, the measurement of workers' health in this study included three dimensions: self-rated health, mental health (whether there is a tendency for depression), and prevalence of illness over a certain period. The CLDS data explain these three dimensions, including the following content. Self-rated health is a five-category variable, and it is assigned as "1, 2, 3, 4, and 5" according to "very unhealthy, relatively unhealthy, general, healthy, and very healthy," respectively. Mental health is a binary variable measured by whether there is a tendency for depression and is assigned as "1" or "0." In this study "1" indicates having a tendency for depression and that "0" indicates not having a tendency for depression. Whether or not the disease has occurred within a certain period is also a binary variable, measured by whether the person experienced pain in the past month and assigned values of "1" or "0." In this study "1" indicates having the disease within a certain period and that "0" indicates not having the disease.

Core Explanatory Variables

Previous studies defined underemployment as a preference, where an average weekly working time of less than 35 h accompanied by the hope of getting more working hours was labeled as underemployment (Creed and Moore, 2006; Wilkins, 2007). Compared with many previous studies, this study focused more on utility—workers not being satisfied with the existing working hours. We believe that it is an important nuance as differences in utility are more likely to affect individuals' health through their psychological satisfaction. Otterbach et al. (2016) conducted a similar study and defined underemployment as the actual working time being less than the preferred working time. The questions in the corresponding questionnaire were as follows: "How many hours do you usually work in a week for your current or last job?" and "Please evaluate your current/last job status and whether you are satisfied with your working hours." As underemployment is not the "good job" that most workers yearn for, few laborers who volunteer for short-term work. Therefore, this study defined the weekly average working hours as between 0 and 35, defined dissatisfaction with working hours as underemployment, and assigned it a score of "1"; other types of working time were defined as other (non-underemployment) and assigned a score of "0."

Control Variables

The control variables selected in this study included individual characteristics, economic status, living habits, and work characteristics. Individual characteristics included gender, age, registered residence, marital status, appearance, and religious beliefs. Gender differences are important to control for as it

is one of the dimensions of health differences among people. Marital status was measured as marriage may help individuals develop healthy behaviors, and it is difficult for health to change with age. The household registration system is the primary social management system in China. Appearance plays an increasingly important role in the labor market. Therefore, this study argues that there may be differences in registered residence and appearance under the conditions in which underemployment affects workers' health. Economic status included personal income, family income, and housing sources. The economic status of workers affects their health by affecting their quality of life, nutritional level, and lifestyle. Generally, the higher a worker's income, the better their health. In terms of the characteristics of living habits, because the distribution of living habits (such as smoking, drinking, and exercise) differs across social groups, this study also introduced these habits as a variable in the analysis. As a good working environment can reduce the probability of workers suffering from physical health injuries, and the floating population groups are often disadvantaged in the labor market, there are differences in labor intensity and time between different occupations. Therefore, we believe that work characteristics have different impacts on workers' health. Further, medical insurance can promote the health of the insured, basic endowment insurance can improve the health of workers, and unemployment insurance expenditure can play a positive role in promoting the health of workers. Therefore, this study also introduced insurance-related variables in the analysis.

This study also introduced some essential characteristics of the sample in the analysis (**Table 1**). There was no significant difference in the proportion of men and women in terms of individual characteristics; most respondents had a junior high school education or below; the average age of respondents was 41.89 years; most respondents were married (first marriage or remarriage); and most of them had a registered agricultural permanent residence. The proportion of those who owned property and those who did not was the same in terms of economic characteristics. The proportions of low- and high-income groups were relatively average in terms of family and personal incomes. More workers were engaged in agriculture, forestry, animal husbandry, and fishing in terms of job characteristics, but the proportions of those employed by others and those engaged in their own business, indoor workers, and outdoor workers were close to the average. The proportions of workers who smoked and consumed alcohol often were relatively low. We also found that the proportion of workers who exercised regularly was low. As for insurance characteristics, most workers had medical insurance, and there were more workers with endowment insurance than those with unemployment insurance.

Descriptive Statistics

We carefully examined the impact of underemployment on workers' health based on different education levels. According to previous studies, we divided workers into three groups: low (high school and below), middle (high school to college education), and high (undergraduate school and above) education levels. We then compared these differences in underemployment and health status. The sample numbers of workers at the low, middle, and high education levels were 7,122, 2,065, and 791, respectively.

It can be seen from **Table 2** that there were apparent differences in underemployment and health status of workers at different education levels. The self-rated health status of workers in the high education level group was higher than that of the workers in the middle education level group, and the self-rated health status of the workers in the middle education level group was higher than that of the workers in the low education level group ($p < 0.01$). The probability of depressive symptoms in workers in the low education level group was higher than that of the workers in the middle and high education level groups ($p < 0.01$). In terms of prevalence of illness in a certain period, the workers in the low-educated group had a higher probability of being ill during a certain period than those in the high-educated group. Further, the workers in the high education level group were more likely to get sick in a certain period than those in the middle education level group. The difference in the prevalence of illness among workers in the low education level group and the other two groups in a certain period was significant at the 1% level. In other words, the self-rated health status of workers in the low-education group was the worst, and they were more prone to depression and illness during a certain period than the other two groups.

Workers with a low education level were the most likely to experience underemployment, followed by those with a middle education level; workers in the high education level group were the least likely to experience underemployment ($p < 0.01$). This may be because to replacing workers with higher education is difficult, and employers may be reluctant to release trained and experienced employees they may need in the future (Sum and Khatiwada, 2010). On the contrary, when the economic situation is not good, workers with low education levels are easily replaced. However, companies are not willing to release them and instead reduce their working hours, which leads to the underemployment of workers with low education levels (Warren, 2015).

RESULTS

Owing to the apparent occupational gender segregation in the labor market (Salin and Nätti, 2019), men usually have more advantages than women. Affected by Chinese cultural characteristics and traditional concepts, women are more inclined to choose occupations with short working hours to facilitate family care (Zhang and Yang, 2013). Therefore, this study discusses the impact of underemployment on the health status of workers with different education levels. It also discusses how gender affects the pattern of underemployment in the labor market and the extent to which it explains the relationship between underemployment and the health status of men and women.

Regression Analysis

It can be seen from **Table 3** that the impact of underemployment on the multi-dimensional health of workers was significant at the 1% level for the entire sample. The likelihoods of underemployed

TABLE 1 | Descriptives and correlations among the study variables.

Type	Variable		Variable explanation and assignment	Mean	*SD*
Dependent variable	Health condition	Self-rated health	1 = Very unhealthy; 2 = Not healthy; 3 = Ordinary; 4 = Healthy; 5 = Very healthy	3.721	0.935
		Mental health	1 = Depressive tendencies; 0 = Non-depressive tendencies	0.153	0.360
		Prevalence	1 = Pain in the past month; 0 = No pain in the past month	0.304	0.460
Core variables	Unemployment		1 = Underemployment; 0 = Others	0.103	0.303
Control variable	Variable of individual characteristics	Sex	1 = Female; 0 = Male	0.453	0.498
		Age	Actual age (years)	41.890	10.356
		Education	1 = Primary school and below; 2 = Junior middle school; 3 = Senior middle school; 4 = Junior college; 5 = Bachelor's degree or above	2.269	1.173
		Appearance	1–10	6.449	1.504
		Hukou	1 = Non-agricultural; 0 = Agricultural	0.258	0.437
		Marital status	1 = First marriage and remarriage; 0 = Others	0.866	0.340
	Variable of economic situation	Housing source	1 = Home ownership; 0 = Others	0.510	0.500
		Household income	10,000 yuan	6.685	10.212
		Personal income	10,000 yuan	3.541	6.271
	Variable of lifestyle and habits	Smoking	1 = Yes; 0 = No	0.297	0.457
		Drinking	1 = Daily drink; 0 = No	0.075	0.263
		Regular exercise	1 = Yes; 0 = No	0.287	0.452
	Variable of working characteristics	Occupation type	1 = Employed by others; 0 = Others	0.467	0.499
		Labor force category	1 = Floating population; 0 = non-floating population	0.137	0.344
		Workplace	1 = Indoors (e.g., workshops, offices, and homes); 0 = Others	0.529	0.499
		Industry attributes	1 = First industry; 2 = Secondary industry; 3 = Third industry	1.998	0.883
	Variable of insurance characteristics	Medical insurance	1 = Yes; 0 = No	0.922	0.269
		Endowment insurance	1 = Yes; 0 = No	0.655	0.475
		Unemployment insurance	1 = Yes; 0 = No	0.179	0.383
	N		10563		

TABLE 2 | Underemployment status and health differences in workers across different education levels.

Variable		Low education level I	Middle education level II	High education level III	I vs. II	I vs. III	II vs. III
Self-rated health	1 = Not healthy; 2 = Ordinary; 3 = Healthy	2.441 (0.008)	2.654 (0.011)	2.738 (0.017)	0.213***	0.296***	0.084***
Depressive tendencies	1 = Yes; 0 = No	0.166 (0.004)	0.122 (0.006)	0.138 (0.012)	–0.044***	–0.028*	0.016
Prevalence over a certain period	1 = Have; 0 = Do not have	0.342 (0.006)	0.224 (0.008)	0.225 (0.007)	–0.118***	–0.117***	–0.001
Unemployment	1 = Yes; 0 = No	0.125 (0.004)	0.064 (0.005)	0.029 (0.005)	–0.061***	–0.096***	–0.035***

*$p < 0.05$, *** $p < 0.001$; we used a t-test as a significance test of the means of the two groups.*

people assessing their health status as being healthy or very healthy, having depressive tendencies, and having experienced pain in the past month were 0.769 ($e^{-0.263}$), 1.330 ($e^{0.285}$), and 1.342 ($e^{0.294}$) times, respectively, more than those who were not underemployed under the same conditions. This is the case after controlling for individual differences, economic conditions, living habits, work characteristics, and regional characteristics of workers. Compared with those who were not underemployed, the underemployed showed a significantly reduced overall health level. However, there were apparent differences in underemployment's effect on the health of workers at different education levels. Specifically, underemployment significantly reduced the self-rated health level of female workers with a low education level, and significantly increased their likelihood of illness for a certain period of time; however, there was no significant impact on their mental health. Regarding the male participants, underemployment significantly reduced the overall health of workers; that is, underemployment significantly reduced the self-rated health level of male workers in the low education level group and increased the presence of their depressive tendencies and the prevalence of illness over a certain period. For the middle education level group, underemployment

did not significantly affect the health of female or male workers. Underemployment only significantly increased the prevalence of illness in a certain period for female workers in the high education level group.

A partial correlation analysis quantifies the correlation between two or more variables by controlling other variables (de la Fuente et al., 2004; Kenett et al., 2010). Therefore, to better assess the strength of the impact of underemployment on the health of workers at different education levels, we continued to use a partial correlation analysis to explore the internal relationship between underemployment and workers' health.

According to the results of the partial correlation analysis (see **Table 4**) and the significance of the partial correlation coefficients, in general, underemployment had the most significant impact on the health of workers in the low education level group, followed by the high education level group. Specifically, the effect of underemployment on men's health was greater than that of women in the low education level group. In the high education level group, the impact of underemployment on women's health was more significant than that of men. This shows that workers with low education levels are more likely to experience adverse effects of underemployment on health.

Endogenous Treatment

Table 5 shows the results of solving the endogenous problem. The two-way causal relationship between underemployment and workers' health status may lead to a joint endogenous problem in investigating the impact of underemployment on workers' health; that is, the worse an individual's health status is, the more likely that individual is to experience underemployment. Owing to changes in hourly wages, employers may alter labor hours and the amount of labor, or capital and labor (Zavodny, 2000). Therefore, an increase in the minimum wage standard may change the proportion of factor input by employers, which will increase the possibility of workers being underemployed. To identify the effect this has on unemployment, the current study regarded a minimum wage increase as an exogenous shock that affects underemployment. Therefore, we selected the minimum wage standard in 2016 as an instrumental variable to solve the endogenous problem.

The regression results of the instrumental variables showed that the significance level and the impact of underemployment on the health status of workers with different education levels remained unchanged, ensuring the reliability of the measurement results and confirming the conclusions of this article.

Robustness Test

In order to verify whether underemployment has a consistent and stable effect on the health of workers with different education levels, we used the occupational classification method of Andersson et al. (2014) and re-divided the labor force into two categories—high- and low-educated labor—and retested the model estimation results. The labor force with a high education level came from government administration, party group organizations, technical departments, offices, administrative office management, and related departments; the rest were laborers with low education levels. The results are shown in **Table 6**.

As shown in **Table 6**, when the ologit and logit models were used to refit the sample data after changing the measurement method, it was found that the estimated results were consistent with the previous results (which involved dividing the difference in education level into three groups). These results also confirm the different characteristics of underemployment that impact the health of workers across different education levels.

Mechanism

According to the previous analysis, underemployment has a significant impact on workers' health, and this impact has significant differences at different education levels. Then, how does underemployment affect the health of workers at different education levels? As summarized in the above analysis on the mechanism of underemployment's impact on workers' health, this study analyzed the economic and leisure effects caused by underemployment to determine its impact on workers' health across different levels of education.

The Economic Effect of Underemployment

Generally, high wages for both men and women improve their physical and mental health. The better their economic status, the more they can invest in their health (Acemoglu et al., 2013). If underemployment is a type of recessive unemployment between unemployment and total employment, will it impact the economic status of workers? If so, are there any differences among underemployed workers across different education levels? This study used four variables to measure workers' economic status when analyzing the relationship between underemployment and workers' economic status. These four variables were personal income, satisfaction with personal income, family income, and satisfaction with family income. Underemployment may not have such consequential impacts when one's family economic status is good, and one's employment status may not affect the overall family's economic status.

We observed a relationship between underemployment and the economic status of workers (see **Table 7**). The regression results showed that in terms of personal income and satisfaction, the income reduction degree brought on by underemployment to workers at different education levels was different after controlling for individual differences, job characteristics, regional characteristics, and other conditions of workers. In particular, the high education level group showed the most significant impact, followed by the middle education level group; the low education level group showed the most negligible impact. The possible reason is the heterogeneity of working time return (There are phenomena of "low income for long working hours" and "high income for short working hours" in the labor market). Workers with higher education levels will obtain more work remuneration per unit time than those with low education levels. In addition, there were also certain differences in the personal income satisfaction brought on by underemployment for workers across different educational levels. Workers in the high education level group experienced the largest negative impact, followed

TABLE 3 | Impact of underemployment on the health of heterogeneous workers.

Variable	Total sample	Female			Male		
		Low education level	Middle education level	High education level	Low education level	Middle education level	High education level
Self-rated health	–0.263*** (0.062)	–0.279*** (0.095)	–0.018 (0.274)	–0.585 (0.874)	–0.255*** (0.098)	–0.215 (0.194)	–0.125 (0.538)
Mental health	0.285*** (0.083)	0.138 (0.128)	0.227 (0.377)	0.928 (1.053)	0.448*** (0.135)	0.454 (0.282)	–0.685 (1.121)
Prevalence over a certain period	0.294*** (0.071)	0.304*** (0.110)	0.302 (0.330)	1.897* (1.132)	0.365*** (0.113)	0.226 (0.242)	–1.881 (1.165)
N	10563	3337	1059	392	3785	1591	399

*$p < 0.05$, ***$p < 0.001$.
Standard error is in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.

TABLE 4 | Partial correlation between underemployment and workers' health.

Variable	Total sample	Female			Male		
		Low education level	Middle education level	High education level	Low education level	Middle education level	High education level
Self-rated health	–0.044*** (0.000)	–0.055*** (0.002)	–0.013 (0.689)	–0.052 (0.338)	–0.042** (0.010)	–0.032 (0.208)	–0.035 (0.516)
Mental health	0.036*** (0.000)	0.020 (0.247)	0.021 (0.511)	0.063 (0.243)	0.058*** (0.000)	0.043 (0.09)	–0.039 (0.462)
Prevalence over a certain period	0.041*** (0.000)	0.048*** (0.006)	0.028 (0.368)	0.085* (0.024)	0.054*** (0.001)	0.026 (0.311)	–0.084 (0.114)
N	10563	3337	1059	392	3785	1591	399

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
P-values are in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.

TABLE 5 | Endogenous problems (adjustment of minimum wage standards in various cities).

Variable	Female			Male		
	Low education level	Middle education level	High education level	Low education level	Middle education level	High education level
Self-rated health	–4.097*** (1.554)	–34.712 (157.405)	2.861 (7.439)	–9.395* (5.615)	–7.452 (13.009)	–12.744 (15.784)
Mental health	–0.038 (1.406)	–1.254 (5.081)	–5.633 (5.220)	–2.822*** (0.442)	2.806 (2.072)	–1.956 (3.229)
Prevalence over a certain period	2.066*** (0.592)	4.057 (3.412)	–5.549** (2.186)	3.103*** (0.182)	–1.564 (7.429)	3.998 (2.501)
N	3283	1059	391	3732	1571	399

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Standard errors are in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.

TABLE 6 | Robustness test.

Variable	Female		Male	
	Low education level	High education level	Low education level	High education level
Self-rated health	–0.230** (0.092)	–0.214 (0.488)	–0.237*** (0.088)	–0.623 (0.420)
Mental health	0.151 (0.121)	–0.169 (0.829)	0.438*** (0.121)	0.499 (0.677)
Prevalence over a certain period	0.307*** (0.105)	0.521** (0.297)	0.303*** (0.103)	0.167 (0.564)
N	4077	670	5113	609

**$p < 0.01$, ***$p < 0.001$.
Standard errors are in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.

TABLE 7 | Economic effects of underemployment.

Variable	Personal income			Satisfaction with personal income		
	Low education level	Middle education level	High education level	Low education level	Middle education level	High education level
Unemployment	–0.404*** (0.154)	–1.309** (0.641)	–2.600* (1.875)	–1.332*** (0.108)	–1.087*** (0.223)	–2.220*** (0.773)
N	7122	2650	791	7060	2632	786
Variable	**Family income**			**Satisfaction with family income**		
	Low education level	**Middle education level**	**High education level**	**Low education level**	**Middle education level**	**High education level**
Unemployment	–0.372* (0.204)	–0.684 (0.977)	–4.005 (4.480)	–0.381*** (0.079)	–0.017 (0.198)	0.274 (0.827)
N	7122	2650	791	7122	2650	727

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.
Standard errors are in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.

TABLE 8 | Leisure effect of underemployment.

Variable	Physical and mental fatigue ([1])			Participation in activities ([2])		
	Low education level	Middle education level	High education level	Low education level	Middle education level	High education level
Unemployment	0.058 (0.087)	–0.378* (0.260)	1.819 (1.700)	–0.459** (0.276)	0.145 (0.329)	0.218 (0.609)
N	7122	2623	690	7404	2910	937

$^*p < 0.05$, $^{**}p < 0.01$.
Standard errors are in the brackets. Control variables include individual characteristics, economic status, living habits, work characteristics, insured characteristics, and province fixed effects.
[1] In the Center for Social Survey (2016) questionnaire, the question on physical and mental fatigue was "Please judge the frequency of physical and mental fatigue based on your feelings and experience." The options were "every day," "several times a week," "several times a month," "several times a year or less," and "never." We assigned "every day" a value of 1, and the answers "several times a week," "several times a month," "several times a year or less," and "never" were assigned a value of 0.
[2] In the questionnaire, the question corresponding to activity participation included community and social organization participation status and involved the nine items of "residential committee," "social work organization," "owner committee," "leisure/entertainment/sports club/salon organization," "learning/training institutions," "fellow villagers' associations," "clan organizations," and "charity/social organizations/volunteer groups/religious organizations." We defined activity participation as participating in social activities and assigned a value of 1. We defined not participating in social activities as someone never having participated in social activities and assigned a value of 0.

by low education level workers, whereas workers in the middle education level group experienced the least negative impact.

In terms of household income and satisfaction, underemployment only significantly impacted the low education level group. In this group, the family income of underemployed workers was 37.2% lower than that of the non-underemployed workers, but this difference was only significant at the 10% level. The likelihood of underemployed people being satisfied with their family economic status was 0.683 (e-0.381) times higher than that of non-underemployed workers; this was significant at the 1% level. A possible reason for this is that education serves as a crucial channel for a bottom group to achieve upward mobility (Shi and Zhang, 2018). The higher the level of education (for workers in the middle and high education level groups), the more income they obtain. This may be because of having a good family background and rich interpersonal resources (Yang and Zhao, 2018). Additionally, both these factors can reduce the impact of underemployment on their family's income.

In conclusion, underemployment will reduce the overall economic situation of workers. This means that the economic effects of underemployment have a negative impact on workers across different education levels.

The Leisure Effect of Underemployment

Studies have pointed out that leisure time promotes physical health (Wei and Yu, 2011), and because underemployment increases leisure time and increases time spent on health, it positively impacts health (Miller et al., 2009). Given the amount of data available, this study measured the leisure effects of underemployment from two aspects: (1) physical and mental fatigue at work and (2) participation in activities outside of work.

According to the estimated results (see **Table 8**), the leisure effects of underemployment on workers varied across different education levels. Underemployment will reduce workers' physical and mental fatigue at the middle education level and the activity participation of workers at the low education level. In other words, underemployment will only bring a positive leisure effect to workers at a middle education level but will negatively affect workers' leisure if they are at a low education level.

Notably, the economic effect and leisure effect of underemployment are harmful to workers with low education levels, making the negative impact on this group's health twofold. There appears to be a positive leisure effect and a negative economic effect for workers with a middle education level. Further, underemployment negatively affects workers with a high level of education. Therefore, underemployment has the most

significant negative impact on the health of workers with low education levels, followed by workers with high education levels. The impact on the health of workers with middle education levels is not significant.

DISCUSSION AND CONCLUSION

Based on the Center for Social Survey (2016) data, this study empirically analyzed the relationship between education level, underemployment, and workers' health. Markedly, the impact of underemployment on workers' health is multi-dimensional. This indicates that underemployment is significantly related to a decline in the self-rated health of workers, an increase in depressive tendencies, and a rise in the prevalence in a certain period. Further, underemployment can significantly reduce the health level of workers at low and high education levels but appears to have no significant impact on workers' health at the middle education level. When altering the index measurement method and considering the endogeneity, the research conclusion remains robust. Moreover, this kind of health inequality mainly comes from the economic and leisure effects that underemployment brings to workers across different education levels. Although underemployment significantly reduces the economic level of workers in each education level group, it can bring a positive leisure effect to workers at the middle education level and a negative leisure effect to workers at the low education level.

Given the above research conclusions, we believe that we should adopt differentiated health promotion programs for underemployed people across various education levels. First, we should increase training opportunities, increase the knowledge stock and technical content of underemployed low-education workers, improve their employment competitiveness in the labor market, and help underemployed workers achieve full employment as soon as possible through learning and vocational training. Second, we suggest that the government adopt tax incentives or low-interest loan incentives to support employers in actively carrying out high-quality training for workers at low education levels. Simultaneously, it is necessary to provide professional psychological counseling for these groups and implement various forms of care activities in order to reduce the multi-dimensional health damage caused by the income reduction and the psychological pressure caused by underemployment. Finally, for workers with a high level of education, especially female workers, the government should strive to improve the efficiency of educational resource allocation, and enterprises should establish a scientific employment mechanism. These measures will not only fully utilize the human resources of high-level talent but also reduce underemployment for highly educated workers. Although the public emphasizes the importance of gender equality in the labor market, underemployment has a significant positive impact on increasing prevalence in a certain period among female workers at high education levels. If this phenomenon is ignored, it will hinder the full use of the human capital of highly educated female workers and further hinder the realization of the maximization of social welfare.

It should be noted that this study also has some limitations. There remains no universally recognized "best method" to assess the health of workers. Therefore, this study constructed a three-dimensional health evaluation system for workers' self-evaluated health, mental health, and prevalence over a certain period. Nonetheless, the conclusions remain robust and credible. However, more studies are needed to explore the assessment of workers' health.

DATA AVAILABILITY STATEMENT

The data from the China Labor-force Dynamics Survey used in this study are available from the Centre for Social Survey, Sun Yat-sen University. Requests to access the datasets should be directed to the authors, and access will be granted upon approval from CSS.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

NL and DW: conceptualization, writing—original draft preparation, and supervision. NL: methodology and formal analysis. DW: writing—review and editing. Both authors: read and agreed to the published version of the manuscript.

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A Cross-Sectional Study of Individual Learning Passion in Medical Education: Understanding Self-Development in Positive Psychology

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Background: Boosting the individual learning passion of medical students is a novel approach to improve their academic performance. It facilitates the medical education reform, motivating both policymakers and educators to focus on the function of positive psychology in the career development of medical students. Therefore, this study aimed (1) to assess the status of two types of learning passion; (2) to clarify the relationship between self-esteem and two types of learning passion among Chinese medical students; (3) to examine the mediating role of psychological capital (PsyCap) in the relationship between self-esteem and two types of learning passion, respectively; and (4) to identify the moderating role of professional identity in the relationship between PsyCap and two types of learning passion, respectively.

Methods: A cross-sectional online survey was conducted from April to June 2016 in China. A total of 1,218 valid questionnaires (effective completion rate: 67.93%) were collected from four medical schools.

Results: Self-esteem significantly and positively influenced medical students' PsyCap ($\beta = 0.637$, $P < 0.01$) and two types of learning passion, including harmonious learning passion ($\beta = 0.589$, $P < 0.01$) and obsessive learning passion ($\beta = 0.436$, $P < 0.01$). PsyCap fully mediated the relationship ($\beta = 0.578$, $P < 0.01$) between self-esteem and harmonious learning passion positively, whereas it suppressed the relationship ($\beta = 0.490$, $P < 0.01$) between self-esteem and obsessive learning passion. Further, professional identity significantly moderated the correlation between PsyCap and harmonious learning passion ($\beta = -0.554$, $P < 0.05$), rather than obsessive learning passion ($P > 0.05$).

Conclusion: Two types of learning passion of medical students are positively influenced by self-esteem and PsyCap. Medical students with high-level self-esteem should possess strong PsyCap, which augments their harmonious as well as obsessive learning

passion. Moreover, the positive effect of medical students' PsyCap on harmonious learning passion is more notable among those with a lower professional identity. Finally, this study argues that strengths-based interventions of self-esteem and PsyCap are a beneficial approach for future enhancing learning passion in the domain of medical education.

Keywords: medical students, learning passion, self-esteem, psychological capital, professional identity

INTRODUCTION

Currently, a low degree of professional commitment and a high level of learning burnout among medical students in China have become noticeable issues in need of an urgent solution (Jinghua et al., 2014; Xie et al., 2019). Positive education has proved to be an emerging paradigm by introducing positive psychology principles into the domain of education. This aims to promote students' wellbeing and academic excellence (Julie, 2021; Morgan and Simmons, 2021). Passion for learning is an important concept that stems from positive education. Learning passion seems to provide new understanding approach of improving the academic performance and academic wellbeing, as well reduced burnout among medical students (Chen et al., 2021). Medical students' learning passion could directly contribute to proficiency in medical knowledge and skills and enhance the potential quality of future clinical work in health services (Rani et al., 2020). Moreover, the study on individual passion can trigger the positive characteristics of medical students, promoting beneficial outcomes in the domain of medical education (Brunzell et al., 2016), which seems to have been widely ignored. In addition, teachers and parents attached great importance to the education of Chinese students (Liu and Tein, 2005). Compared to general professional learners, medical students need to fully absorb learning materials from several courses and endure a long academic journey that involves professional and practical curricula (Abdulghani et al., 2012). This contributes to increasing academic pressure and anxiety and decreasing learning enthusiasm and learning engagement (Sun et al., 2017), which may significantly affect the academic performance and wellbeing of the students. Being a component of individuals' psychological factors, passion for learning is beneficial in helping the students engage in an activity for a long time and exerting a remarkable influence on the student's academic performance (Mageau et al., 2009), belongingness (Stenseng et al., 2015), and interpersonal relationships (Vallerand, 2008). Furthermore, harmonious learning passion has been significantly and positively correlated with individuals' positive emotional experiences in school and a series of positive indexes of psychological adjustment (life satisfaction, vitality, etc.); However, obsessive learning passion has been significantly negatively correlated with the undesirable indexes, such as alcohol-related problems, and mental health (Vallerand et al., 2003, 2007). In addition, the personal characteristics and psychological states of medical students, such as self-esteem, optimism, psychological resilience, and other PsyCap, are crucial for the formation of optimistic and healthy psychological traits and the promotion of academic performances for future medical and clinical work. Currently, much of previous research regarding the influence of passion has been extensively discussed in different occupational groups; however, limited academic attention has been given to the research on learning passion in the domain of education (Yim et al., 2008; Oh, 2021; Violet et al., 2021), especially in the Chinese cultural background. In particular, studies on the learning passion of medical students and the factors affecting it are still needed.

Dualistic Passion

In 2003, Robert J. Vallerand and his team summarized and defined passion as the strong will or emotional inclination of an individual to engage in an activity that they are attached to, and they are willing to invest a great deal of time and energy in Vallerand et al. (2003). Drawing from self-determination theory (SDT), scholars have developed a two-dimensional model of general passion by addressing a distinction between harmonious and obsessive passion (Vallerand et al., 2010). Harmonious passion originates from an autonomous internalization of individual activity into self-identity. Autonomous internalization occurs when a person willingly accepts the activity of one's own accord with self-directed behaviors, following a sense of volition and personal endorsement. Moreover, harmonious passion can be coordinated with other aspects of an individual's life, which can result in a series of positive outcomes. However, obsessive passion arises from the process of controlling the internalization of the activity. Although a person with obsessive passion tends to trigger a strong motivation to engage in activities, the prescribed course of internalized actions is more likely to be affected by external or environmental force, interpersonal or self-pressure, or interpersonal environments—self-esteem or social identity. This may further result in a strong sense of reluctant drive and control (Zylan, 2011). Moreover, obsessive passion has an overpowering effect, engendering potential conflicts with other activities in different aspects of one's life, which tends to result in different outcomes for the individual, within a controllable range (Mageau et al., 2009). Individuals have a passionate tendency to assimilate and integrate external behavior (Deci and Ryan, 1985). Specifically, the Dualistic Model of Passion (Vallerand et al., 2003) has suggested that people can experience two types of passion toward an activity, further causing diverse affective, cognitive, and behavioral outcomes. Unfortunately, inadequate research has been conducted regarding how psychological elements independently affect one's dualistic passions; therefore, this study aims to enrich the research on the issues mentioned above through an academic discussion. It is the first study to explore the association between self-esteem, psychological capital and two

types of passions and the underlying mechanisms among Chinese medical students.

Internal Relationships Between the Two Types of Passion, Self-Esteem, and Psychological Capital

The learning passion of medical students could directly affect their proficiency in medical knowledge and skills and potentially benefit the quality of future clinical work in health services (Rani et al., 2020). In this study, we propose a conceptualization of learning passion as a strong inclination toward learning activities that students would value and like, and in which they invest a substantial amount of time and energy. Driving passion for learning *activities* requires a series of psychological characteristics, states, or resources involving subjective experience, self-evaluation, psychological resources, self-identification, and self-psychological experience (Newell, 2003; Ivanova, 2021). Self-esteem, as a comprehensive positive or negative self-evaluation of a person's self-worth, refers to the motivation of individuals to evaluate themselves positively and maintain this positive evaluation (Rosenberg, 1965a). A study indicated that higher self-esteem was likely to stimulate enhanced initiative and pleasant feelings and had been related to greater happiness (Baumeister et al., 2003). Psychological capital refers to one's positive psychological resources—self-efficacy, hope, optimism, and resilience—which usually focuses on how an individual is changing or evolving rather than who that individual is (Luthans et al., 2007a). Previous results found that college students' PsyCap had a significantly positive relationship with positive emotions, achievement motivation, learning empowerment, academic performance (Carmona-Halty et al., 2019), and wellbeing (Ji, 2016). According to a self-consistency revision of cognitive dissonance theory (Stone, 2003), we inferred that medical students with high self-esteem are less likely to succumb to feelings of incompetence and self-doubt and have greater aspirations. Thus, high self-esteem contributes to driving the process of passion for learning among medical students and establishing positive psychological resources for them. Owing to the existing conflict between obsessive passion and other activities, they are more likely to experience self-esteem fluctuations that covary with their performances in their passionate activities (Mageau et al., 2011). Previous study has found that obsessive passion could be driven by the need for social acceptance or self-esteem (Vallerand et al., 2003, 2007). Conversely, individuals with high-level harmonious passion do not experience self-esteem fluctuations (Mageau et al., 2011). Although there posing multiple challenges for researchers to measure passion and test passion-linked theories across different cultural contexts. However, it is possible that cultural differences could be driving the cultural variation in the link between the two types of passion and self-esteem, especially in China with the characteristic of collectivism (Li Q. L. et al., 2021). Therefore, we speculate that two distinct types of passion arise as a result of a continuous spiral internalization process that varies in the level of its development in the learning process (Vallerand et al., 2007). This is more likely to comprise a series of complex interactive relationships rather than the single directional relationship between the variables previously mentioned (Ji, 2016; Carmona-Halty et al., 2019); thus, we attempt to explore the following five research hypotheses in this study, hypothesis were shown **Figure 1**.

Hypothesis 1: Self-esteem is positively related to PsyCap.

Hypothesis 2: PsyCap is positively related to harmonious learning passion.

Hypothesis 3: PsyCap is positively related to obsessive learning passion.

Hypothesis 4: Self-esteem is positively related to harmonious learning passion.

Hypothesis 5: Self-esteem is positively related to obsessive learning passion.

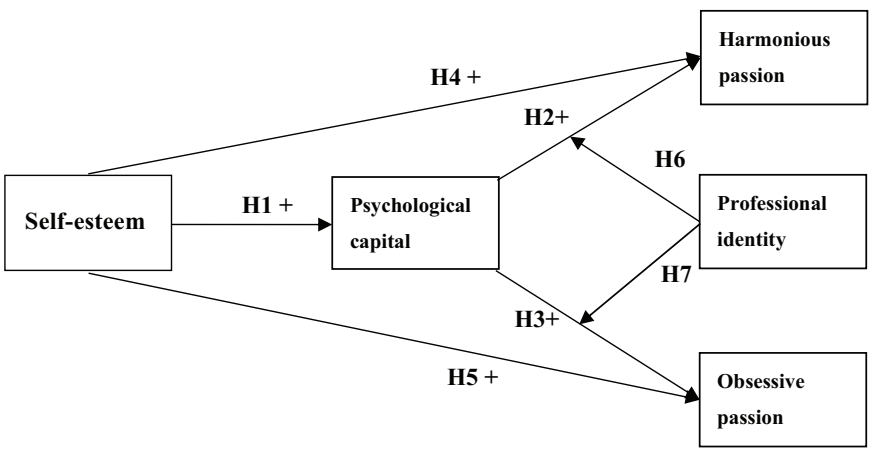

FIGURE 1 | Hypothesis model.

The Moderating Effect of Professional Identity

The conceptualization of professional identity is the individuals' sense of oneness regarding a profession (e.g., medicine) (Olesen, 2001) and a consistency degree to which they are willing to define themselves as professional members (Olesen, 2001). For medical students, professional identity tends to affect their understanding regarding the recognition of the medical profession and the degree of emotional connection with their major (Joseph et al., 2017). The self-identification of students with the medical profession has been linked with a successful transition from being a medical student to a professional doctor, in addition to a series of positive outcomes—PsyCap, learning efficiency (Li and Yang, 2018), achievement motivation, and learning satisfaction (Jianyu and Dan, 2016). Although evidence exists regarding the positive effect of activity identification on harmonious as well as obsessive passion (Mageau et al., 2009), some studies account for the multitude of relationships between PsyCap, professional identity, and learning passion. Previous studies found that identity played a moderator in the multiple relations between self-efficacy, self-concepts, self-feeling, motivation, and behavior-relevant outcomes (De Cremer, 2005; Lim and Kim, 2011). Professional identity is a subjective judgment and can be influenced by one's psychological characteristics, behavioral norms, and extrinsic work values toward the medical discipline (Monrouxe, 2010; Joseph et al., 2017). Moreover, it represents the extent of the cognitive connection between the attributes and goals that subjects often identify themselves with. We inferred that PsyCap, interacting with different levels of professional identity, is more likely to drive different types of learning motivation during medical students' learning process. Based on the above, we formed the following hypotheses:

> Hypothesis 6: Professional identity moderates the relationship between PsyCap and harmonious learning passion.
>
> Hypothesis 7: Professional identity moderates the relationship between PsyCap and obsessive learning passion.

The Mediating Role of Psychological Capital

PsyCap, as a cognitive-motivational variable, has been linked with several positive outcomes and plays a key role in the relationships between the various school-related factors (Luthans et al., 2007a; Siu et al., 2014; Kim and Shin, 2021; Lin, 2021). Similar research has found that positive study-related emotions could enhance students' learning engagement, academic performance, and achievement (Villavicencio and Bernardo, 2013). Moreover, related evidence has indicated that individuals with positive beliefs about personal competence could respond by adaptively facing stressors, thereby predicting positive states of spiraling gains (e.g., learning passion and engagement) (Datu et al., 2018). Specifically, many studies concluded that both high-level PsyCap and self-esteem are positively related to better academic achievement, greater academic engagement and adaptation, and more positive learning attitudes (Datu et al., 2018; Carmona-Halty et al., 2019). Dualistic passion increases based on the SDT (Vallerand et al., 2003), involving harmonious and obsessive passion, and exerts prominently different processes of motivation internalization owing to distinct psychologically functional mechanisms (Vallerand et al., 2003). Thus, we can infer that students who have a stable and high level of self-esteem—that can inspire learning interest—tend to perceive more positive emotions during the learning period. This arouses learning motivation and awakens learning passion and engagement through different paths. The proposed mediational mechanism occurs because study-related positive emotions, such as self-esteem, may facilitate the construct of PsyCap and, in turn, foster two types of learning passion through increasing resource caravans. Therefore, PsyCap, as a cognitive-motivational factor, likely plays a mediating role in the relationship between self-esteem and the two types of passion. A study has revealed that PsyCap could positively predict two types of motivation—controlled and autonomous motivation. According to the study, students with PsyCap tend to achieve higher academic performance and exhibit greater adaptability of school-related activities (Datu et al., 2018). Thus, based on the above statements, we propose the following hypotheses:

> Hypothesis 8: PsyCap mediates the relationship between self-esteem and harmonious learning passion.
>
> Hypothesis 9: PsyCap mediates the relationship between self-esteem and obsessive learning passion.

Objectives of the Study

The previous research highlights the following significant goals in our study: (1) to assess the status of two types of learning passion; (2) to clarify the relationship between self-esteem and two types of learning passion among Chinese medical students; (3) to examine the mediating role of PsyCap in the relationship between self-esteem and two types of learning passion, respectively; and (4) to identify the moderating role of professional identity in the relationship between PsyCap and two types of learning passion, respectively.

MATERIALS AND METHODS

Subjects and Procedures

A combination of multistage stratified and convenient sampling was used in this study. For the convenient sampling process, an anonymous online questionnaire was completed by medical students from Chengde Medical College, Qiqihar Medical College, Mudanjiang Medical College, and Harbin Medical University, from April to June 2016. The participants who are different classes and grades were randomly selected in surveyed medical universities. First, we contacted the teachers in charge of student affairs and the academic administrators as the original deliverers of the survey. Subsequently, a webpage link to our self-administered questionnaire[1] was sent by the teachers to the students via mobile phones. Each participant can respond only once. Furthermore, researchers use the Questionnaire Star

[1]https://www.wenjuan.com/

platform to monitor the collected questionnaires in real time and manage the data effectively. Senior investigators conduct quality control by checking the collected questionnaires on a daily basis. A total of 1,793 students completed their questionnaires. For the purposes of data management and quality control, strict adherence to exclusion criteria was maintained. Finally, 1,218 valid questionnaires were collected, with an effective completion rate of 67.93%, excluding unanswered or incomplete questionnaires, those answered in an extremely short period, and/or those with an excessive number of blank items. The inclusion criteria were recognized as (1) medical students who is studying in a medical college; (2) voluntarily and truthfully cooperating with the online questionnaire survey; (3) complete answers. Similar survey method has been successfully used in international studies (Zhang et al., 2018; Li X. et al., 2021; Shi et al., 2021).

Measurements

The Measurement of Learning Passion

Referring to the primitive General Passion Scale developed by Vallerand et al. (2003), a Learning Passion Scale was revised to adapt to the group of medical students (Ge et al., 2016). This primary tool had 12 items and was applied to medical students; this tool obtained high reliability and validity in a previous study conducted in China (Ge et al., 2016). In this study, after conducting a factor analysis, the remaining Medical Students' Learning Passion Scale presented 12 items and was divided into two dimensions: the passion of harmonious learning and that of obsessive learning, with six items each. We used a seven-point Likert scale ranging from 1 (*completely inconsistent*) to 7 (*completely consistent*). The score equaled the sum of the average of each item, and a higher score presented a higher level of student's learning passion. In this study, the Cronbach's alpha coefficient was 0.898.

The Measurement of Psychological Capital

This survey used the PsyCap Questionnaire (PCQ-24) developed by Luthans et al. (2007b) and translated into Chinese by Li Chao-ping. The Chinese version of this tool had been applied to a previous study conducted among college students, which presented a good cross-cultural adaptation with high reliability and validity in China's setting (Pan et al., 2015). The questionnaire contained six topics and 24 items that were assembled into four dimensions—self-efficacy, hope, toughness, and optimism. They were measured on a six-point Likert scale—1 implying *totally disagree* and 6 implying *totally agree*. Some items had been reversed. Higher scores indicated higher levels of PsyCap of medical students. In this study, the Cronbach's alpha coefficient for the scale was 0.931.

The Measurement of Self-Esteem

A one-dimensional Self-esteem Scale containing a total of 10 items was developed by Rosenberger and was later translated and revised by Ji Yifu, Tian Yimei, and their colleagues (Rosenberg et al., 1978). A four-point Likert scale was used (1 = *completely inconsistent*, 2 = *sometimes consistent*, 3 = *often consistent*, 4 = *always consistent*). Some items had been reversed. A higher score reflected a higher self-esteem of medical students. In this study, the Cronbach's alpha coefficient for the scale was 0.859.

The Measurement of Professional Identity

A one-dimensional instrument with six items suggested by Mael and Ashforth (1992) was used to measure professional identity, which had previously been widely used and has been proven to have good reliability and validity in a Chinese context (Peng et al., 2020). Participants were asked to provide responses on a five-point scale (1 implying *completely inconsistent* and 5 implying *always consistent*). Higher scores indicated higher professional identity. The Cronbach's alpha coefficient for the scale was 0.842.

Data Analysis

The main statistical methods included descriptive statistical analysis—to describe the demographic information of the participants and the status of learning passion—and Pearson correlation, which was tested to estimate the correlations between the two types of learning passion, PsyCap, and self-esteem. Hierarchical linear regression analysis was performed to test the associations and moderating and mediating effects of variables. In this study, $P < 0.05$ (two-tailed) was considered statistically significant. The previously mentioned analyses were conducted using SPSS 17.0 (IBM, BM SPSS Statistics for Windows).

RESULTS

Demographic Information of the Sample

The demographic information of the sample included school, gender, provenience, academic year, gross annual household income, subjective academic performance and program, as presented in **Table 1**.

Status of Medical Students' Learning Passion

Table 2 shows that the mean scores of harmonious and obsessive passion are (4.826 ± 0.90) and (4.114 ± 1.02), respectively. These results show that the overall level of learning passion of participants is relatively high, and the score of harmonious passion is higher than that of obsessive passion.

Correlations Between Study Variables

The means, standard deviations, and Pearson correlation coefficients of variables are described in **Table 2**. The absolute value of the correlation coefficient is statistical significance, which indicates that each variable could be used in subsequent regression analyses to explore the association and mediating effects between them (Baron and Kenny, 1986).

Multiple Linear Hierarchical Regression Models

Multiple linear regression analysis was used to test the relationship between PsyCap, self-esteem, and two types of learning passion, after eliminating the interference of the

TABLE 1 | Characteristics of respondents ($N = 1,218$).

Characteristics	Categories	*N* (%)
School		
	Chengde Medical College	223 (18.3)
	Qiqihar Medical College	277 (22.7)
	Mudanjiang Medical College	125 (10.3)
	Harbin Medical University	593 (48.7)
Gender		
	Male	264 (21.7)
	Female	953 (78.2)
	Unsure	1 (0.1)
Origin of student		
	Urban	672 (55.2)
	Non-urban	546 (44.8)
Academic year		
	First	736 (60.4)
	Second	194 (15.9)
	Third	93 (7.6)
	Fourth	146 (12.0)
	Fifth	49 (4.0)
Gross annual household income (RMB)	Less than 20,000 ¥	368 (30.2)
	20,001–50,000 ¥	380 (31.2)
	50,001–100,000 ¥	278 (22.8)
	100,001–200,000 ¥	150 (12.3)
	More than 200,000 ¥	37 (3.0)
	Unsure	5 (0.4)
Subjective academic performance	Superior level	140 (11.5)
	Upper middle level	383 (31.4)
	Medium level	414 (34.0)
	Middle and lower level	216 (17.7)
Program	Inferior level	65 (5.3)
	Clinical medicine	863 (70.9)
	Non-clinical medicine	355 (29.1)

¥ *Legal tender symbol of the People's Republic of China.*

TABLE 2 | Means, standard deviations (*SD*) and Pearson correlations of variables ($N = 1,218$).

Variables	Mean	*SD*	1	2	3	4
1. Self-esteem	2.986	0.409	1			
2. PsyCap	4.054	0.609	0.650**	1		
3. Harmonious learning passion	4.826	0.909	0.411**	0.594**	1	
4. Obsessive learning passion	4.114	1.023	0.236**	0.433**	0.641**	1

***p <0.01, Correlation is significant at the 0.01 level (2-tailed).*

some demographic variables that may potential affect outcomes involving gender, academic year, program, and subjective academic performance, which was confirmed. Demographic information as control variables was variables that were statistically different in outcome variables in previous studies. Such variables are regarded as the control variables and are brought into Models 1, 3, and 7. As self-esteem was significantly positively associated with PsyCap (M_2, $\beta = 0.637$, $P < 0.01$), H1 was confirmed; in addition, harmonious learning passion (M_5, $\beta = 0.400$, $P < 0.01$) confirmed H4, and obsessive learning passion (M_9, $\beta = 0.234$, $P < 0.01$) confirmed H5. Moreover, the PsyCap of participates was found to be significantly positively associated with harmonious learning passion (M_4, $\beta = 0.589$, $P < 0.01$) and obsessive learning passion (M_8, $\beta = 0.436$, $P < 0.01$). Therefore, H2 was supported, and H3 was confirmed. We relied on the four-step mediated regression approach recommended by Baron and Kenny (1986) and showed the results of the mediation analysis in **Table 3**. We found that PsyCap had a fully mediating effect on the relationship (M_6, $\beta = 0.578$, $P < 0.01$) between self-esteem and harmonious learning passion; thus, H8 was confirmed. However, PsyCap had a suppression effect on the relationship between self-esteem and obsessive learning passion (M_{10}, $\beta = 0.490$, $P < 0.01$). Therefore, H9 was confirmed in **Table 3**.

Multiple Linear Regression Analysis of Moderation

When the moderating effect was verified, according to the recommendations by Aiken and West (1991), the data were normalized (subtracted its average value) in **Table 4**. This study shows that professional identity significantly moderated the correlation between PsyCap and harmonious learning passion ($\beta = -0.554$, $P < 0.01$), rather than obsessive learning passion ($P > 0.05$); therefore, H6 was confirmed, and H7 was refused. To further demonstrate the trend of professional identity's moderating effect and avoid a collinearity problem referring to the high correlation between independent variables and interaction term—after the data were centralized—we drew a diagram of the moderating role, as shown in **Figure 2**. Based on a series of findings in our study, we revised the relational model in **Figure 3**. The slope of low professional identity was higher than that of high professional identity, and the slope of low professional identity was more inclined. Compared with low professional identity, high professional identity weakened the influence of PsyCap on harmonious learning passion.

DISCUSSION

Status of Medical Students' Learning Passion

The overall mean score (standard deviation) of Chinese medical students' harmonious passion and obsessive passion were 4.826 (0.90) points and 4.114 (1.02) points, respectively. Participants reported high scores of both types of learning passion, indicating that medical students maintained a high-degree enthusiasm for learning while exhibiting a passive emotional experience and even reluctant incentives (Zylan, 2011). This study indicates that, in medical students' professional learning motivation, the level of harmonious learning passion—characterized by autonomous internalization—is higher than that of obsessive learning passion—characterized by compulsory internalization. By driving instrumental orientation, medical students' learning engagement and passion are motivations for maintaining their

TABLE 3 | Hierarchical linear regression analysis models ($N = 1,218$).

Variables	PsyCap		Harmonious learning passion				Obsessive learning passion			
	M_1 (β)	M_2 (β)	M_3 (β)	M_4 (β)	M_5 (β)	M_6 (β)	M_7 (β)	M_8 (β)	M_9 (β)	M_{10} (β)
Control variables										
Gender	−0.069*	−0.052*	−0.066*	−0.026	−0.069*	−0.045	0.011	0.041	0.016	0.044
Academic year	−0.087**	−0.066**	−0.063*	0.017	−0.058*	−0.022	−0.061*	−0.027	−0.055	−0.023
Major	−0.047	−0.040	−0.035	0.002	−0.024	0.001	−0.050	−0.026	−0.044	−0.013
Subjective academic performance	−0.158**	−0.077**	−0.166**	0.070**	−0.127**	−0.091**	−0.149**	−0.077**	−0.114**	−0.077**
Annual household income	0.108**	0.048*	0.006	0.057**	−0.029	−0.059*	−0.062*	−0.107**	−0.085**	−0.113**
Mediating variable										
PsyCap				0.589**		0.578**		0.436**		0.490**
Independent variable										
Self-esteem		0.637**			0.400**	0.024			0.234**	−0.083*
F	9.365**	135.486**	6.818**	104.828**	44.040**	89.751**	6.342**	48.740**	16.327**	40.415**
R^2	0.043**	0.438**	0.030**	0.362**	0.190**	0.376**	0.028**	0.209**	0.081**	0.214**
ΔR^2	0.043**	0.395**	0.030**	0.332**	0.156**	0.337**	0.028**	0.182**	0.054**	0.186**

M_1, M_3, M_7, the influence of demographic variables on the PsyCap, harmonious learning passion and obsessive learning passion; M_2, the influence of self-esteem on the PsyCap; M_4, M_8, the influence of the PsyCap on harmonious learning passion and obsessive learning passion; M_5, M_9, the influence of self-esteem on harmonious learning passion and obsessive learning passion; M_6, M_{10}, the influence of self-esteem and PsyCap on harmonious learning passion and obsessive learning passion.
$^*p < 0.05$, $^{**}P < 0.01$.

TABLE 4 | Moderated regression analysis ($N = 1,218$).

Variable	Harmonious learning passion		Obsessive learning passion	
	B	*P*	*B*	*P*
Cause variable	0.885	<0.01	0.370	<0.01
PsyCap	0.885	<0.01	0.370	<0.01
Moderator				
Professional identity	0.476	<0.01	0.185	>0.05
Interaction				
PsyCap*Professional identity	−0.554	<0.01	0.017	>0.05
R^2	0.367	<0.01	0.223	<0.01
ΔR^2	0.367	<0.01	0.223	<0.01
F	213.529	<0.01	105.020	<0.01

Professional identity-interaction, PsyCap professional identity.*

subsequent profession's livelihood and social status rather than professional calling (Zhang et al., 2020). Recently, medical practice and education have been emphasizing on motivation to stem from professional spirit, instead of livelihood. Thus, our findings suggest that medical educators and managers need to boost students' learning passion because it would be a significantly meaningful measure for innovating the development pattern of medical education.

Association Between Self-Esteem and Learning Passion in Medical Students: Mediating Effect of Psychological Capital

The results showed that self-esteem and PsyCap positively predicted the two types of learning passion among medical students. Self-esteem can directly predict obsessive learning passion and not directly predict harmonious learning passion among Chinese medical students. In China, *Mianzi* (face) is regarded as the recognition by others of an individual's social standing and position, which is the most prominent Chinese cultural characteristics that have strong implications for Chinese people's thinking, behavior and decision making process (Buckley et al., 2006). Influenced by the *Mianzi* culture, medical students think that it is vital to protect a their *Mianzi* or dignity and prestige, and force themselves to learn more responsive to the expectations from parents and teachers. Therefore, *Mianzi* culture can help us understand the current result. Owing to the *Mianzi* culture is conducive to driving the external learning motivation rather than self-growth-driven learning motivation, thereby self-esteem can directly affect obsessive learning passion and not directly affect harmonious learning passion for Chinese medical students.

PsyCap had a full mediating effect on the relationship between self-esteem and harmonious learning passion while suppressing the relationship between self-esteem and obsessive learning passion; this finding was inconsistent with a previous study (Larson and Luthans, 2006).

Self-esteem is a kind of overall self-evaluation with a self-affirmative tendency (Rosenberg, 1965b) that has a remarkable correlation with the increasingly positive cognition and behaviors of medical students—to the extent that individual it is contingent on a relatively stable source. Individuals with high self-esteem are better at understanding and taking advantage of their strengths and avoiding their weaknesses comprehensively (Wang et al., 2020). Thus, they are not affected by negative effects or setbacks during their daily study and maintain a positive outlook toward every situation, irrespective of the outcome (Chin, 2014). Additionally, medical students with high-level hope and high-degree optimism toward the future tend to have a greater propensity to being autonomous in learning

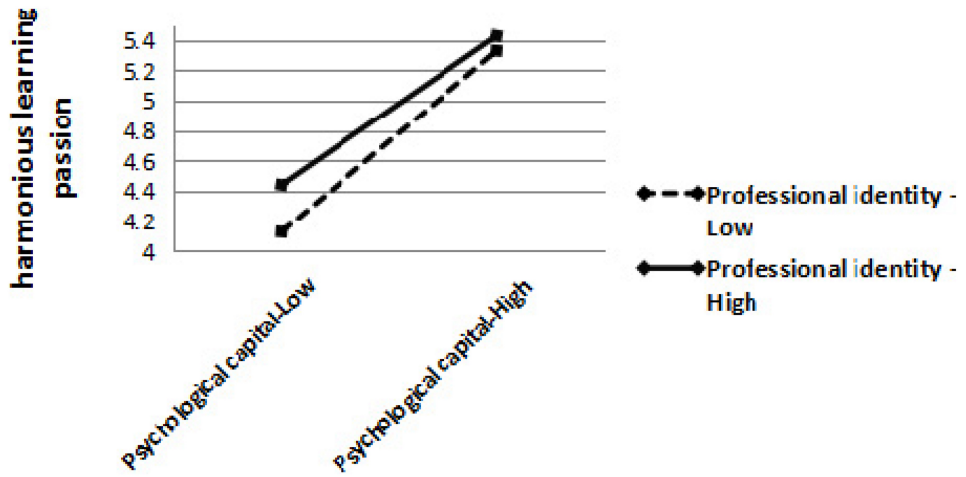

FIGURE 2 | Moderator effect of professional identity on the relationship between PsyCap and harmonious learning passion.

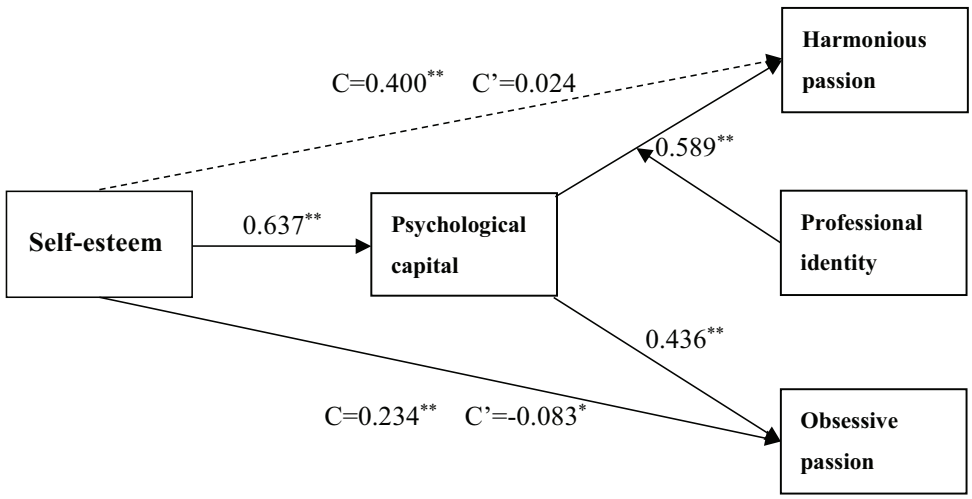

FIGURE 3 | Modified model and standardized path coefficients. C is the total effect of self-esteem on harmonious passion and obsessive passion. C' is the direct effect of self-esteem on harmonious passion and obsessive passion. $^{*}p < 0.05$, $^{**}p < 0.01$, Correlation is significant at the 0.01 level (2-tailed).

regulations. They are more likely to devote to their passionate learning style with adequate openness to aim for better academic performance and clinical skills. Furthermore, students with higher PsyCap also exhibit optimistic completion of learning activities; they are emotionally driven to pursue their goals, resulting in a better balance between learning and other life activities. Therefore, students with positive self-evaluations and self-worth are prone to trigger a process of autonomous internalization to begin and maintain. Further, they engage in learning activities to reach the desired academic goals through the positive integration of individual psychological resources—self-efficacy, hope, optimism, and resilience (Luthans et al., 2007b).

Moreover, this study proves that students' self-esteem and obsessive passion are negatively related, after controlling for the effects of PsyCap. The differences due to PsyCap would mask the effects of students' self-esteem on obsessive passion, creating the observed suppression effect. For those students with obsessive passion, their actions have often been energized, coerced, or seduced by desired environmental conditions, involving parental expectations or their volition. Medical students with a positive PsyCap involving psychological resilience are likely to be skilled in coping with intrapersonal and/or interpersonal pressure owing to external support and high self-esteem. This tends to launch a self-driven process of controlled internalization of students' learning into self-identity. Furthermore, they tend to exhibit reasonable control in the way they achieve their learning goals by properly balancing learning behaviors and other activities, which further augment their enthusiasm toward learning behavior. A previous study had indicated that students with high PsyCap generally have a stronger ability to alleviate learning pressure and decrease learning burnout in academic circumstances (Cheung et al., 2011). Analogously, medical students with high levels of

stable self-esteem tend to exhibit greater psychological resilience and can actively regulate emotional states when they are facing frustration, academic stress, or other difficulties. They always maintain a higher level of passionate learning or force themselves to complete the learning objectives. Additionally, students with high self-esteem and resilience are prone to a greater persistence on tasks after a failure, although the persistence is non-productive or forced. Overall, self-esteem, as a psychological resource to increase one's environmental adaptability (Steffenhagen, 1990), tends to enhance an individual's ability to resist pressure and mental toughness. This helps one in effectively adjusting emotional states and pressure during the process of learning and living, which further results in a greater learning passion. Therefore, this study contributes to the existing literature by providing educators and policymakers with methods to boost students' learning passion by strengthening PsyCap interventions and maintaining stable and high self-esteem.

Association Between Psychological Capital and Learning Passion in Medical Students: Moderating Effect of Professional Identity

This study demonstrates how professional identity interactively shaped the relationship between PsyCap and harmonious learning passion rather than obsessive learning passion. It shows differences in how the internalization of a learning activity into a student's identity occurs. Further, it demonstrates how the degree of identity internalization is greater for those with obsessive passion compared to those with harmonious learning passion. As PsyCap and professional identity have complementary effects on the two types of learning passion, this finding contributes to initially empirical support for responding to recent contentions that professional identity may have interactive effects. That is, students with low-degree PsyCap will boast greater harmonious learning passion among those with high professional identity more than those with low professional identity. Professional identity is an individual's subjective feeling toward the specialty in daily life and represents the degree of consistency and balance between the individual and the profession (Olesen, 2001). In a medical education context, positively emotional identity tends to enable the individual to obtain better psychological identification and emotional pleasure and satisfaction. This inner emotional pleasure can directly cause positive motivations and lead to explicit behavioral outcomes, which prompts a sustainable professional identity (Sun et al., 2017). A theory of social identity pointed out that the most basic motivation of identity is the enhancement of individual self-esteem and that identity can promote a positive self-concept (Tajfel, 2003). Medical students with high professional identity have a strong sense of identity with the medical major and are more likely to be willing to love medical work and career; for these reasons, they may be directly inspired to devote more energy to learning. Thus, for medical students with low professional identity, the effect of their PsyCap on harmonious learning passion is greater. Medical students with obsessive learning passion also work on learning activities; however, they often feel compelled to engage in those driven by strategic contingencies (e.g., responding to parental expectations, pressures in finding jobs, environmental factors) that may control them.

Limitations

Although this study makes significant discoveries, the following limitations cannot be ignored. First, as the samples were extracted from only four medical universities in Northern China, our results may be biased because of institutional and geographical influence and may not completely represent all Chinese medical students. Second, we used several foreign measuring tools that ignored issues of cross-cultural adaptability, such as professional identity, which offers the scope for further academic attention in the future. Third, the data were collected from the self-report of students through an online survey, which may have led to potential response bias because of social desirability or unsure effect. Furthermore, as a network survey, it could only indicate the situation at one point in time. Fourth, because this is a cross-sectional study, it could not determine the causal relationship between variables. Finally, further research is still needed to test whether the results are appropriate in different cultural contexts or regions.

CONCLUSION

The results of the study showed that medical students with high self-esteem present greater PsyCap, and they strengthened two types of passion for learning. Moreover, this research demonstrated that medical students' professional identity and PsyCap determined a harmonious learning passion through a significant interaction effect, rather than obsessive passion. In other words, the positive effect of PsyCap on harmonious learning passion is more remarkable among medical students with lower professional identity. Therefore, this study provides an insight into facilitating a reform in medical education. Further, it acts as a practical guide for educators and policymakers in the medical education industry to inspire the learning enthusiasm of medical students and enhance the quality of medical staff training. These goals can be attained by using advanced intervention measures based on positive psychology, such as professional identity, PsyCap, and leaning passion.

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 research was reviewed and approved by the Ethics Committee of the Institutional Review Board of Harbin Medical University (ECHMU). Owing to the anonymous survey approach, written informed consent could not be obtained.

However, electronic informed consent for the research was approved by the ECHMU and obtained from each participate.

AUTHOR CONTRIBUTIONS

TS and D-PC conceived and designed the study. S-EZ and S-AG drafted the manuscript. JT, Q-LL, MZ, X-HW, J-YZ, and L-BY collected the data and controlled quality. M-SW and S-EZ conducted the data analyses. All authors contributed to publishing the final manuscript, read, and approved the final manuscript.

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Blended Online Intervention to Reduce Digital Transformation Stress by Enhancing Employees' Resources in COVID-19

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Generally, the solutions based on information and communication technologies (ICT) provide positive outcomes for both companies and employees. However, the process of digital transformation (DT) can be the cause of digital transformation stress (DTS), when the work demands caused by fast implementation of ICT are elevated and employees' resources are limited. Based on the Job Demand-Resources (JD-R) Model we claim that DT, rapidly accelerating in the COVID-19 pandemic, can increase the level of DTS and general stress at work. To reduce these negative effects of DTS, we propose the online intervention aimed to strengthen employees' resources, such as self-efficacy. In this article we evaluate the effectiveness of the blended intervention, based on cognitive behavioral therapy (CBT) and social cognitive therapy, composed of a prototyped online training (e-stressless) and series of interactive online workshops. In a longitudinal study, we examined the change in DTS, perceived stress at work, attitudes toward DT, self-efficacy and burnout in two time points, before and after the intervention. We compared five groups of participants (558 in total), three groups not qualified ($n = 417$), and two groups qualified to intervention ($n = 141$). Our results revealed that the designed blended intervention decreased DTS and one of the dimensions of burnout, namely disengagement. More specifically, the results showed that in the group of active participants of the blended intervention DTS significantly decreased [$M_{T1} = 3.23$, $M_{T2} = 3.00$, $t(432) = 1.96$, $p = 0.051$], and in the group of ineligible participants DTS significantly increased [$M_{T1} = 1.76$, $M_{T2} = 2.02$, $t(432) = 4.17$, $p < 0.001$]. This research paves way for the creation of blended online intervention which could help in addressing employee digital transformation stress before it starts having adverse effects on employee performance and well-being.

Keywords: digital transformation stress, digital transformation, online intervention, self-efficacy, burnout, COVID-19

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INTRODUCTION

Digital transformation (DT) is a continuous process which is changing the economy and the society in fundamental ways (Meske and Junglas, 2020). In organizations, the DT often takes the form of a rapid and ongoing implementation of new information and communication technologies (ICT) solutions. It requires an organizational change (Verina and Titko, 2019) and instilling a culture that

supports the change while enabling the company's overarching strategy (Mergel et al., 2019; Verina and Titko, 2019). Digital transformation also modifies employees' overall workplace experience: tasks processing, the workload, the sense of control, and social relations within the organization (Dubois et al., 2014; Cortellazzo et al., 2019).

The COVID-19 pandemic leading to national lockdowns forced a transition to new working conditions almost overnight (Dwivedi et al., 2020; Iivari et al., 2020). The digital transformation has accelerated (Iivari et al., 2020; Priyono et al., 2020). Many employees, for the first time, were strongly dependent on ICT solutions (Leonardi, 2020; Park and Inocencio, 2020) and their current workplace was replaced by a remote one, saturated with ICT solutions to the maximum (Shaw et al., 2020). Consequently, the COVID-19 pandemic necessitated the employees' adaptation to new working conditions and increased job demands. Therefore, DT in these conditions can be a substantial source of stress in the workplace (Day et al., 2012, 2017; Tarafdar et al., 2015; Legner et al., 2017) for some employees (Tims et al., 2012).

Based on the Job Demand-Resources (JD-R) Model (Demerouti and Bakker, 2011), we claim that digital transformation demands (Day et al., 2012) are rapidly growing in the COVID-19 pandemic and they increase the level of digital transformation stress (DTS) (Makowska-Tłomak et al., 2022) and general stress at work (Day et al., 2012; Berg-Beckhoff et al., 2017). In the long term, the elevated level of stress might result in the employees' burnout (Bedyńska and Żołnierczyk-Zreda, 2015; Berg-Beckhoff et al., 2017). Therefore, to reduce these negative effects of DTS, we propose a psychological intervention aimed to strengthen employees' resources in order to facilitate healthy coping strategies with digital transformation stress. Due to the limited possibilities of direct contact in the COVID-19 pandemic, we proposed self-help online training supported by online group workshops as a blended intervention to help employees in dealing with digital transformation stress.

The psychological Internet-based interventions have been shown to deliver effective treatment for a variety of mental health problems, such as depression or anxiety (Cieslak et al., 2016; Andersson et al., 2019). Internet-delivered cognitive behavior therapy (CBT) has been used for more than 20 years and hundreds of studies have presented its effectiveness (Andersson et al., 2019). In contrast, interventions conceptualized in the stress and cognitive appraisal model (Lazarus and Folkman, 1984), or job demands-resources (JD-R) model (Bakker and Demerouti, 2007) are still relatively uncommon (Smoktunowicz et al., 2021). Hence, we decided to design an online intervention to address the digital transformation stress in the occupational health and well-being context within the dominating theoretical framework based on the CBT (Bond and Hayes, 2002) and Social Cognitive Therapy (SCT) (Bandura, 1989).

In this study, we tested the effectiveness of the blended intervention approach, composed of online training and online workshops. We predicted that this intervention would reduce perceived stress in the workplace (Lesage et al., 2012; Chirkowska-Smolak, 2016), digital transformation stress (Makowska-Tłomak et al., 2021), and job burnout (Dubois et al., 2014; Berg-Beckhoff et al., 2017). Moreover, our aim was to verify the role of self-efficacy, one of the most important employees' resources (Aesaert et al., 2017; Lloyd et al., 2017) as a possible mediator of the reduction in stress and digital transformation stress. Following previous studies on the online interventions, we focused here not on a general self-efficacy, but on contextual self-efficacy related to coping with digital transformation stress (Smoktunowicz et al., 2021).

To summarize, the main aim of the study was to verify if the online blended intervention is an effective tool in decreasing stress and digital transformation stress, reducing negative attitudes toward digital transformation and burnout. Firstly, we designed a prototype of the online intervention in form of an online training on the Moodle platform, with different activities strengthening self-efficacy and reducing DTS. Secondly, to evaluate the effectiveness of this intervention, we measured general stress at work, DTS, attitudes toward DT, burnout (Smoktunowicz et al., 2019) and self-efficacy (Gam et al., 2016) in two time points: before and after a blended online intervention. Thirdly, we collected the evaluation about our online training in terms of usability (Kopeć et al., 2018; Makowska-Tłomak et al., 2021), effectiveness and attractiveness.

MATERIALS AND METHODS

Study Design

The presented study was prepared as a longitudinal study, with two time points, i.e., with baseline assessment (T1), and follow-up assessment (T2)—see flow diagram in **Figure 1**. The study consisted of two surveys measuring the outcome variables and a blended online intervention, which in turn was composed of online training and workshops (both interactive), as well as support in form of video material. The study was approved by the Ethical Review Board at SWPS University of Social Sciences and Humanities (opinion 8/2021 issued in February 2021).

Participants

The participants were recruited between March and April 2021, from professionally active adults or students who used ICT technologies at work or studies. The participants represented a large range of occupations: teachers, IT specialists, corporate employees, managers, engineers, from 21 different business sectors (according to the Polish Classification of Business Activities, i.e., PKD). From the convenient sample (n = 558) of adults (245 women, 313 men), the following inclusion criteria were applied: (1) Adults, at least 20 years old, (2) using ICT technology at work or studies (3) perceived digital stress level above average (i.e., 2.5 of DTS scale), 4) indicated willingness to participate in workshops and/or a course online (internet intervention). 55% of all respondents (309) declared to participate in the online psychological intervention, but 54% (168) among them qualified to the program because of the higher DTS score. 279 of all survey respondents (50%) represented a

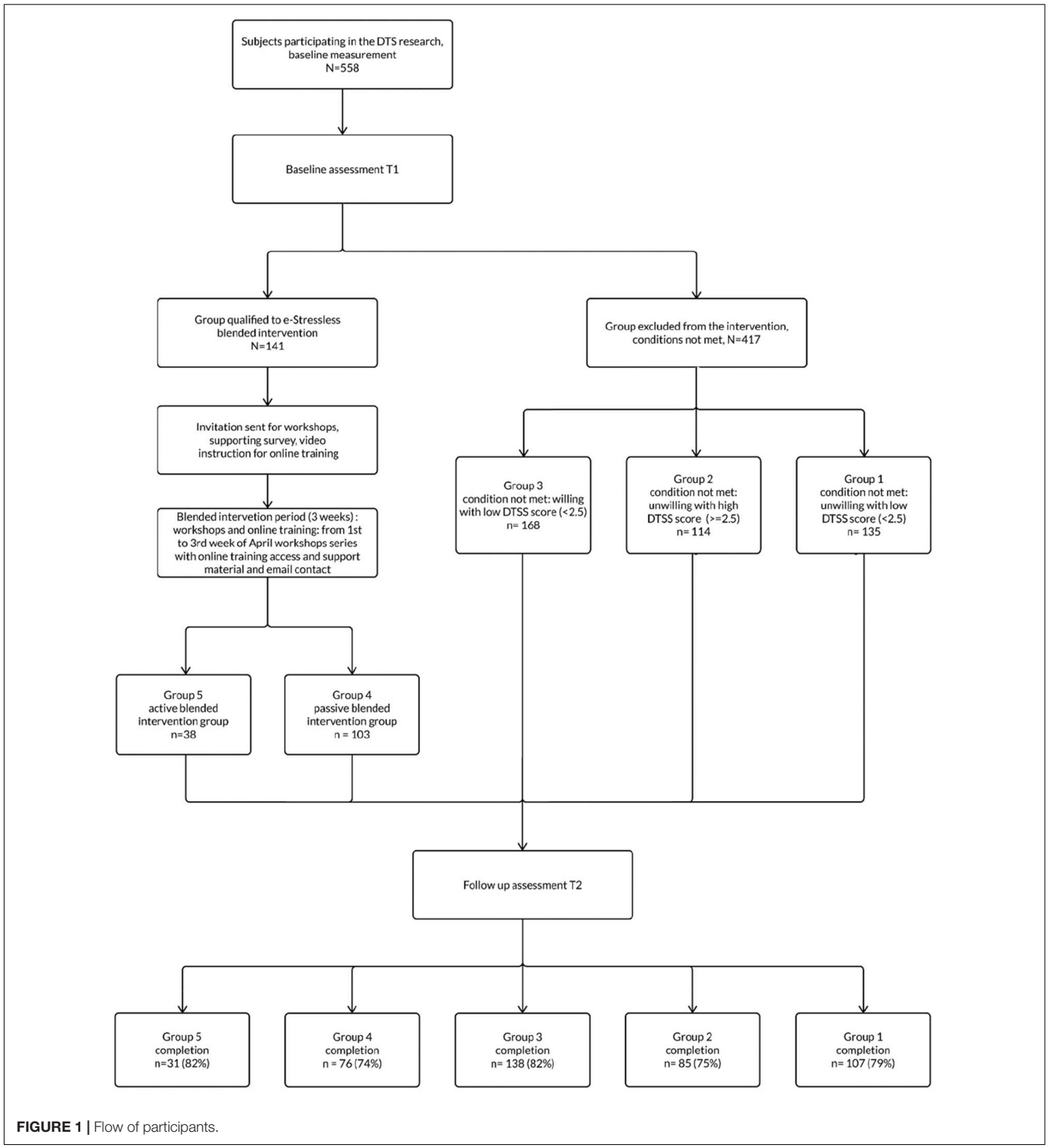

FIGURE 1 | Flow of participants.

higher score of DTS (greater or equal to 2.5) and 60% of them declared their readiness to the intervention program and entered their e-mail.

The invitation to the blended intervention was sent to 141 participants (81 women and 60 men), the average age of 39 (*SD* = 9.8). Although men comprised the majority of the whole study sample, i.e., 56%, this proportion was reversed in the group qualified to the intervention, where women constituted 57% of participants. The demographic characteristics of participants qualified (141) and not qualified to the intervention (417) are presented in **Table 1**.

TABLE 1 | Demographic characteristics of the participants qualified and not qualified to the blended intervention.

Variable	Total ineligible participants (*N* = 417)	Respondents qualified to blended intervention (*N* = 141)	Comparison of respondents qualified and not qualified to the blended intervention—tests statistics
Gender N (%)			$\chi^2(1, N = 558) = 14.05, p < 0.001$
Females	164 (39.3)	81 (57.4)	
Males	253 (60.7)	60 (42.6)	
Age in years M (SD)	43.43 (10.81)	39.52 (9.88)	$t(556) = 3.799, p < 0.001$
Seniority in years M (SD)	19.84 (10.91)	16.09 (9.01)	$t(556) = 3.680, p < 0.001$
Remote work N (%)	232 (55.6)	103 (73.0)	$\chi^2(1, N = 558) = 13.32, p < 0.001$
Education level N (%)			$\chi^2(4, N = 558) = 28.64, p < 0.001$
Primary	3 (0.7)	0 (0)	
Vocational	31 (7.4)	2 (1.4)	
Secondary	170 (40.8)	34 (24.1)	
Studying	6 (1.4)	7 (5.0)	
University degree	207 (49.6)	98 (69.5)	
Self-assessment ICT Skills M (SD)	3.37 (0.91)	3.67 (0.75)	$t(556) = 3.511, p < 0.001$
Digital transformation stress—time 1, M (SD)	2.16 (0.76)	3.08 (0.39)	$t(556) = 13.660, p < 0.001$

The blended intervention group consists of 38 participants (active group). Participants who did not decide to take part in workshops and further did not declare the preferred type of intervention have received a notification with educational video material containing information about the online training and access to it. The demographic characteristics of participants are presented in **Tables 2**, **3**.

Power Calculation

Although the blended intervention composed of online training and online workshops had a limited number of participants, we conducted an *a priori* sample size estimation using G*Power 3.1 3.1 (Faul et al., 2009), to ensure a statistical power of 0.95 to detect the post-test effect of comparisons between study conditions (Smoktunowicz et al., 2021). According to the approach in similar intervention research, we aimed to detect the minimum effect sizes of $d = 0.30$ for the comparisons between conditions at 2 measurement points (T1, T2), while controlling for baseline scores at an alpha error level of 0.05. A power analysis showed that a sample of 38 was needed as minimum. With regard to other online interventions studies (Rogala et al., 2016; Smoktunowicz et al., 2019), we expected a high dropout rate, therefore we decided to qualify a sample of 141 participants, according to baseline conditions. Because of expected high dropout rate as well as approach of prototyping the blended intervention, willingness of participants, and testing in real-life, we decided to use pragmatic trial (Patsopoulos, 2011; Ford and Norrie, 2016; Säfsten et al., 2019; Zvonareva, 2021).

Procedure

The study flow is presented in **Figure 1**. The conditions for blended interventions were as follows in the baseline assessment (T1): (1) Willingness, declaration to participate in the blended intervention; (2) Digital Transformation Stress Scale (DTSS) score >= 2.5 (equal or greater mean of DTSS), (3) participants are adult and active professionally, (4) participants have entered their email address. If participants met these conditions, an additional survey was sent where they could choose the type of intervention - blended (workshops with the online course) or only the online course. The participants who have chosen the blended intervention could then choose an available date for online workshops meetings. We sent the invitation to online workshops with proposed slots of online meetings. Before each online workshop, we sent email notifications about the meeting and information about the training online together with the link to our e-stressless online training.

The workshops series (5 online workshops in MS Teams) were conducted from the beginning of April 2021. During each workshop the participants identified the digital transformation stress factors on sticky-cards on Google Jamboard. Participants could add new DTS factors or add to those already mentioned. Afterward, we sent the invitation e-mail with a link to the course online with the key code to the training and the audio-video instruction for logging in (a short movie).

We replicated the approach from the first study (June/August 2020), where we surveyed adult and professionally active people and then selected, from the intervention volunteers, those with high stress indicators (Makowska-Tłomak et al., 2021).

TABLE 2 | Demographic characteristics of the participants eligible to the blended intervention.

Variable	Respondents who actively participated in the blended intervention (*N* = 38)	Respondents who received educational materials (*N* = 103)	Means comparison of respondents—blended intervention vs. educational materials—tests statistics
Gender N (%)			$\chi^2(1, N = 141) = 2.56, p = 0.109$
Females	26 (68.4)	55 (53.4)	
Males	12 (31.6)	48 (46.6)	
Age in years M (SD)	38.11 (9.80)	40.04 (9.89)	$t(139) = 1.032, p = 0.30$
Seniority in years M (SD)	14.53 (8.69)	16.67 (9.09)	$t(139) = 1.257, p = 0.21$
Remote work N (%)	30 (78.9)	73 (70.9)	$\chi^2(1, N = 141) = 0.92, p = 0.338$
Education level N (%)			$\chi^2(3, N = 141) = 2.91, p = 0.406$
Primary	0 (0)	0 (0)	
Vocational	0 (0)	2 (1.9)	
Secondary	6 (15.8)	28 (27.2)	
Studying	2 (5.3)	5 (4.9)	
University degree	30 (78.9)	68 (66.0)	
Self-Assessment ICT Skills M (SD)	3.52 (0.74)	3.72 (0.75)	$t(139) = 1.48, p = 0.14$
Digital transformation Stress—time 1, M (SD)	3.18 (0.43)	3.04 (0.36)	$t(139) = 1.835, p = 0.07$

TABLE 3 | Demographic characteristics of the participants ineligible to the blended intervention.

Variable	Wiling but Ineligible participants (*N* = 168)	Reluctant ineligible participants (*N* = 249)	Means comparison of ineligible participants wiling vs. reluctant - tests statistics
Gender N (%)			$\chi^2(1, N = 417) = 0.65, p = 0.422$
Females	70 (41.7)	94 (37.8)	
Males	98 (58.3)	155 (62.2)	
Age in years M (SD)	42.13 (10.89)	44.32 (10.68)	$t(415) = 2.04, p < 0.05$
Seniority in years M (SD)	18.48 (10.45)	20.77 (11.14)	$t(415) = 2.11, p < 0.05$
Remote work N (%)	112 (66.7)	120 (48.2)	$\chi^2(1, N = 417) = 13.87, p < 0.001$
Education level N (%)			$\chi^2(4, N = 417) = 9.18, p = 0.057$
Primary	0 (0)	3 (1.2)	
Vocational	15 (8.9)	16 (6.4)	
Secondary	56 (33.3)	114 (45.8)	
Studying	3 (1.8)	3 (1.2)	
University degree	94 (56.0)	113 (45.4)	
Self-assessment ICT skills M (SD)	3.69(0.83)	3.16 (0.89)	$t(415) = 2.04, p < 0.05$
Digital transformation stress—time 1, M (SD)	1.97 (0.70)	2.30 (0.77)	$t(415) = -6.17, p < 0.001$

After about a month from finishing the blended intervention period, the same group of respondents was tested using the same questions to enable the measurement and comparison of variables. Modification of the questionnaire concerned the removal of questions about the preferred scope of intervention, which were replaced by questions about the participation in

the intervention program and preferable module(s) from the training. The list of modules also included those that were not in the online training. We aimed to verify if respondents actually participated in this specific intervention.

We registered the online training users' activity using standard Moodle functionality (logins, exercises completion, frequency). Additionally, we identified the most active participants during workshops, individual meetings and emails and rated their engagement. We created a supporting variable with the rating of participants' activity from 0 to 5, where 0 meant *no activity* and 5-*very high activity* at workshops and online training.

All data was collected in online mode only, via a survey. The majority of measured data (T1, T2) was collected by a research agency and, according to prior consent. Simultaneously, data was collected on the Qualtrics platform, under the license of the university. The research application was approved by the Ethical Committee of the University. The present study was conducted in compliance with ethical standards adopted by the American Psychological Association (APA 2010). Accordingly, prior to participation, all participants were informed about the general aim of the research and the anonymity of their data. After marking informed consent to the study, the questionnaire was activated. Participation was voluntary, and participants did not receive compensation for their participation in the study.

Participatory Workshops

In the study conducted between June and August 2020 we surveyed 150 employees of different sectors to evaluate the level of the digital transformation stress and identify crucial resources protecting from the high level of DT stress (Makowska-Tłomak et al., 2021). Based on the DTS survey results, we distinguished variables that were associated with the DT stress level, i.e., the ICT workload, the ICT hassles. We also identified the self-efficacy, self-assessed ICT competences and ICT Support as significant resources protecting employees from the high level of digital transformation stress. During two series of participatory workshops, we worked with previously selected exercises, which were aimed at strengthening self-efficacy and coping with stressful situations in the workplace during the digital transformation process. The workshops resulted in a list of exercises and materials that were assessed by the participants as most useful for online interventions addressing stress in the workplace (Makowska-Tłomak et al., 2021).

Qualitative assessment of the first series of workshops as well as educational materials and exercise evaluation indicated that co-design workshops can work as psychological interventions themselves. The majority of participants of the first series of workshops admitted that their stress coping knowledge increased and that intervention exercises were useful and helpful to manage DTS and to increase their self-efficacy. During workshops, participants were working with selected exercises, and in the post-workshops survey they indicated the most useful and helpful exercises as well as language and intervention design preferences.

Consequently, we decided to organize the blended intervention as a prototype of an unguided online intervention with educational materials and practical, interactive exercises with social, informative support in the form of interactive workshops. This approach allowed us to collect the feedback of the online intervention prototype focused on dealing with the stress of digital transformation.

Blended Intervention

Because of the prototype of further unguided online intervention, in the study we opted for the blended online intervention concept, i.e., a mix of social support in form of workshops, consultation meetings and online training (e-stressless), mainly addressing digital transformation stress and perceived stress at the workplace.

E-stressless is a prototype of self-guided online intervention in the form of online training on the Moodle platform (Moodle, 2021). Moodle is a software package designed to help educators create effective online trainings, with a possibility to log users' activities, self-authorization registration, and privacy policy. The platform is tailored to create exercises in a flexible and effective way. Therefore, we decided to adopt the Moodle platform's large range of functionalities to the intervention needs.

The e-stressless online training contains 4 modules with psychoeducational materials and interactive exercises. We adapted the online training intervention to available Moodle functionalities like lessons, quizzes, surveys, essays, with Moodle's feedback features. These were made available to participants in different variants depending on participants' needs and preferences. Every module started with a one-page guide for navigation in the module. Each consisted of psychoeducational animated clips and interactive tasks proposing both web-based and offline activities (Smoktunowicz et al., 2021), tips and short TED movies that were made available to participants sequentially (one module a week). We identified two main modules. The first module (1) concentrated on general stress and stress in the workplace. The second module (2) was intended to strengthen the sense of self-efficacy and the ability to cope with difficult situations (see **Figure 2**). The next two modules were supporting the previous ones—the third module covered relaxation as an efficient method of addressing stress (**Figure 3**) and the fourth module contained tips and additional materials supporting participants with stress coping. A detailed description of the modules' content is presented in **Table 4**. None of the modules were treated as obligatory. All the modules were available for participants for 3 weeks, with full support of the team available. To complete all the tasks within each exercise, participants needed up to 1.5 h. All exercises were available to be retaken depending on individual needs and preferences.

The exercises were selected through Cognitive Behavior Therapy (CBT) handbooks such as *Brief cognitive behavior therapy* (Curwen et al., 2018) and *Mind over mood: Change how you feel by changing the way you think* (Greenberger and Padesky, 2015). The selection of exercises was a process started in July 2020 by psychologists before the first series of participatory workshops. Based on workshops participants' feedback, we selected exercises based on CBT (Beck, 1993) and Cognitive Social Therapy (CST) (Bandura, 1989), empowering self-efficacy and coping with stressful and/or difficult situations. We chose specific exercises for the blended intervention based on the opinions of the participants (from the 2020 workshops and surveys), which have

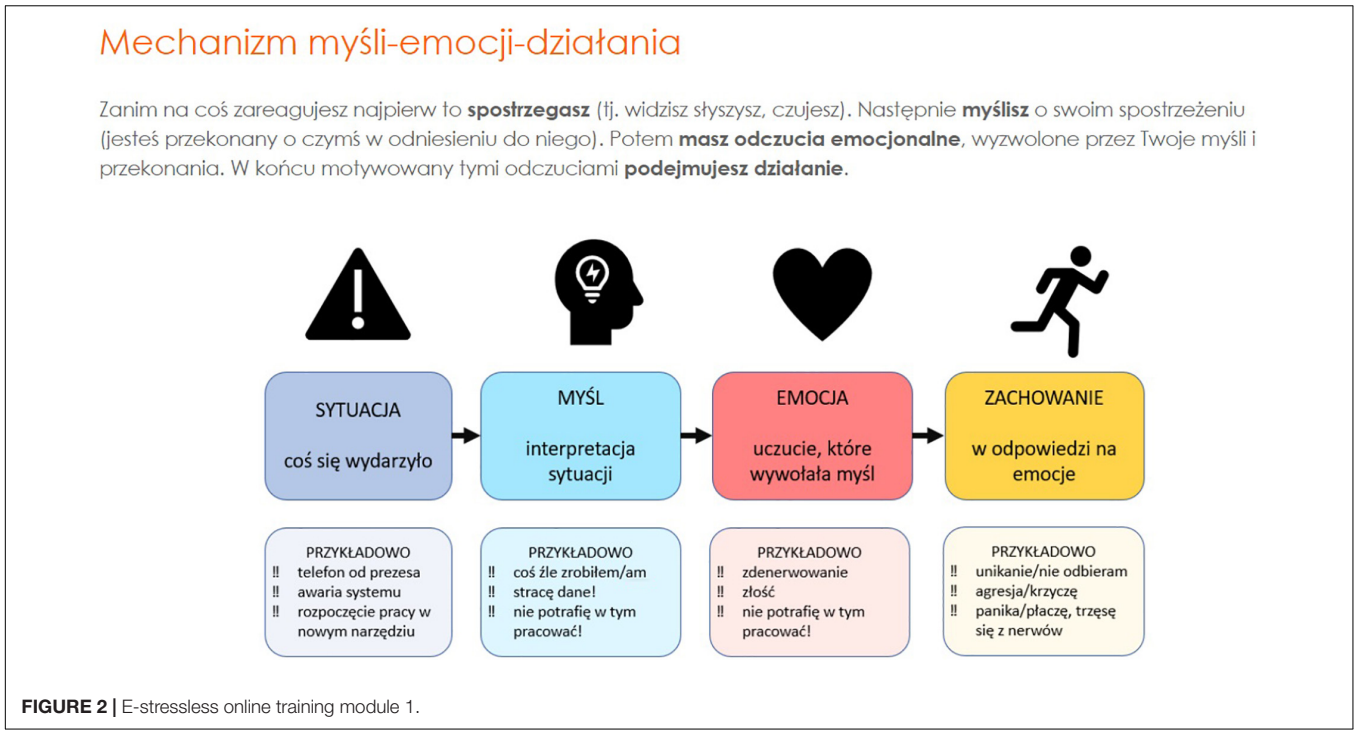

FIGURE 2 | E-stressless online training module 1.

FIGURE 3 | E-stressless online training module 4. Vector image reproduced with permission from vectorstock.com.

defined the most interesting areas for them regarding coping with stress, especially digital transformation stress.

Before starting with online training, we have organized a series of online workshops which served as a training introduction. Participants were identifying the main digital transformation stress sources and sharing opinions with others using Google Jamboard sticky notes (see **Figure 4**). Afterward, together with participants we were looking for ways to deal with (digital transformation) stress using a different board. The main aim of these workshops was the introduction to the self-online training, using the digital solution for digital transformation stress. We helped to login to the e-stressless training. We discussed the scope and functionality, strengths and weaknesses of the solution.

TABLE 4 | DTS online training—overview of the online intervention on Moodle Platform.

Module	Educational material	Exercises and practical materials
1. Stress in human life	**"**What is stress?"—educational materials as a Moodle lesson, regarding the definitions, causes and consequences of stress, stress at workplace. Materials supported by short TED movies "How stress affects our body and mind."	- Survey: How much does the stress of digital transformation impact me? - Exercise: "drag and drop"- identification of stressors of digital transformation. - Survey—Does procrastination bother you at work? - Exercise: "Do it Now! How to overcome procrastination." Exercise with tips and step by step instructions.
2. Overcome difficulties and strengthen yourself	"Different situations: our thoughts, emotions and beliefs"—educational material regarding the thought-emotion-action mechanisms, based on the cognitive–behavioral therapy (CBT). "Self-efficacy belief"—educational material regarding the social cognitive theory (SCT).	- Exercise: "Identifying stressful situations," quiz form, with instructions to a step-by-step analysis of a chosen situation, with tips. - Exercise: "Get ready for a difficult situation," quiz form, with instructions to a step-by-step analysis of a chosen situation. - Exercise: "Plan how to deal with difficulties." - Exercise: "Should I send this?" A list of tips and instructions as a to-do checklist before making a decision. - Exercise: "Goal I want to achieve"—an exercise type to-do task with instructions in form of a checklist.
3. Relaxation and activity	"Exercise's introduction"—educational material regarding relaxation and activities (like sport, leisure) addressing stress.	- Relaxation exercise 1: "Jacobson training," progressive muscle relaxation - an audio-visual material with exercise narration. - Relaxation exercise 2: Relaxation according to Benson. - Relaxation diary - an exercise with instruction, describing feelings and emotions during relaxation. - Diary: "Planning leisure activities," an exercise with instructions, supporting identification and planning of leisure time as a way of coping with stress.
4. Tips and additional materials	"The power of words"—educational material on how the words impact people. Healthy words can improve our mental and physical health. Unhealthy words can be toxic and cause negative thoughts and emotions.	- Exercise: "time management" - an audio-visual material. - Survey: "What factors may cause stress of digital transformation for you"?

FIGURE 4 | What is digital transformation stress for you—Google Jamboard screenshot.

Participants have been assured that in case of any difficulties, concerns or needs they could always contact us directly, and participate in the next workshops to share their online training opinions.

Measures

Perceived Stress Scale

Perceived Stress Scale (PSS-4), and in the workplace (Cohen et al., 1983; Lesage et al., 2012; Smoktunowicz and Cieślak, 2017). Consisted of four items such as e.g., "How often have you felt difficulties were piling up so high that you could not overcome them?" All items were rated on a 5-point Likert-like scale where 1 meant *Never* and 5 meant *Almost always*.

Digital Transformation Attitudes Scale

Digital Transformation Attitudes Scale (DTAS) is a self-descriptive tool for measuring digital transformation stress (Makowska-Tłomak et al., 2021), composed of 12 items. DTAS consists of four subscales concerning three different symptoms of digital transformation stress: (1) Affective (emotional) accompanied by digital transformation in the workplace (3 items, Cronbach's Alpha = 0.67, e.g., "I am worried that my responsibilities may change and I may not be able to meet them"). (2) Proactive behavior—reactions to the occurring changes in the organization as a result of new ICT solutions implementation (3 items, Cronbach's Alpha = 0.80, e.g., "I am excited because the changes related to the implementation of new IT solutions will allow me to improve my skills and professional development"). (3) Positive cognitive attitudes, i.e., thoughts and beliefs of ongoing or planned digital, technological or IT changes in the work environment (3 items, Cronbach's Alpha = 0.88, e.g., "New technologies and ICT solutions are necessary for the efficient functioning of an organization") 4) Negative cognitive attitudes (3 items, Cronbach's Alpha = 0.79, an example of the item: "IT implementations of e.g., new systems and programs most often cause chaos in the organization and the growing frustration of its employees"). All items were rated on a 5-point Likert-like scale where 1 = *Not applicable* and 5 = *Applicable* in the first block of statements and 1 = *Disagree* and 5 = *Agree* in the second block of statements.

Digital Transformation Stress Scale

Digital Transformation Stress Scale (DTSS) measures the perceived stress of employees during the digital transformation process, in the last month with 6 items (Makowska-Tłomak et al., 2021). An example of item is "How often have you felt irritated in connection to new ICT solutions implementation which have affected your professional duties/tasks?." All items were rated on a 5-point Likert-like scale where 1 meant Never and 5 meant *Almost always*. Reliability was high with Cronbach's Alpha = 0.90.

Short Occupational Self-Efficacy Scale

Short Occupational Self-Efficacy Scale (Rigotti et al., 2008) was adapted to Polish conditions; it consists of 6 statements measuring self-efficacy related to work with a 5-level response scale ranging from 1 = *Disagree* to 5 = *Agree*. An exemplary item is "I feel prepared for most of the demands in my job." The reliability of the scale was high with Cronbach's Alpha = 0.89.

Oldenburg Burnout Inventory

Oldenburg Burnout Inventory (OLBI) (Demerouti and Bakker, 2008). The Polish version of OLBI (Baka and Basinska, 2016) measures two dimensions of burnout: exhaustion and disengagement. We used 6 items, 3 from each dimension. Examples of the items are "After work, I tend to need more time than in the past in order to relax and feel better," and "During my work, I often feel emotionally drained" (both reversed). Participants indicated their answers on a 4-point Likert-like scale where 1 meant *strongly disagree*, and 4 meant *strongly agree*. Reliability of the OLBI was high with Cronbach's Alpha = 0.79.

Self-Assessment Information and Communication Technologies Skills Scale

To assess specific ICT skills, we developed the ICT skills self-assessment scale, based on The Digital Competence Framework for Citizens (Carretero et al., 2017). At the beginning, participants were asked to estimate their general ICT skills in the context of work ("Please evaluate your computer skills in the workplace"), by using 5-point scale where 1 meant *Basic level—limited to elementary functionality* and 5 meant *Very advanced level—programming, graphic processing, computer operation of machines*. There was also a possibility to mark the answer "*I'm not using a computer at work.*" Afterward, respondents were asked to describe their skills in the listed areas, such as using keyboard shortcuts, or working in different programs commonly used in the workplace. They were also questioned about their activity on the Internet. Examples of items are: "I can prepare a presentation in a dedicated program," "I can choose the layout, background, template, charts, tables." "I can pay my bills using online bank transfer." The responses evaluated their skills on a 5-point scale, where 1 means very low skill level and 5 means very high skill level. The reliability of the Self-assessment ICT scale was high (Cronbach's alpha = 0.88).

Digital Transformation Processing at the Workplace

We asked a question: "Are there any implementation projects (IT) currently being carried out in the organization where you work or study, which affect your work or your activities?". Respondents indicated their answer by using the following options: *Yes, there are* and *No, there are not, I do not know* and *Not applicable.*

Digital Transformation Stress Intervention Expectations

At the end of the survey in the first measurement time (T1: before the intervention) there were 3 questions regarding the scope of intervention and declaration of participation. We asked participants the following question: "Would you like to take part in the online stress counteract program, in particular the digital transformation?". Participant, who confirmed were asked about their expectation by indicating the areas of interest in the proposal of program for counteracting stress of digital transformation. Respondents who declared to participate in the

intervention online, were asked to enter their e-mail address for further contact.

Digital Transformation Stress Intervention Usability

At the end of the second measurement time (T2, for all study participants) there was a 2-question block about participation in the blended intervention: "Have you participated in workshops or an online training addressing stress?," and when the participant has indicated Yes, the next two questions were as follows: (1) "Was the online workshop or training useful for you in coping with stress?," with a 5-point Likert reverse scale where 1 meant *Definitely helpful* and 5 meant *Definitely unhelpful*; (2) "Which module of online training did you like the most?" with a multiple-choice list with the actual names of online training modules as well as false names of modules.

Socio-Demographic Information

Participants were asked to indicate the appropriate year of birth, seniority in years, gender, education level, occupation, and position in their current job.

Activity Measure

Activity tracking by Moodle logs reports and an online training list from Moodle online training, intervention survey, Teams list of participation were gathered to evidence blended intervention participants' activity. Based on these indicators, participants' activity in the program was evaluated using a 6-point scale where 0 meant *Not applicable* (for DTS study participants who were not selected to the blended intervention program), 1 meant *Lack of activity,* 2—*low activity, 3—moderate activity* (participation in the workshop or/and online training), 4—*high activity* (active participation in the workshop or/and online training) and 5—*very high activity* (many logs in the online training and active participation in the workshops).

RESULTS

The main goal of the present study was to verify the effect of the psychological intervention aimed at reducing digital transformation stress. Thus, we conducted a series of statistical analyses in which we tested change in several outcome variables: digital transformation stress, digital transformation attitudes, and more general work outcomes such as stress in the workplace, burnout, employees' resources (i.e., self-efficacy at the workplace). All these variables were measured at two specific time points: before and after the intervention. We applied a two-way analysis of variance in mixed design with between-person factor differentiated 5 groups of participants: (1) not assigned to an intervention, unwilling, with a low DTSS score, (2) not assigned, unwilling, with a high digital transformation stress score, (3) (wait list) not assigned, willing, with a low digital transformation stress score and (4) assigned, willing (with a high digital transformation stress score), not active and (5) assigned, willing (with a high digital transformation stress score), active.

We also conducted a dropout analysis using a chi-square statistic, Mann-Whitney's *U*-test, and Student's *t*-test for independent samples. To compare those respondents who participated in the intervention with those who resigned, we tested differences in sociodemographic variables (gender, age, seniority, education level, intervention group) and dependent variables (self-efficacy, digital transformation stress and attitudes, self-assessment ICT skills) measured before the intervention (Time 1). We start the presentation of the results from dropout analysis, and then we present descriptive statistics for all dependent variables and a series of mixed design analysis of variance examining the change in the dependent variables in two measurement points across intervention groups.

Dropout Analysis

Comparison of groups of respondents revealed significant differences only in age, seniority, education, self-efficacy at work, and one dimension of digital transformation attitude—positive cognition. Those who resigned from participation in the study were younger (dropout M = 38.45, SD = 9.68, no-dropout M = 43.55, SD = 10.73), with lower seniority (dropout M = 16.71, SD = 10.80, no-dropout M = 19.50, SD = 10.45), lower education level (dropout Mrank = 250.28, no dropout Mrank = 287.59), lower self-efficacy at work (dropout M = 3.67, SD = 0.72, no-dropout M = 3.81, SD = 0.66), and higher positive cognition (dropout M = 2.23, SD = 0.86, no-dropout M = 2.05 SD = 0.81). Detailed statistics are presented in **Table 5**.

The general dropout rate between T1 and T2 equals to 21% (121 respondents). In the 5th group—the active group in the intervention, the dropout rate was 18%—7 participants did not complete the T2 survey, but actively participated in workshops or online training. The highest dropout rate was observed in the 2nd and 4th group—groups with high level of digital transformation stress score before the intervention. The 2nd group was not interested in participating in the blended intervention and the 4th group did not participate actively in interventions and received only video material related to interventions. In the 4th group the dropout rate was equal to 26% (27 participants) and in the 2nd group the dropout was 25% (29 participants).

TABLE 5 | Statistics of tests in dropout analysis.

Variable	Test statistics comparing dropout and no-dropout
Age	$t(556) = 4.73$, $p = 0.001$, Cohen's $d = 0.50$
Seniority	$t(556) = 2.58$, $p = 0.010$, Cohen's $d = 0.26$
Gender	$\chi^2(1, N = 558) = 0.64$, $p = 0.423$
Education	$U = 22902.5$, $p = 0.011$
Intervention group	$\chi^2(4, N = 558) = 3.95$, $p = 0.413$
Self-efficacy at work	$t(556) = 2.02$, $p = 0.044$, Cohen's $d = 0.20$
DTS	$t(556) = 0.74$, $p = 0.458$
ICT Skills	$t(556) = 0.51$, $p = 0.609$
Stress at work (PSS)	$t(556) = 0.02$; $p = 0.983$
DTAS Affect	$t(556) = 0.60$, $p = 0.547$
DTAS Negative Cognition	$t(556) = 0.41$, $p = 0.679$
DTAS Positive Cognition	$t(556) = 2.20$, $p = 0.028$, Cohen's $d = 0.22$
DTAS Proactive Behavior	$t(554) = 2.58$, $p = 0.126$

DTS, Digital Transformation Stress; DTAS, Digital Transformation Attitude Scale; ICT Skills, Self-assessment ICT skills scale.

Generally, we can conclude that the dropout level was relatively low compared to others reported in interventions (Rogala et al., 2016; Smoktunowicz et al., 2021).

Descriptive Statistics

Descriptive statistics: means, standard deviations, and Pearson's r coefficients for variables in baseline and post-intervention measurement are presented in **Table 6**. Inspection of the means leads to a conclusion that the level of stress at work, digital transformation stress and burnout is moderate, with values around the middle point of the scale. The level of self-efficacy is rather high. As predicted, self-efficacy is related negatively to stress, digital transformation stress, negative affect, negative cognition toward digital transformation, and both dimensions of burnout. Age and gender were almost non-related to the rest of the variables.

Hypothesis Testing

To test the influence of the blended intervention on the level of digital transformation stress and more general work outcomes, we conducted a series of analyses of variance in mixed design with the intervention condition as a between-group factor and pre- and post-intervention measures of the digital transformation stress and work outcomes. Detailed statistics of all effects of analysis of variance are presented in **Table 7**. Based on theoretical assumptions, we predicted significant interactions of the intervention and time of measurement (pre-post). Therefore, when interaction effect was significant, we present only decomposition of the interaction effect into simple main effects, without further exploration of main effects. Guided by our hypotheses, we also limited description of simple main effects of interaction effect to differences between pre- and post- intervention. The differences between intervention groups in a specific time point and the results of *post hoc* tests for significant main effects of intervention groups are presented in **Supplementary Material**.

The results showed that there were significant interactions of condition and measurement points in DTS, at the tendency level in DTAS—negative affect, and in disengagement—one of the dimensions of burnout. Decomposition of the interaction for DTS showed that there were significant changes in the level of DTS in the following groups: not assigned and not willing to participate in the intervention (1st group), and not assigned but willing with low stress (3rd group). In these groups, the digital stress level was higher in T2 than in T1 [group1: $M_{T1} = 1.76$, $SE = 0.05$, $M_{T2} = 2.02$, $SE = 0.07$, $t(432) = 4.17$, $p < 0.001$; group 3: $M_{T1} = 1.95$, $SE = 0.04$, $M_{T2} = 2.21$, $SE = 0.06$, $t(432) = 4.67$, $p < 0.001$]. Participants who were not assigned to the intervention because they were unwilling to do so (with high stress, 2nd group) had a lower stress level in T2 than in T1 [$M_{T1} = 2.70$, $SE = 0.08$, $M_{T2} = 2.95$, $SE = 0.06$, $t(432) = 3.44$, $p < 0.001$]. As predicted, participants who were actively involved in the intervention (5th group) had a lower level of digital transformation stress in T2 than in T1 [$M_{T1} = 3.23$, $SE = 0.09$, $M_{T2} = 3.00$, $SE = 0.13$, $t(432) = 1.96$, $p = 0.051$].

In the DTAS—negative affect, there were significant differences only among participants who were actively involved in the intervention (5th group). They had a lower level of negative emotions related to digital transformation in T2 than in T1 [$M_{T1} = 3.20$, $SE = 0.14$, $M_{T2} = 2.80$, $SE = 0.14$, $t(432) = 2.71$, $p = 0.007$]. There were no significant differences in the other groups.

Interestingly, the only change observed in general work outcomes was in one of the dimensions of burnout, namely disengagement. Active participation in the intervention (5th group) lowered the level of disengagement [group 5: $M_{T1} = 3.20$, $SE = 0.14$, $M_{T2} = 2.39$, $SE = 0.11$, $t(430) = 2.59$, $p = 0.010$]. Among the participants who wanted to take part in the intervention but were not assigned with low stress (3rd group) the pattern was reversed and their level of disengagement was higher in T2 than in T1 [group3: $M_{T1} = 2.10$, $SE = 0.05$, $M_{T2} = 2.00$, $SE = 0.05$, $t(430) = 2.61$, $p = 0.009$]. There were no significant differences in the other groups.

In the first assessment (T1) we also tested users' expectations toward online training and, in the second assessment (T2), the usability of the intervention (online training). Measures of expectations showed that the most preferred components were exercises enhancing the self-efficacy (70.5%) and relaxation techniques (66.3%). Therefore, in the e-stressless online training we focused on modules related to self-efficacy and relaxation. After the intervention, in T2, participants with high activity in the course rated its usability. The usability of the intervention in coping with stress was assessed as high ($M = 3.84$, $SD = 1.01$).

DISCUSSION

In the presented longitudinal study, the main aim was to test the efficiency of blended psychological intervention in employees' stress reduction, more specifically the stress related to digital transformation. Because of reported high dropout rate of self-guided internet interventions (Hoerger, 2010; Rogala et al., 2016; Smoktunowicz et al., 2021) we decided to use the blended intervention, and combine self-guided online training addressing digital transformation stress with online interactive workshops with participants. The interactive workshops might have had additional social support function, which could increase self-efficacy (Hogan et al., 2002). We assumed that because the increase of self-efficacy raises a person's ability to solve difficult tasks and endeavors and succeed in them for a long time (Gam et al., 2016), it consequently results in improvement in the ability to cope with stress (Cieslak et al., 2016; Gam et al., 2016).

To verify the effects of the intervention on digital transformation stress and more general work outcomes, namely general stress, self-efficacy at work, and burnout, we assessed these measures before (T1) and after (T2) the intervention. We compared five groups of participants depending on their participation in the workshop, willingness to participate, baseline level of stress and activity during the intervention (Zwarenstein et al., 2008; Patsopoulos, 2011; Loudon et al., 2015). The results indicated that in the group of participants who were active in the intervention the levels of digital transformation stress, negative emotions toward digital transformation and disengagement were lower after the intervention in comparison to the baseline level. These results, in our opinion, offered a preliminary confirmation of the positive effect of the blended intervention in reducing

TABLE 6 | Descriptive statistics: means, standard deviations, and Pearson's r coefficients for variables in baseline (T1) and post-intervention (T2) measurement.

Variable	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. Gender																					
2. Age	42.44	1.708																			
3. DTS -T1	2.39	0.79	−0.15**	−0.04																	
4. DTS -T2	2.45	0.80	−0.07	−0.12*	0.62**																
5. PSS—T1	2.65	0.63	−0.19**	−0.09*	0.45**	0.37**															
6. PSS—T2	2.65	0.66	−0.01	−0.14**	0.35**	0.47**	0.39**														
7. DTAS_B—T1	2.97	0.98	−0.05	−0.00	−0.03	−0.02	0.06	0.07													
8. DTAS_B—T2	2.96	0.97	−0.03	0.07	−0.04	−0.11*	−0.03	0.08	0.54**												
9. DTAS-PC—T1	2.09	0.82	0.00	−0.01	0.21**	0.19**	0.12**	0.20**	0.31**	0.22**											
1. DTAS-PC—T2	2.18	0.85	0.01	−0.01	0.20**	0.20**	0.11*	0.18**	0.22**	0.32**	0.62**										
11. DTAS-AF—T1	2.55	0.83	−0.09*	−0.11*	0.50**	0.42**	0.44**	0.33**	−0.17**	−0.16**	0.11*	0.15**									
12. DTAS-AF—T2	2.55	0.82	−0.10*	−0.11*	0.43**	0.56**	0.28**	0.47**	−0.07	−0.13**	0.17**	0.11*	0.50**								
13. DTAS-NC—T1	3.01	0.85	0.00	0.01	0.40**	0.31**	0.21**	0.17**	0.16**	0.13**	0.13**	0.20**	0.24**	0.26**							
14. DTAS-NC—T2	3.06	0.84	0.01	−0.01	0.35**	0.38**	0.17**	0.26**	0.12*	0.09	0.17**	0.17**	0.20**	0.29**	0.50**						
15. SEW—T1	3.78	0.67	0.04	0.14**	−0.40**	−0.33**	−0.32**	−0.33**	−0.25**	−0.20**	−0.40**	−0.38**	−0.31**	−0.28**	−0.20**	−0.23**					
16. SEW—T2	3.69	0.73	−0.01	0.11*	−0.34**	−0.36**	−0.27**	−0.37**	−0.18**	−0.20**	−0.32**	−0.36**	−0.25**	−0.30**	−0.18**	−0.14**	0.53**				
17. OLBI-E—T1	2.31	0.62	−0.10*	−0.07	0.42**	0.38**	0.39**	0.35**	0.15**	0.12*	0.16**	0.13**	0.32**	0.26**	0.32**	0.29**	−0.31**	−0.25**			
18. OLBI-E—T2	2.39	0.56	−0.08	−0.04	0.36**	0.42**	0.32**	0.39**	0.05	0.08	0.16**	0.17**	0.27**	0.30**	0.30**	0.27**	−0.29**	−0.34**	0.65**		
19. OLBI-D—T1	2.19	0.59	−0.02	−0.20**	0.30**	0.29**	0.31**	0.31**	0.30**	0.24**	0.20**	0.28**	0.27**	0.20**	0.23**	0.23**	−0.46**	−0.36**	0.59**	0.43**	
2. OLBI-D—T2	2.21	0.58	−0.01	−0.15**	0.29**	0.34**	0.23**	0.38**	0.20**	0.21**	0.22**	0.28**	0.25**	0.28**	0.20**	0.19**	−0.33**	−0.45**	0.47**	0.53**	0.66**

$^{**}p < 0.01$; $^{*}p < 0.05$.

PSS, Perceived Stress Scale; DTSS, Digital Transformation Stress Scale; DTAS, Digital Transformation Attitude Scale; DTAS_AF, DTAS Affect; DTAS_PB, Proactive Behavior; DTAS_CN; DTAS Negative Cognition; DTAS_PC, DTAS Positive Cognition; SEW, Self-efficacy; OLBI-E, Burnout—exhaustion, OLBI-D, Burnout –disengagement.

TABLE 7 | Statistics of the mixed design analysis of variance testing the differences between intervention condition and change in time (pre- and post-intervention).

Variable	Main effect of condition	Main effect of T1-T2	Interaction
DTS	$F(4, 432) = 91.85$, $p < 0.001$, $eta^2 = 0.46$	$F(1, 432) = 0.032$, $p = 0.859$, $eta^2 = 0.001$	$F(4, 432) = 12.78$, $p < 0.001$, $eta^2 = 0.11$
DTAS_PC	$F(4, 432) = 8.04$, $p < 0.001$, $eta^2 = 0.07$	$F(1, 432) = 10.29$, $p < 0.001$, $eta^2 = 0.02$	$F(4, 432) = 0.72$, $p = 0.578$, $eta^2 = 0.007$
DTAS_NC	$F(4, 432) = 13.55$, $p < 0.001$, $eta^2 = 0.11$	$F(1, 432) = 0.39$, $p = 0.535$, $eta^2 = 0.001$	$F(4, 432) = 0.91$, $p = 0.460$, $eta^2 = 0.008$
DTAS_PB	$F(4, 432) = 13.01$, $p < 0.001$, $eta^2 = 0.11$	$F(1, 432) = 0.02$, $p = 0.896$, $eta^2 = 0.001$	$F(4, 432) = 0.51$, $p = 0.726$, $eta^2 = 0.005$
DTAS_NAFF	$F(4, 432) = 19.25$, $p < 0.001$, $eta^2 = 0.15$	$F(1, 432) = 1.16$, $p = 0.281$, $eta^2 = 0.003$	$F(4, 432) = 2.16$, $p = 0.073$, $eta^2 = 0.020$
Stress at work (PSS)	$F(4, 432) = 14.59$, $p < 0.001$, $eta^2 = 0.12$	$F(1, 432) = 0.88$, $p = 0.349$, $eta^2 = 0.002$	$F(4, 432) = 1.12$, $p = 0.344$, $eta^2 = 0.010$
Self-efficacy (SEW)	$F(4, 432) = 13.77$, $p < 0.001$, $eta^2 = 0.11$	$F(1, 432) = 6.14$, $p = 0.014$, $eta^2 = 0.014$	$F(4, 432) = 0.98$, $p = 0.420$, $eta^2 = 0.009$
Burnout—exhaustion (OLBI)	$F(4, 430) = 10.88$, $p < 0.001$, $eta^2 = 0.09$	$F(4, 430) = 3.17$, $p = 0.076$, $eta^2 = 0.007$	$F(4, 430) = 1.79$, $p = 0.129$, $eta^2 = 0.016$
Burnout-disengagement (OLBI)	$F(4, 430) = 7.39$, $p < 0.001$, $eta^2 = 0.06$	$F(1, 430) = 0.33$, $p = 0.568$, $eta^2 = 0.001$	$F(4, 430) = 03.75$, $p = 0.005$, $eta^2 = 0.034$

Pillai's trace was reported in all within-group effects. DTS, Digital Transformation Stress; DTAS_PC, Digital Transformation Attitude—Positive Cognition; DTAS_NC, Digital Transformation Attitude –Negative Cognition; DTAS_PB, Digital Transformation Attitude—Proactive Behavior; DTAS_NAFF, Digital Transformation Attitude—Negative Affect.

digital transformation stress. By lowering the level of burnout dimension—exhaustion—these results are also in line with our assumptions that this kind of psychological intervention may influence not only specific stress related to digital transformation but also more general work outcomes. The latter results are of great practical importance because disengagement is associated with the intention to resign from work and may have a tremendous effect on the available workforce (Bakker et al., 2005; Atanasoff and Venable, 2017; Willard-Grace et al., n.d.).

Although we assumed that the intervention should strengthen employees' resources, namely self-efficacy, we did not observe significant increase in this variable. We believe that such changes may appear in some time distance and therefore the third measurement point would be necessary to evaluate such a prolonged change. Furthermore, it can be hypothesized that this type of intervention influences digital transformation stress rather by providing social support (Hogan et al., 2002; Cieślak et al., 2018) or by helping to deal with negative emotions (Hülsheger et al., 2013; Ninaus et al., 2015), than by changing self-efficacy. These alternative mechanisms should be verified in further studies.

Our results also offer very important contribution for practice. Our intervention seems to be "fighting fire with fire," because it significantly reduced the digital transformation stress by using online intervention [i.e., digital (ICT) solution]. Moreover, we successfully tested the concept of internet intervention using an open-source e-learning platform such as Moodle, which enabled users to self-develop an effective open access intervention without sophisticated IT knowledge. This platform offered also quite good user experience (UX) qualities and were positively evaluated by the participants representing a wide range of business sectors; therefore the sample of employees was very heterogeneous. In comparison to other online interventions (Cieslak et al., 2016; Rogala et al., 2016; Smoktunowicz et al., 2019), our blended intervention had similar results in effectiveness within the active group of participants, with a lower dropout rate (18%) vs. (c.a. 80%) in other online interventions (Rogala et al., 2016; Smoktunowicz et al., 2019, 2021). Thus, the effect of blended intervention seems to have the potential to be available for both practitioners and wide range of users.

Additionally, in our study, in the follow-up assessment (T2) we measured the whole group of respondents, not only participants of the blended intervention. This approach allowed us to test the DTS score in ineligible groups. According to this approach, we can cautiously conclude that the lack of blended intervention has increased the level of digital transformation stress in comparison to active participation in interventions, whose DTS significantly decreased.

LIMITATIONS

The present study has several limitations that need to be emphasized. Firstly, because of the COVID-19 pandemic, and the resulting online activities overload, participants may hesitate to engage in the additional Internet initiative, like online meetings, workshops and trainings. As a consequence, this factor could be one of the reasons for the high dropout rate and the low activity of the 4th group. Although the differences between active and control groups are not significant, we consider using a randomized control trial (RCT) approach in the future studies (Rogala et al., 2016; Smoktunowicz et al., 2019, 2021).

Secondly, a related limitation was finding balance in using digital solutions, namely the online intervention, as a digital transformation stress countermeasure, especially in the situation where people spend a lot of time in front of the computer out of necessity. Although participation in the intervention might be demanding due to the lockdown difficulties and tiredness while working online for the whole day before, the activity during workshops was successful. Monitoring of online training frequency of the participants revealed that they completed the majority of proposed exercises. However, using this intervention in a group of employees working in a traditional way might be a good control group in the future research.

The next limitation was lack of a possibility to receive objective measures of the level of digital transformation in a participants' organization and necessity to rely on self-report measures. Possibly, some participants might have overestimated the level of digital transformation in their organization. For future research, we should purposefully select the organizations to invite participants to the study.

Finally, we were not able to observe the prolonged effects of the interventions that would enable us to evaluate

the stability of observed effects in the long term, with 3 measurements of dependent variables (stress in the workplace, digital transformation stress, digital transformation attitudes). Finally, in the further research we should consider examining intervention effect in different cultural contexts, for generalization of results. Although recent meta-analysis on effectiveness of Internet -based CBT interventions confirmed its effectiveness in different cultural context (Andersson et al., 2019) it is important to better understand factors that may limit its usability.

CONCLUSION

This study offers both theoretical and practical contributions. It confirmed the usefulness of ICT demands and employees' resources model in the context of the digital transformation stress and digital transformation attitude. The blended intervention with e-stressless online training is an effective program enhancing the well-being of professionals affected by ICT demands increasing during the accelerated digital transformation in the workplace. Being broadly accessible to employees who currently work under DT demands, the proposed, blended intervention offers substantial psychological and social support, especially in the situation of remote 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 research protocol was approved by the Ethical Committee of the SWPS University of Social Sciences and Humanities, Warsaw, Poland, number of decisions: 47/2020, 50/2020, 3/2021, 8/2021. The study was conducted in compliance with ethical standards adopted by the American Psychological Association (APA, 2010). Accordingly, prior to participation, all participants were informed about the general aim of the research and the anonymity of their data. The patients/participants provided their written informed consent to participate in this study. Participation was voluntary, and the participants did not receive compensation for their participation in the study.

AUTHOR CONTRIBUTIONS

EM-T: research concept, project preparation, organization, planning, scales development methodology, writing the original draft, intervention content development, and design of figures. SB and EM-T: data curation, formal analysis, interpretation of results, writing the manuscript, editing, and revision. EM-T and KS: project administration and first abstract writing. SB and KS: scale English back translation. EM-T and JP: intervention diagram preparation. All authors contributed to the article and approved the submitted version.

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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.2022.732301/full#supplementary-material

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Job Burnout Is Associated With Prehospital Decision Delay: An Internet-Based Survey in China

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Background: Prehospital delay is associated with non-modifiable factors such as age, residential region, and disease severity. However, the impact of psychosocial factors especially for job burnout on prehospital decision delay is still little understood.

Method: This internet-based survey was conducted between 14 February 2021 and 5 March 2021 in China through the Wechat platform and web page. Self-designed questionnaires about the expected and actual length of prehospital decision time and the Chinese version of Maslach Burnout Inventory-General Survey, Type D Personality Scale-14, and Social Support Rating Scale were applied. A total of 1,039 general participants with a history of perceptible but tolerable body discomfort were included.

Results: The top six reasons for prehospital decision delay were: (1) endure until self-healing (50.7%), (2) too busy to ask for leave (40.3%), (3) process for seeing a doctor too complicated (35.8%), (4) too tired after work (26.2%), (5) worry about the expenditure (16.6%), and (6) fear of being identified as with serious problem (14.5%). The univariate analyses revealed that older age ($p = 0.001$), type D personality ($p = 0.025$), job burnout ($p = 0.055$), and worrying about expenditure ($p = 0.004$) were associated with prolonged prehospital decision time, while engaged in medical-related job ($p = 0.028$) and with more social support ($p = 0.066$) would shorten the delay. The multivariate analysis using logistic regression model with forward selecting method showed that age [per 10 years, odds ratio (OR) 1.19 (1.09–1.31), $p < 0.001$], job burnout [per 10 points in Maslach Burnout Inventory-General Survey (MBI-GS), OR 1.17 (1.04–1.31), $p = 0.007$], and worrying about expenditure [OR 1.75 (1.25–2.47), $p = 0.001$] were the three determinants for prehospital decision delay (>7 days). Mediating effects were analyzed by using bias-corrected percentile bootstrap methods ($N = 10{,}000$). Social support was found partially mediated the relationship between the determinants and prehospital decision time. The partial mediating effect of social support accounted for 24.0% of the total effect for job burnout and 11.6% for worrying about expenditure.

Conclusion: Psychosocial factors have a non-negligible impact on prehospital decision delay. The crucial part of prehospital decision delay may be the lack of motivation inside. Job burnout and lack of social support, as two commonly seen features in the modern world, should be given enough consideration in disease prevention and treatment.

Keywords: burnout, time-to-treatment, social support, type D personality, decision making

INTRODUCTION

Delay in seeking medical help can profoundly increase the risk for serious complications, major disability, and death (De Luca et al., 2004; Denti et al., 2016; van Dijk et al., 2018). Previous studies have focused on diseases such as acute myocardial infarction (AMI) and stroke (De Luca et al., 2004; Denti et al., 2016) and found that lack of disease-related knowledge, older age, and residing in rural areas were associated with prehospital delay (Cao et al., 2010; Mohan et al., 2018; Park et al., 2020). However, these factors are often non-modifiable and likely account for only a small proportion of prehospital delay (George et al., 2017). Besides, the behavior of seeking medical aids for such acute diseases was to a large extent driven by symptoms (Wu et al., 2017). For diseases at the initial stage without intense manifestations such as cancers, the prehospital delay may cause more mournful outcomes.

Psychosocial factors such as depression, type D personality, and lack of social support have been linked to a worse prognosis of several somatic diseases (Hare et al., 2014) and reported in one recent article to be associated with prehospital decision delay in patients with AMI (Arrebola-Moreno et al., 2020b). It was also mentioned in another research that patients' negative trustworthiness of others was independently associated with an increased intention to wait before going to the hospital (Sullivan et al., 2009). Given the fact that a large part of the delay time for seeking medical care is due to the patient's decision delay instead of some objective reasons (Mackay et al., 2014), it is possible that psychosocial problems and their related behaviors may be a pivotal factor in causing prehospital delay (Bunde and Martin, 2006; Smolderen et al., 2010). More importantly, these problems are often neglected but the modifiable parts for the individual in clinical practice and exert significant influence on prognosis through affecting the decision-making process (Arrebola-Moreno et al., 2020b; Veazie and Denham, 2021) and medical compliance (Acharya and Agius, 2018).

Characterized by feeling exhaustion, cynicism, and reduced personal accomplishment, job burnout has been considered to affect both the physical and psychological states (Maslach and Leiter, 2016) and is associated with an increased risk of somatic diseases and their progression (von Känel et al., 2020). It depletes energy and makes employees more likely to delay decisions (Roster and Ferrari, 2020) and trapped into a risky decision-making style (Michailidis and Banks, 2016). Considering the necessity of work in our life and also the increasing social competition, it is worthwhile to figure out the impact of job burnout on prehospital decision delay. To the best of our knowledge, this relationship has not been explored before.

As for these reasons above, we initiated this research in the general population and focused on the influence of psychosocial factors especially for job burnout on the delay before seeking medical help in individuals previously having perceptible but tolerable body discomfort. We hypothesized that (1) job burnout would postpone the prehospital decision time and (2) social support might mediate the relationship between burnout and prehospital decision delay. We expected that these modifiable factors could be associated with the delay in seeking medical care so that provide new insights for improving the current disease prevention system.

METHODS

Design and Participants

This study aimed to explore the influence of psychological factors, especially for job burnout on the delay in seeking medical help in individuals previously having perceptible but tolerable body discomfort. It was conducted based on the Internet through the Wechat platform and web page (available on https://www.wjx.cn/vj/r4hD79V.aspx) between 14 February 2021 and 5 March 2021. Participants with a history of perceptible tolerable body discomfort and a history of visiting doctors were eligible for this research. All the participants needed to check their qualifications and to read and tick the box of informed consent on the web page before enrollment. In the survey, they were asked to recall the experiences of visiting hospitals and to calculate the actual length from the beginning of body discomfort to visiting doctors. Self-designed questionnaire (see **Supplementary File 1**) about demographic characteristics, expected length of prehospital decision time, reasons for prehospital decision delay, and modified form of Maslach Burnout Inventory-General Survey (MBI-GS), Type D Personality Scale-14 (DS14), and Social Support Rating Scale (SSRS) were also included in this survey.

To avoid data missing, all the questionnaires were mandatory and the web page would remind the participants if there was an item blanked when submitting. In all, 1,039 participants across China from 29 provinces or autonomous regions attended this survey. However, questionnaires that were completed in <100 s were ruled out in consideration for quality control, leaving a sample size of 1,032 into analysis. Among those participants, 400 (38.8%) were men, 380(36.8%) were aged <30 years, and 229 (22.2%) were engaged in medical-related jobs. This research complied with the Declaration of Helsinki and was approved by the ethics committee.

Expected Length of Prehospital Decision Time

Participants were asked to imagine a scenario that some perceptible but tolerable body discomfort had for the first time occurred on them. The ideal length of prehospital decision time in expectation based on their cognition was inquired.

Modified Form of Maslach Burnout Inventory-General Survey (Chinese Version)

As a widely used questionnaire, MBI-GS consists of 16 items (0–6 Likert-type scale: 0 = never, 6 = everyday), 3 dimensions (emotional exhaustion, cynicism, and reduced personal accomplishment), with higher scores indicating higher levels of job burnout (Leiter and Robichaud, 1997). The modified form of MBI-GS (Chinese version) deletes the 13th item about cynicism, but keeps the same structure and good reliability and validity (Gan et al., 2019). A total score of 51–75 indicates mild job burnout, whereas a total score >75 represents moderate to severe burnout, for which leaving the post for a period of time for adjustment is suggested.

Type D Personality Scale-14 (Chinese Version)

Type D personality was assessed by the Chinese version of the Type D Personality Scale-14. It comprises two 7-item subscales to measure negative affectivity (NA) (e.g., "I often feel unhappy") and social inhibition (SI) (e.g., "I am a closed kind of person") with a maximum score of 28 on each scale. Type D personality was classified as scores of both two subscales $\geq$10 (Pedersen et al., 2004). The inner and retest consistency and content and structure validity have been validated in the general Chinese population (Bai and Zhao, 2007).

Social Support Rating Scale

Social Support Rating Scale was designed in accordance with the actual living state of Chinese people by referring other foreign scales (Chang-Fei et al., 2011). It consists of 14 items and assesses the level of social support from 3 dimensions of objective support, subjective support, and utilization of support. Its reliability and validity have been validated in general population. More details about this questionnaire were attached in **Supplementary File 1**. A good internal consistency (Cronbach's $\alpha = 0.79$) was observed. As there has not been a widely recognized cutoff point for the scale and higher score indicates a higher level of social support, we adopted the lower quartile of 30 points for categorization in the dichotomous analysis.

Statistical Analyses

The actual length of prehospital decision time of participants in different demographic and psychosocial categorizations was presented as means (SDs) and compared between/among groups with the Wilcoxon rank-sum test or the Kruskal–Wallis test due to the skew distribution. Prehospital decision delay was defined as actual prehospital decision time exceeding 7 days. The multivariate logistic regression model with forward selection method (sle = 0.1, sls = 0.1) was applied to find out the main determinants for prehospital decision delay by including all statistically significant variables in the univariate analyses. The correlations between variables were assessed by the Spearman correlation coefficient. These analyses were performed with SAS version 9.4 (SAS Institute Incorporation, Cary, North Carolina, USA). The mediating effects of social support, type D personality, and medical-related jobs in the relationship between determinants and prehospital decision time were examined with bias-corrected percentile Bootstrap methods by Mplus version 8.0.

Based on our pilot data, about 40% of the general population in China would have job fatigue. The rate of prehospital decision delay was estimated at 50% in individuals with at least mild burnout and 41% in those without job fatigue. With at least 80% power, the sample size was calculated to be approximately 1,000 by using PASS 15 software. The actual prevalence gap was slightly lower than expected, causing the power of this research to be at 74.4%. All the tests for significance were two-tailed at the threshold of 0.05.

RESULTS

Characteristics of Participants

The demographic and psychological characteristics of the participants are shown in **Table 1**. Of the 1,032 subjects, 311 (30.1%) had type D personality, 431 (41.8%) had at least mild job burnout, and 13(1.3%) were in the state of moderate to severe burnout. Although nearly half of participants (45.1%) actually sought medical help after 1 week, one fifth (19.9%) after 1 month since the first time that some unexpected, perceptible but tolerable body discomfort occurred on them, the majority (88.1%) believed that the ideal decision delay should be within 1 week (**Figure 1**). For this reason, we defined that a prehospital decision time exceeding 7 days could be regarded as prehospital decision delay. Consequently, the prevalence of prehospital decision delay was 48.5% in participants with job burnout and 42.6% in their counterparts.

In addition, we also investigated the first choice when facing that situation and noticed that 405 (39.2%) chose to endure for a while to see if the symptoms could disappear, 262 (25.4%) would search the symptoms on Internet, 99 (9.6%) tried to consult their relatives or friends in the medical field, and only 197 (19.1%) would immediately access to the nearby clinics or hospitals.

Associations Between Prehospital Decision Delay and Characteristics of Participants

In the univariate analyses, older age ($p = 0.001$), type D personality ($p = 0.025$), and job burnout ($p = 0.055$) were associated with prolonged prehospital decision time, while engaged in medical-related job ($p = 0.028$) and with more social support ($p = 0.066$) would shorten the delay in seeking medical help.

Reasons for prehospital decision delay had been collected in the pilot study and later been placed in our questionnaire. The

TABLE 1 | Summary of the associations between demographic, psychological characteristics, and prehospital decision time ($n = 1,032$).

Variable	Categorization	*N*	Length of delay in seeking medical help [days, mean (SD)]	*p*-value
Gender	Male	400	21.97 (37.68)	0.44
	Female	632	19.83 (33.99)	
Age	10–19	21	32.67 (62.22)	**0.001**
	20–29	359	17.35 (32.57)	
	30–39	194	16.98 (29.25)	
	40–49	169	21.77 (33.99)	
	50–59	239	26.81 (41.90)	
	60–	50	20.50 (29.80)	
Income	0–3,000	309	21.44 (36.09)	0.54
	3,000–6,000	273	22.49 (37.88)	
	6,000–10,000	250	17.56 (29.45)	
	10,000–20,000	153	19.11 (35.48)	
	20,000–	47	26.51 (44.82)	
Medical related job	Yes	229	15.97 (29.28)	**0.028**
	No	803	22.00 (36.95)	
Physical examination frequency	Almost never	205	26.57 (43.47)	0.11
	< 1 time per year	288	21.64 (35.28)	
	≥ 1 times per year	539	17.89 (31.75)	
Type D personality	Yes	311	24.06 (40.10)	**0.025**
	No	721	19.19 (33.19)	
Burnout	<50	601	19.05 (33.74)	0.055
(MBI-GS)	50–75	418	22.36 (36.50)	
	≥75	13	40.38 (64.80)	
Social support	≤30	280	26.49 (44.09)	0.066
(SSRS)	>30	752	18.49 (31.42)	
Seeking medical help in time	Always	683	13.16 (23.76)	**<0.001**
	Sometimes	203	26.23 (33.28)	
	Seldom	146	48.01 (60.68)	
Reasons				
1. Hold on a little longer, might be OK	With	523	19.33 (33.65)	0.67
	Without	509	22.02 (37.22)	
2. Too busy at workdays, hard to find time	With	416	19.22 (34.01)	0.39
	Without	616	21.62 (36.39)	
3. Process for seeing a doctor too complicated	With	369	19.27 (33.02)	0.62
	Without	663	21.44 (36.75)	
4. Too tired after work, prefer to rest	With	270	21.37 (36,74)	0.37
	Without	762	20.41 (35.03)	
5. Worried about the expenditure	With	171	27.66 (44.16)	**0.004**
	Without	861	19.27 (33.32)	
6. Fear of being identified as with serious problem	With	150	23.43 (36.63)	0.11
	Without	882	20.19 (35.26)	

The length of prehospital decision time was presented as means (SDs), however, were compared with Wilcoxon rank-sum test or Kruskal–Wallis test. MBI-GS, Maslach Burnout Inventory-General Survey; SSRS, Social Support Rating Scale. Variables marked in bold indicate a statistically significant differece between/among groups.

top six reasons (**Figure 2**) for the delay were (1) personal reason: endure until self-healing (50.7%); (2) job reason: too busy to ask for leave (40.3%); (3) objective reason: process for seeing a doctor too complicated and troublesome (35.8%); (4) job reason: too tired after work and prefer to rest (26.2%); (5) economic reasons: worry about the expenditure (16.6%); and (6) personal reason: fear of being identified as with serious problem (14.5%). To our surprise, none of these reasons, neither the level of income, but for having worries about the possible expenditure ($p = 0.004$) were in fact associated with delayed decision time (see **Table 1**). Those who felt afraid of the possible bad results were prone to have a longer mean prehospital decision time ($p = 0.11$). People who felt busy at work, preferred to endure discomfort, or felt the process to see the doctor too complicated even had a slightly shorter mean prehospital decision time.

Multivariate analysis taking all these factors into logistic regression model with forward selection method (sle = 0.1, sls = 0.1) revealed that job burnout [every 10 points increase in MBI-GS, odds ratio (OR) 1.17 (1.04–1.31), $p = 0.007$], age [every 10 years increase, OR 1.19 (1.09–1.31), $p < 0.001$], and worrying about expenditure [OR 1.75 (1.25–2.47), $p = 0.001$] were the three determinants for the delay in seeking medical help.

Job Burnout, Age, Social Support, and Prehospital Decision Delay

To fully understand the inner relationships between all these variables, Spearman's rank correlation tests were further conducted (see **Table 2**). Intercorrelates among variables were in line with our expectations. Job burnout ($r = 0.11$, $p < 0.001$), age ($r = 0.13$, $p < 0.001$), and worrying about expenditure ($r = 0.09$, $p = 0.004$) correlated positively, while SSRS score ($r = -0.05$, $p = 0.081$) and be occupied in medical-related job ($r = -0.07$, $p = 0.028$) correlated negatively with prehospital decision time. Type D personality ($r = 0.07$, $p = 0.024$) was another predominant associated factor, though the correlation as not as strong as negative affectivity ($r = 0.11$, $p < 0.001$).

Due to the existence of collinearity between variables, the interrelationship of some factors might be overlooked. Therefore, we tried to testify the mediating effect of social support, type D personality, and medical-related jobs between each of the three determinants (job burnout, age, and worrying about expenditure) with prehospital decision time by using bias-corrected percentile Bootstrap methods (iteration = 10,000 times). These results are given in **Table 3**. Obviously, social support partially mediated the relationship between job burnout and decision time and the relationship between worrying about expenditure and decision time, which suggested that the length of the time before seeking medical help might be shortened by strengthening social support for individuals. It however diluted the relationship between age and prehospital decision time, indicating that the influence of aging on prehospital delay could be more evident and should be paid enough attention.

Further analyses tried a simple mediation model to estimate the effect of social support and to avoid the interference of complex interactions (see **Supplementary Figure 1**). The partial mediating effect of social support accounted for 24.0% of the total effect for job burnout, and 11.6% of the total effect for worrying about expenditure.

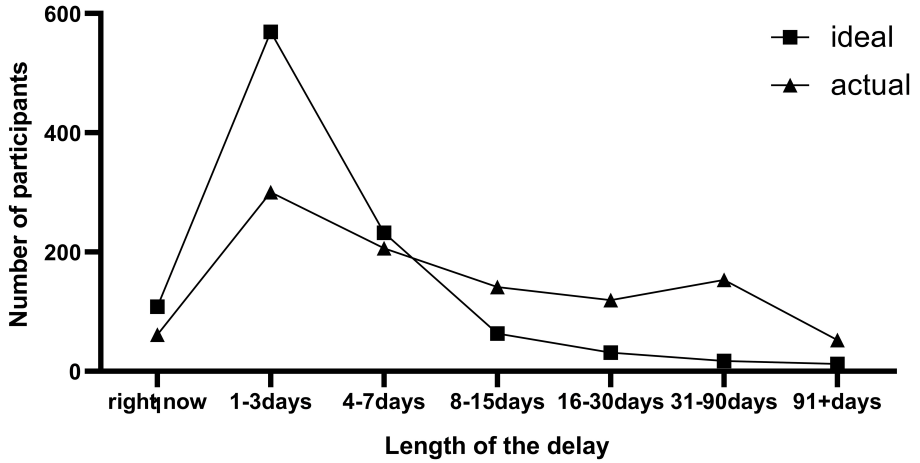

FIGURE 1 | Frequency distribution of the expected and actual delay for seeking medical help ($N = 1,032$).

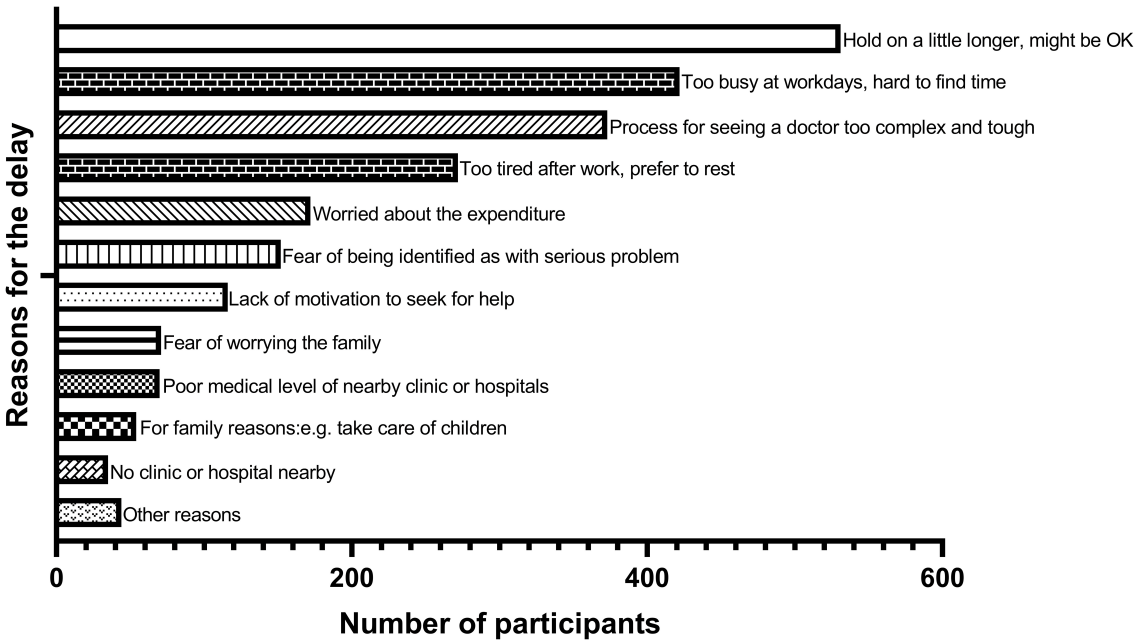

FIGURE 2 | Ranking for reasons of the delay for seeking medical help ($N = 1,032$).

DISCUSSION

In this study of 1,032 participants, job burnout, older age, worrying about possible expenditure, type D personality, engaging in medical-related jobs, and lack of social support were all found correlated with prehospital decision time delay. However, only the first three were retained in the multivariate analyses, proving themselves to be the most significant related factors. Social support, though not remarkably associated with decision time, partially mediated the relationship between job burnout, worrying about expenditure with prehospital decision time. These findings confirm the correctness of our hypotheses that burnout postpones the prehospital decision time and social support buffers the relationship between burnout and prehospital decision delay.

For the majority, working is always a crucial part of life. The experience at work closely relates to the mood and to some extent also reshapes our character (Dai, 2002). As the outcomes of excessive chronic stress at work, job burnout can lead to psychological disturbance such as insomnia, depressive symptoms, and use of psychotropic medications (Salvagioni et al., 2017) and be viewed as the predictors for worse prognosis in some somatic diseases. It is a widespread phenomenon

TABLE 2 | Spearman's correlations between prehospital decision time and demographic, psychological features ($N = 1,032$).

	1	2	3	4	5	(NA)	(SI)	6	(EE)	C	(RPA)	7
1 Prehospital decision time	–											
2 Age	0.13***	–										
3 Education level	−0.08**	−0.42***	–									
4 Medical related job	−0.07*	−0.30***	0.36***	–								
5 Type D personality	0.07*	−0.12***	0.04	0.02	–							
Negative affectivity (NA)	0.11***	−0.11***	0.04	0.01	0.63***	–						
Social inhibition (SI)	0.08**	−0.12***	0.06*	0.01	0.74***	0.62***	–					
6 Job burnout (MBI-GS)	0.11***	−0.19***	0.04	0.04	0.40***	0.52***	0.41***	–				
Emotional exhaustion	0.06	−0.24***	0.22***	0.13***	0.31***	0.45***	0.34***	0.69***	–			
Cynicism	0.08*	−0.22***	0.17***	0.07*	0.40***	0.53***	0.41***	0.78***	0.70***	–		
Reduced personal accomplishment	0.10**	0.05	−0.24***	−0.09**	0.15***	0.13***	0.14***	0.52***	−0.12***	0.04	–	
7 Social support (SSRS)	−0.05	0.34***	−0.17***	−0.11***	−0.34***	−0.36***	−0.42***	−0.32***	−0.23***	−0.28***	−0.16***	–

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$. MBI-GS, Maslach Burnout Inventory-General Survey; SSRS, Social Support Rating Scale.*

TABLE 3 | The mediation effects of relating factors between the three determinants and prehospital decision time ($N = 1,032$).

	Job burnout			Age			Worrying about expenditure		
	Estimate	**Est./S.E.**	***p*-Value**	**Estimate**	**Est./S.E.**	***p*-Value**	**Estimate**	**Est./S.E.**	***p*-Value**
Multiple mediation model									
Total effect	0.104	2.905	**0.004**	0.077	2.307	**0.021**	0.086	2.389	**0.017**
Total indirect effect	0.026	1.634	0.102	−0.029	−2.026	0.043	0.006	0.946	0.344
Specific indirect 1: social support	0.027	2.221	**0.026**	−0.039	−3.282	**0.001**	0.010	2.221	**0.026**
Specific indirect 2: medical related jobs	−0.005	−1.514	0.130	0.016	2.037	**0.042**	−0.007	−1.902	0.057
Specific indirect 3: type D personality	0.003	0.245	0.807	−0.005	−1.035	0.301	0.003	0.679	0.497
Direct effect	0.079	2.055	**0.040**	0.106	2.982	**0.003**	0.080	2.217	**0.027**

Bold values indicate statistically signficant.

in the modern world and has been regarded as a profound concern, which has caused enormous financial and emotional costs for companies and individual employees (Bakaç et al., 2021).

In this study, we tried to connect this "common" phenomenon with the behavior of seeking medical help and revealed a significant relationship between job burnout and prehospital decision delay. To the best of our knowledge, this is the first study that explores the association between these two things. Given the benefits of seeking medical care timely, finding the factors that help to promote early detection, early diagnosis and early treatment are of great importance. However, previous studies have paid more attention to acute diseases, which manifest as more serious symptoms, and found that some unmodifiable factors influence the prehospital delay (Cao et al., 2010; Mohan et al., 2018; Park et al., 2020). For most chronic diseases and some acute diseases at the initial stage, the manifestations are often mild and tolerable, and the timing to choose to go to the hospital varies significantly between individuals. As a result of this, it is possible that psychosocial factors have played a vital role in the formation of motivation for seeking medical examinations. Therefore, to enroll participants with previously tolerable body discomfort without restricting to a certain somatic disease was a drawback, perhaps also a strength of this research in finding the influence of psychosocial factors.

This conclusion can be corroborated by the finding that job burnout can result in the exhaustion of energy, make employees delay decisions (Roster and Ferrari, 2020), and be prone to have a more risky decision-making style (Michailidis and Banks, 2016). In addition, it is reported that burnout is a non-negligible cause and source of depression (Johansson et al., 2011); meanwhile, depression in patients with cardiac diseases is found associated with delay in seeking medical care (Arrebola-Moreno et al., 2020a). In fact, job burnout is often understood as the chronic depletion of an individuals' physical, emotional, and cognitive energy resources (Nguyen et al., 2010b; Salpigktidis et al., 2016). People with high levels of job burnout were more likely to experience conflicts inside and outside of work, which in turn would cause depression, anxiety, and other negative emotions and cognitive bias (Salvagioni et al., 2017).

There is also an interesting finding that although as high as 50.7% of respondents would endure the discomfort and 40.3% believed that delay was attributed to their business at work, statistical analyses demonstrated even a decrease in prehospital decision time as compared to the rest participants. Analogously, worrying about the possible expenditure was a determinant for

prehospital decision delay; however, the actual income level did not correlate with the delay. It is probably not the business of work, but how the mind thought that really matters. The crucial part of the process in seeking medical help maybe not lie in how big objective obstacles are, but the lack of motivation inside.

Social support is considered to promote biological or behavioral adaptations under conditions of stress. Low social support may lead to mood disturbance (Åhlin et al., 2018), worse treatment compliance (Sousa et al., 2019), and unhealthy behaviors, which usually have a negative impact on the overall physical condition (Wang et al., 2017). In accord with previous studies, lack of social support was found as an important element for prehospital delay (Reisinger et al., 2018). Besides the direct correlation, this study also revealed that social support partially mediated the relationships between job fatigue and prehospital decision time. In other words, the delayed care-seeking manner caused by job burnout was partially attributed to the lack of social support. This is in line with the findings that enhancing social support can mitigate the extent of job burnout (Diehl et al., 2021; Yamoah, 2021). It also points out a direction that strengthening the social support may help reduce prehospital decision time and to facilitate disease prevention.

Consistent with previous studies (Zhang et al., 2016), this study also observed that aging was one of the determinants leading to the extension of prehospital decision time. The gradually decreased motor ability and lack of care and support might be an important reason. Engaging in medical-related jobs was found to be related to shortened decision time, which has also been reported by several prior studies (Nguyen et al., 2010a; Li et al., 2019). It is, however, impossible for the general public to master the knowledge of all the kinds of diseases and to self-diagnose. One recent review concludes that so far there is limited evidence for a relationship between prehospital delay and knowledge of symptoms (Mooney et al., 2012). The correlation between type D personality especially for negative affectivity and prehospital decision delay was another finding of this research, although this phenomenon has already been reported before (Zhang et al., 2020). In our study, a mediating effect of type D personality in the relationship between job burnout and the prehospital delay was not found, indicating that certain personalities might have exerted a non-negligible effect in the delay independent of job fatigue.

Unlike previous studies, this study has focused on the influence of psychosocial factors such as job burnout, social support, and type D personality, which we believe have played a non-negligible role and have not been paid enough attention to by the medical practitioner and policymakers. More importantly, these factors are a modifiable and perhaps essential supplement to the current disease prevention system. Under the circumstance that the graded diagnosis and treatment system in China has not been fully established and annual physical examination is still not a mainstream trend, realizing the significant impact of psychosocial factors may bring about a great improvement in promoting health. Future researches are still needed in figuring out the exact influence of burnout caused by prehospital delay on prognosis and finding measures to alleviate the negative impact of job fatigue. A more stringent design to minimize the recall bias in larger and restricted populations is also necessary.

There are also several limitations to this study. First of all, as for representing the general population in China, the sample size is still comparatively small. Given the difference in public health systems between countries, which significantly affects medical-seeking behavior, the generalization of the results worldwide needs to be further verified. Second, the data were collected during coronavirus disease 2019 (COVID-19) pandemic. Whether the conclusion drawn from this study can be extended needs to be treated with caution, although only 1 confirmed case of domestic infection has been reported nationwide during the period of data collection. Third, the propagation of questionnaires on the Internet may cause a bias toward younger participants with better living conditions. However, with the widespread use of smartphones in China, the proportion of participants aged over 40 in this study reached 44.4%. At last, the prehospital decision time, acquired based on the memories of participants can bring about recall bias. The reassuring thing is that the length of prehospital delay and self-assessment about the timeliness in seeking help are extremely consistent ($p < 0.001$), and the conclusions drawn in this study can be strongly supported by previous researches.

CONCLUSION

In an internet-based survey, job burnout was found associated with prehospital decision delay. Social support partially mediated the relationship between burnout, worrying about expenditure with prehospital decision time. Job burnout and lack of social support, as two elements are commonly seen in the modern world, should be given enough consideration in disease prevention and treatment. Future researches are still needed to find out more effective intervention measures for burnout and to testify the conclusions in larger populations.

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 Medical Ethics Committee of Guangdong Provincial People's Hospital. Written informed consent to participate in this study was provided by the participants.

AUTHOR CONTRIBUTIONS

HY and CJ designed this study. HY, XS, and YC wrote the first draft. CJ, XY, YW, and WL did statistical analyses. QG revised

the manuscript. HM and QG were senior physicians principally responsible for this study. All authors read and approved the final version of the manuscript.

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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.2022.762406/full#supplementary-material

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