Mental health of healthcare professionals

Edited by
Feng Jiang, Yi-lang Tang and Huanzhong Liu

About Frontiers

Frontiers is more than just an open access publisher of scholarly articles: it is a pioneering approach to the world of academia, radically improving the way scholarly research is managed. The grand vision of Frontiers is a world where all people have an equal opportunity to seek, share and generate knowledge. Frontiers provides immediate and permanent online open access to all its publications, but this alone is not enough to realize our grand goals.

Frontiers journal series

The Frontiers journal series is a multi-tier and interdisciplinary set of open-access, online journals, promising a paradigm shift from the current review, selection and dissemination processes in academic publishing. All Frontiers journals are driven by researchers for researchers; therefore, they constitute a service to the scholarly community. At the same time, the *Frontiers journal series* operates on a revolutionary invention, the tiered publishing system, initially addressing specific communities of scholars, and gradually climbing up to broader public understanding, thus serving the interests of the lay society, too.

Dedication to quality

Each Frontiers article is a landmark of the highest quality, thanks to genuinely collaborative interactions between authors and review editors, who include some of the world's best academicians. Research must be certified by peers before entering a stream of knowledge that may eventually reach the public – and shape society; therefore, Frontiers only applies the most rigorous and unbiased reviews. Frontiers revolutionizes research publishing by freely delivering the most outstanding research, evaluated with no bias from both the academic and social point of view. By applying the most advanced information technologies, Frontiers is catapulting scholarly publishing into a new generation.

What are Frontiers Research Topics?

Frontiers Research Topics are very popular trademarks of the *Frontiers journals series*: they are collections of at least ten articles, all centered on a particular subject. With their unique mix of varied contributions from Original Research to Review Articles, Frontiers Research Topics unify the most influential researchers, the latest key findings and historical advances in a hot research area.

Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers editorial office: frontiersin.org/about/contact

Mental health of healthcare professionals

Topic editors

Feng Jiang — Shanghai Jiao Tong University, China
Yi-lang Tang — Emory University, United States
Huanzhong Liu — Chaohu Hospital of Anhui Medical University, China

Citation

Jiang, F., Tang, Y.-l., Liu, H., eds. (2023). *Mental health of healthcare professionals*. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-83251-131-2

Table of
contents

frontiers | Frontiers in Psychology

Editorial: Mental health of healthcare professionals

Feng Jiang[1,2], Huanzhong Liu[3,4,5]* and Yi-lang Tang[6,7]

[1]School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai, China, [2]Institute of Healthy Yangtze River Delta, Shanghai Jiao Tong University, Shanghai, China, [3]Department of Psychiatry, Chaohu Hospital of Anhui Medical University, Hefei, China, [4]Department of Psychiatry, School of Mental Health and Psychological Sciences, Anhui Medical University, Hefei, China, [5]Department of Psychiatry, Anhui Psychiatric Center, Hefei, China, [6]Department of Psychiatry and Behavioral Sciences, Emory University, Atlanta, GA, United States, [7]Substance Abuse Treatment Program, Atlanta Veterans Affairs Medical Center, Decatur, GA, United States

Editorial on the Research Topic
Mental health of healthcare professionals

According to the World Health Organization, mental health is defined as a state of mental wellbeing that enables individuals to cope with stresses, realize their abilities, work well, learn well, and contribute to society (World Health Organization., 2003). Compared to the general population, healthcare professionals are more likely to encounter mental health problems, and these symptoms not only affect the wellbeing of those affected but also often negatively impact the healthcare quality and workforce sustainability (Windover et al., 2018; Anderson et al., 2021; Hodkinson et al., 2022). On the other hand, mental health is considered an integral and essential component of health, and it is also a type of health human capital (Hooker, 2021), which can be invested and maintained (Lim et al., 2018; Stein and Sridhar, 2019; Wang et al., 2021). Recent studies suggested that, in the setting of the COVID-19 pandemic, the overall mental health status of healthcare professionals has worsened due to multiple factors, including heavier workload, fear of COVID-19, psychological distress, and other environmental factors (Labrague and de Los Santos, 2021). Therefore, the mental health issue of healthcare professionals deserves more attention from researchers and policymakers (Spoorthy et al., 2020).

As the guest editors for the Special Issue on the Mental Health of Healthcare Professionals, we would like to highlight five research articles here. These articles involved different perspectives and different samples, including healthcare professionals themselves, family members, hospital management, policymakers, and the public.

In healthcare workers, Li et al. demonstrated that one-fourth of psychiatrists in China experienced depressive and anxious symptoms during the COVID-19 pandemic, calling for urgent action. Shi et al. showed that primary healthcare workers reported high levels of anxiety and depression symptoms in China during the pandemic. They also demonstrated that social support and resilience significantly mediate the relationship between work stress and anxiety/depression, highlighting the roles of social support (resources) and individual coping skills (resilience) and possible targets for interventions.

Actions should be taken by physicians and other stakeholders, such as the hospitals' management, healthcare policymakers, patients, family members, and others.

In family members, Alimoradi et al. found that healthcare professionals coped communally within their families, especially with their spouses, in dealing with work-related stress. As family members are often the primary support, any intervention strategies should consider involving families.

In hospital management and peers, Rizzi et al. demonstrated that individual support sessions were a protective and supportive factor for healthcare professionals' mental health. The psychological support program was recommended for all COVID-19 patients' care units. This research suggested that hospital management and peers can take effective psychological actions to improve the health human capital of healthcare workers.

In health policymakers, Pacutova et al. indicated that pandemic management was strongly associated with the psychological responses of healthcare workers. As health policymakers usually handle pandemic management, the effects are often widespread and systemic. Even before the COVID-19 pandemic, studies had shown that organizational system factors affected the mental health of health professionals (Hall and Friedman, 2013).

In light of this Research Topic's findings, awareness of mental health issues among healthcare professionals should be emphasized. Government, healthcare systems, and healthcare organizations need to create and ensure the infrastructure and resources to support healthcare professionals. Specific actions may vary, but common interventions include having regular surveys and assessments of the stress and mental health symptoms, adjusting their workload, and ensuring time for them to recover (Dang et al., 2020).

The collection of articles in this Issue is an important start. More research is needed, especially interventional studies focusing on the effectiveness of different programs and studies involving interventions by various stakeholders. Studies examing the role of institutional factors and individual coping mechanisms may also inform the development of more targeted interventions.

Author contributions

FJ, HL, and Y-LT made substantial contributions to the study design. FJ and HL collected data. FJ analyzed the data, interpreted the analysis results, and completed the manuscripts. HL and Y-LT contributed to critical revision of the manuscript. All authors have read and approved the published version of the manuscript.

Conflict of interest

Publisher's note

References

Anderson, M., O'neill, C., Macleod Clark, J., Street, A., Woods, M., Johnston-Webber, C., et al. (2021). Securing a sustainable and fit-for-purpose UK health and care workforce. *Lancet* 397, 1992–2011. doi: 10.1016/S0140-6736(21)00231-2

Dang, S., Penney, L. S., Trivedi, R., Noel, P. H., Pugh, M. J., Finley, E., et al. (2020). Caring for caregivers during COVID-19. *J. Am. Geriatr. Soc.* 68, 2197–2201. doi: 10.1111/jgs.16726

Hall, R. C., and Friedman, S. H. (2013). Guns, schools, and mental illness: potential concerns for physicians and mental health professionals. *Mayo. Clin. Proc.* 88, 1272–1283. doi: 10.1016/j.mayocp.2013.08.016

Hodkinson, A., Zhou, A., Johnson, J., Geraghty, K., Riley, R., Zhou, A., et al. (2022). Associations of physician burnout with career engagement and quality of patient care: systematic review and meta-analysis. *BMJ* 378, e070442. doi: 10.1136/bmj-2022-070442

Hooker, R. S. (2021). Independence and human capital theory for the american physician assistant. *J. Physician. Assist. Educ.* 32, 26–27. doi: 10.1097/JPA.0000000000000342

Labrague, L. J., and de Los Santos, J. A. (2021). Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses. *J. Nurs. Manag* .29, 395–403. doi: 10.1111/jonm.13168

Lim, S. S., Updike, R. L., Kaldjian, A. S., Barber, R. M., Cowling, K., York, H., et al. (2018). Measuring human capital: a systematic analysis of 195 countries and territories, 1990-2016. *Lancet* 392, 1217–1234. doi: 10.1016/S0140-6736(18)31941-X

Spoorthy, M. S., Pratapa, S. K., and Mahant, S. (2020). Mental health problems faced by healthcare workers due to the COVID-19 pandemic-A review. *Asian J. Psychiatr.* 51, 102119. doi: 10.1016/j.ajp.2020.102119

Stein, F., and Sridhar, D. (2019). Back to the future? Health and the World Bank's human capital index. *BMJ* 367, l5706. doi: 10.1136/bmj.l5706

Wang, Q. S., Hua, Y. F., Tao, R., and Moldovan, N. C. (2021). Can health human capital help the sub-saharan Africa out of the poverty trap? An ARDL model approach. *Front. Public Health* 9, 697826. doi: 10.3389/fpubh.2021.697826

Windover, A. K., Martinez, K., Mercer, M. B., Neuendorf, K., Boissy, A., and Rothberg, M. B. (2018). Correlates and outcomes of physician burnout within a large academic medical center. *JAMA Intern. Med.* 178, 856–858. doi: 10.1001/jamainternmed.2018.0019

World Health Organization. (2003). Investing in Mental Health [Online]. Available online at: https://www.who.int/publications/i/item/9241562579 (accessed November 8, 2022).

![frontiers in Psychology]

Institutional Satisfaction and Anxiety Mediate the Relationship Between Social Support and Depression in Hypertension Patients in Elderly Caring Social Organizations: A Cross-Sectional Study

Kai Ji[1†], Zhongliang Bai[1†], Ling Tang[1], Huosheng Yan[1], Ying Zhu[1], Guimei Chen[1] and Ren Chen[1,2]*

[1] School of Health Services Management, Anhui Medical University, Hefei, China, [2] Office of Science and Education, Suzhou Hospital Affiliated to Anhui Medical University, Suzhou, China

Background: Depression is a prevalent health condition among hypertension patients in elderly caring social organizations (SOs). Patients with hypertension and depression symptoms have worse health outcomes than those without depression. As the population ages, chronic and mental health issues such as depression of hypertension patients in elderly caring SOs have become prominent. However, the combined effects of social support, institutional satisfaction, and anxiety on depression among hypertension individuals in elderly caring SOs remain unclear. This study aimed to explore the mediating effects of institutional satisfaction and anxiety on the relationship between social support and depression among hypertension patients in elderly caring SOs in Anhui Province, China.

Methods: A cross-sectional study was conducted using a multi-stage stratified random sampling method. A questionnaire was used to collect data on demographic characteristics, the satisfaction of elderly caring SOs, social support, anxiety, and depression. A multiple linear regression model was utilized to investigate depression-related factors, and structural equation modeling (SEM) was employed to examine the relationships between social support, institutional satisfaction, anxiety, and depression among patients with hypertension in elderly caring SOs.

Results: Our results indicated that the mean scores of social support were 20.19 ± 6.98 and 1.92 ± 3.18 for anxiety, and 6.24 ± 5.03 for depression; besides, 33.3% of participants were very satisfied with elderly caring SOs, 48.5% were satisfied, and only 6.0% were dissatisfied or very dissatisfied. Comorbid chronic diseases were significantly associated with depression. Institutional satisfaction was directly negatively related to depression, whereas anxiety was directly positively correlated with depression. Social support had an indirect negative association with depression by the mediating effects of institutional satisfaction and anxiety.

Conclusions: The study highlights the importance of social support in maintaining mental health among hypertension patients residing in elderly caring SOs. To alleviate depression among hypertension patients in elderly caring SOs, strategies that target enhancing social support, institutional satisfaction, and anxiety reduction should be prioritized. More importantly, more attention should be paid to patients with comorbid chronic diseases.

INTRODUCTION

Hypertension is one of the most common chronic diseases worldwide, accounting for two-thirds of all strokes and half of all coronary disease, and thus representing a major risk factor for cardiovascular morbidity and mortality (Chobanian et al., 2003; Perkovic et al., 2007; Prince et al., 2015). Numerous surveys conducted in China have revealed an increased prevalence of hypertension, affecting 18.8% of the population in 2002 and 27.8% in 2014 (Wu et al., 2008; Li et al., 2017). By 2025, this disease is anticipated to affect 29% of the world's population (Mittal and Singh, 2010). Due to the rapidly increasing prevalence of hypertension and disease burden, its effective and timely management and control have become a basic public health service priority in China.

Depression is the major cause of disability among patients with chronic diseases, impacting 350 million people worldwide (Davidson et al., 2000; Long et al., 2015). Hypertension patients are more likely to develop depression, and depression has been recognized as an independent risk factor for hypertension (Davidson et al., 2000; Meurs et al., 2015). Patients with hypertension and depression have worse health status, poorer quality of life, impaired well-being, higher health care expenditure, and increased mortality than those without depression (Oganov et al., 2011; Scuteri et al., 2011; Tsartsalis et al., 2016; Shao et al., 2017). Furthermore, patients with depression display lower adherence to hypertension treatment (Krousel-Wood and Frohlich, 2010), resulting in a 50% failure rate (Stephenson, 1999; Naderi et al., 2012). These studies highlight the importance of addressing depression in hypertension patients.

Social support is defined as "the social resources that persons perceive to be available or that are provided to them" (Gottlieb and Bergen, 2010). It is one of the most well-documented psychosocial factors associated with physical health outcomes (Cohen et al., 2000; Pinquart and Duberstein, 2010; Compare et al., 2013), including hypertension (Strogatz and James, 1986). Prior studies have demonstrated the association between social support and depression among patients with hypertension (Dennis et al., 2008; Ma, 2018). Poor social support has also been linked to poor adherence to anti-hypertension treatment and poor blood pressure control (Berkman et al., 2000; Taher et al., 2014; Ojo et al., 2016) and may thus cause poor prognosis and eventually influence the mental state of hypertension patients.

According to a previous report, anxiety was one of the most prevalent classes of problems in China and abroad, with ~5.3% of the population suffering from anxiety (Yu et al., 2018; Shi et al., 2020). Moreover, hypertension patients are at greater risk of exhibiting anxious symptoms (Cheung et al., 2005; Wei and Wang, 2006). Additionally, 39% of individuals with a generalized anxiety disorder have been demonstrated to meet depression criteria (Hunt et al., 2002).

Institutional satisfaction refers to the elderly's subjective evaluation of their overall satisfaction level, including quality of life, quality of care, and quality of service in elderly caring social organizations (SOs). Satisfaction with primary healthcare services appears to affect depression (Kavalniene et al., 2018). Numerous research has demonstrated a negative correlation between life satisfaction and depression (Gómez-Restrepo et al., 2013; Atienza-González et al., 2020; Köttl et al., 2021). However, the relationship between institutional satisfaction and depression among hypertension patients in elderly caring SOs remains unknown.

Hypertension is prevalent among nursing home residents, with prevalence ranging from 72 to 90% worldwide (Simonson et al., 2011; Könner et al., 2014; Benetos et al., 2015; Harris-Kojetin et al., 2016). The ineffective control of hypertension patients may increase their difficulty in coping with depressive symptoms and the possibility of developing anxiety and a low level of institutional satisfaction. In China, nursing homes and elderly apartments are classified into three major types, which can be operated by government organizations, SOs, or private investors (Chu and Chi, 2008). Commonly, the government-sponsored or -owned nursing homes are mainly served older people who have been disabled in financial resources. On the other hand, older people who are affordable are often covered by nursing homes that are operated by private investors. While the others have dwelled in nursing homes operated by SOs, which can play a major role in planning and developing relevant services for the elderly (Brick and Clarfield, 2007; Yang, 2018). Yet, little attention has been paid to the potential of SOs to participate in China's elderly care services.

Furthermore, previous studies had investigated associations between social support, institutional satisfaction, anxiety, and depression (Seabrook et al., 2016; Alipour et al., 2019; Barnett et al., 2019); however, the combined effects of these factors on depression and the underlying mechanisms of those relationships remain unclear. Besides, lacking social support has been positively associated with anxiety in type 2 diabetic patients (Wu

FIGURE 1 | Theoretical model and hypotheses.
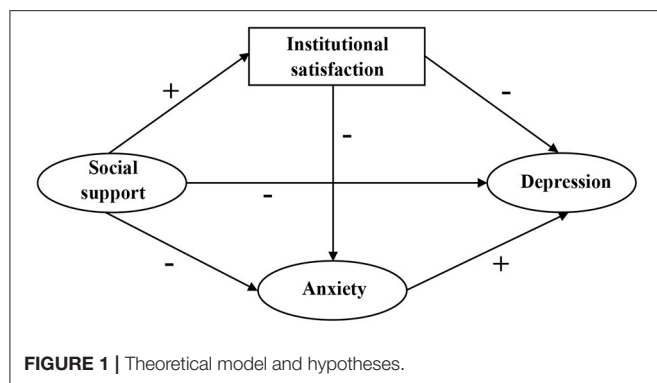
TABLE 1 | The theoretical hypotheses.

Theoretical hypotheses

1. Social support has a direct negative relationship with depression

2. Institutional satisfaction has a direct negative relationship with depression

3. Anxiety has a direct positive relationship with depression

4. Social support has a direct positive relationship with institutional satisfaction

5. Social support has a direct negative relationship with anxiety

6. Institutional satisfaction has a direct negative relationship with anxiety

7. The relationship between social support and depression is mediated by institutional satisfaction

8. The relationship between social support and depression is mediated by anxiety

9. The relationship between social support and anxiety is mediated by institutional satisfaction

10. The relationship between institutional satisfaction and depression is mediated by anxiety

et al., 2013) and hospitalized cardiac patients (Hughes et al., 2004). Given recent findings indicating that anxiety predicts depression (Gay et al., 2010, 2017) and the acknowledged role of social support in mental health (Yasin and Dzulkifli, 2010), we speculated that anxiety mediates the relationship between social support and depression in hypertension patients in elderly caring SOs. In addition, a prior study demonstrated the relationship between social support and life satisfaction, as well as their interactions in explaining depression among the elderly (Moon, 2010; Nam and Bok, 2013; Matud et al., 2019; Fang et al., 2021). Thus, we hypothesized the mediation effect of institutional satisfaction on the association between social support and depression among hypertension patients in elderly caring SOs. Moreover, researchers suggest that a high level of anxiety is associated with lower levels of life satisfaction (Rogowska et al., 2020). A low level of institutional satisfaction may cause hypertension patients to have feelings of distrust and disgust of elderly caring SOs, resulting in anxiety symptoms.

Thereby, to testify above mentioned research gaps and hypotheses, we employed structural equation modeling (SEM) to explore interrelationships between latent variables, which cannot be directly measured. According to the theoretical framework mentioned above, we developed the hypotheses

shown in **Table 1**, corresponding to the structural equation model displayed in **Figure 1**. Eventually, we aimed to provide a reference for interventions targeting mental health improvement of hypertension patients in elderly caring social organizations.

MATERIALS AND METHODS

Study Design and Data Collection

We conducted this cross-sectional survey in Anhui province, eastern China, between November and December 2019. Moreover, we used a multi-stage stratified random sampling method to ensure a representative sample considering socioeconomic levels and geographic location. As a result, we selected 15 elderly caring SOs from six cities in Anhui province: Fuyang, Anqing, Chizhou, Huainan, Luan, and Suzhou.

Following that, we identified potential participants, individuals diagnosed with hypertension in secondary hospitals and above, using chronic disease-related information from health records of residents in elderly caring SOs. With assistance from elderly caring SOs managers, skilled or trained graduate students personally conducted structured face-to-face interviews with participants. First, students verbally explained the study's purposes and procedures to interviewees, who were then requested to complete voluntary consent forms before the interviews. Those who could not fully understand verbal explanations due to severe deafness and limited communication skills were excluded. The analysis included 518 hypertension patients who agreed to be interviewed.

Measures

Demographic Data

Demographic data comprised age, gender, education level, visited frequency of relatives, marital status, self-perceived health level, and comorbid chronic diseases. Age was categorized as <70, 70–79, and ≥80 years. The educational level was divided into middle school and above, primary school, and no formal education. The visited frequency of relatives was classified into three categories: <2, 2–4, and ≥5 (times per month). Marital status was defined as a binary variable: married with spouse and divorced, unmarried, or widowed. Self-perceived health level was divided into low, medium, and high. We asked participants whether they were diagnosed with heart disease, malignant tumors, chronic obstructive pulmonary disease, diabetes (type 1 or 2), neurological disorders, hyperlipidemia, chronic hepatitis, or other chronic diseases. Finally, hypertension patients were categorized into a comorbid chronic diseases group if they had at least one of the above-mentioned diseases (Yan et al., 2019).

Social Support

Social support was assessed using Multidimensional Scale of Perceived Social Support (MSPSS) assessment scores. Gregory developed MSPSS scale to identify the participants' perceived social support elements (Zimet et al., 1988). This measure includes three subscales assessing perceived support quality from family, friends, and special persons. Participants rated on a seven-point Likert response format (1 = "very strongly disagree" to 7 = "very strongly agree"). As a result, higher scores indicate high

social support (Zimet et al., 1988). Scores from 12 to 48 indicate low social support, scores from 49 to 68 indicate moderate social support, and scores from 69 to 84 indicate high social support. In this study, Cronbach's α was found to be 0.98 for the family support subfield, 0.98 for the friend support subfield, 0.97 for the special person support subfield, and 0.96 for the scale in total, respectively, suggesting an adequate psychometric property in this sample.

Anxiety

Anxiety was measured using Generalized Anxiety Disorder 7-item Scale (GAD-7) (Spitzer et al., 2006). Participants indicate how frequently they have been bothered by each symptom over the last 2 weeks on a four-point Likert scale (0 = not at all, to 3 = nearly every day). Possible scores range from 0 to 21, with higher scores indicating higher levels of generalized anxiety. According to the scoring standard, the GAD-7 score is divided into 4 groups: 0–5, 6–10, 10–15, 16–21, corresponding to no, mild, moderate, and severe anxiety, respectively (Spitzer et al., 2006; Yang et al., 2020). GAD-7 has been shown to produce reliable and valid scores in community studies (Hinz et al., 2017), and the reliability in the current sample was acceptable (Cronbach's α = 0.88).

Institutional Satisfaction

A single item, "What is your overall satisfaction with the elderly caring social organizations?" was used to measure the institutional satisfaction of hypertension patients in elderly caring SOs. Many studies use a single item to measure overall satisfaction in large-scale satisfaction surveys with good reliability (Labarbera and Mazursky, 1983; Yi, 1990; Mittal et al., 1998). In this study, we employed a single item with a Likert 5-point option to measure the overall satisfaction of elderly caring SOs, where 1 represents very dissatisfied, and 5 represents very satisfied.

Depression

To assess depression, the Center for Epidemiologic Studies Depression Scale 10-item version (CESD-10) was employed, which has been demonstrated to appropriately reflect depressive symptoms experienced in the previous week (Andresen et al., 1994). CESD-10 includes ten items addressing depressed affect, somatic symptoms, and positive affect. The options for each item range from "rarely or none of the time" (score of 0) to "all of the time" (score of 3). The scoring is reversed for items 5 and 8, which are positive effect statements. Total scores can range from 0 to 30. Scores of 10 or over indicate clinically relevant depression (Andresen et al., 1994). The scale has excellent internal reliability (Cronbach's α = 0.80) and good validity (Roberts and Vernon, 1983). In the present study, Cronbach's α coefficient was acceptable (Cronbach α =0.81).

Statistical Analysis

Statistical analyses were conducted using SPSS 23.0 and MPLUS 8.3. First, descriptive statistics were calculated to describe the sample, and continuous variables are presented as mean ± standard deviation, while categorical variables are presented as percentages (%). Second, Pearson correlations were employed

TABLE 2 | Descriptive results of the sample.

Variables	N (%), Mean ± SD
Gender	
Male	298 (57.5)
Female	220 (42.5)
Age (years)	
<70	112 (21.7)
70–79	221 (42.7)
≥80	185 (35.6)
Education	
No formal education	269 (51.9)
Primary school	140 (27.0)
Middle school and above	109 (21.1)
Marital status	
Married have spouses	93 (18.0)
Divorced, widowed, or unmarried	425 (82.0)
Visited frequency of relatives (times/month)	
<2	224 (43.2)
2–4	96 (18.5)
≥5	198 (38.3)
Comorbid chronic diseases	
No	240 (46.3)
Yes	278 (53.7)
Self-perceived health level	
Low	159 (30.7)
Medium	288 (55.6)
High	71 (13.7)
Institutional satisfaction	
Very dissatisfied	1 (0.2)
Dissatisfied	30 (5.8)
General	63 (12.2)
Satisfied	251 (48.5)
Very satisfied	173 (33.3)
Social support	60.69 ± 16.42
From family	20.19 ± 6.98
From friends	19.80 ± 5.96
From significant others	20.69 ± 5.78
Anxiety	1.92 ± 3.18
Depression	6.24 ± 5.03

Continuous variables are presented as mean ± standard deviation; categorical variables are presented as number (%).

to explore the relationships between social support, institutional satisfaction, anxiety, and depression. A multiple linear regression model was used to estimate associations between independent variables and depression. Finally, SEM was used to test the hypotheses about four study variables. We used subscale scores of social support, scale scores of anxiety and depression as measurement variables, then used the total scores of these measures as latent variables. Institutional satisfaction was included as a measurement variable. Statistical significance was set at $P < 0.05$.

TABLE 3 | The correlation among key variables.

Variables	Social support	Institutional satisfaction	Anxiety	Depression
Social support				
Institutional satisfaction	0.335**			
Anxiety	−0.164**	−0.208**		
Depression	−0.296**	−0.378**	0.658**	

**P < 0.001.*

RESULTS

Descriptive Analysis

Descriptive statistics of the sample are displayed in **Table 2**. The participants contained 298 men (57.5%) and 220 women (42.5%). The highest proportion was 70–79 years old (42.7%), with no formal education (51.9%). Most participants were divorced, widowed, or unmarried (82.0%) and had comorbid chronic diseases (53.7%). A large proportion of hypertension patients in elderly caring SOs are visited by relatives less than twice a month (43.2%), and low levels of self-perceived health (30.7%) are more than those high levels of self-perceived health (13.7%).

The mean scores for social support, anxiety and depression were 60.69 ± 16.42, 1.92 ± 3.18, and 6.24 ± 5.03, respectively. The proportion of individuals with a high level of social support was 38.0%, and 86.7% of subjects had no anxiety symptoms. In addition, 21.4% of hypertension patients in elderly caring SOs exhibited depressive symptoms. Furthermore, 81.8% of participants were satisfied or very satisfied with their elderly caring SOs.

Correlations Between Study Variables

Correlations between social support, institutional satisfaction, anxiety, and depression are presented in **Table 3**. Social support was negatively correlated with anxiety and depression but positively correlated with the satisfaction of elderly caring SOs. Additionally, there was a significant negative correlation between institutional satisfaction and anxiety and depression. Anxiety was significantly positively correlated with depression.

Linear Regression Analysis of Study Variables

Table 4 reveals that depression among hypertension patients in elderly caring SOs was associated with the factor of comorbid chronic diseases, in addition to social support, institutional satisfaction, and anxiety. The depressive symptoms of hypertension patients who had comorbid chronic diseases were more serious than those who did not have ($\beta = 0.105$, $P = 0.001$).

Test of Study Model

SEM was used to test the model depicted in **Figure 1**. The path coefficient of the link between social support and depression was not statistically significant. As a result, we revised our model by removing this path. After setting socio-demographic characteristics as covariates, the direction

TABLE 4 | Multiple linear regression analysis of factors associated with depression.

	B	t	P	95% CI
Constant	5.444	5.670	<0.001	3.558, 7.331
Gender				
Male (ref)				
Female	0.571	1.589	0.113	−0.135, 1.276
Age (years)				
<70 (ref)				
70–79	−0.043	−0.106	0.916	−0.851, 0.764
≥80	0.761	1.698	0.090	−0.120, 1.643
Education				
No formal education (ref)				
Primary school	−0.644	−1.702	0.089	−1.387, 0.099
Middle school and above	−0.281	−0.665	0.506	−1.111, 0.549
Marital status				
Married have spouses (ref)				
Divorced, widowed, or unmarried	0.011	0.027	0.978	−0.822, 0.845
Visited frequency of relatives (times/month)				
<1 (ref)				
1–5	−0.724	−1.559	0.120	−1.636, 0.189
≥5	0.447	0.997	0.319	−0.433, 1.326
Comorbid chronic diseases				
No (ref)				
Yes	1.075	3.341	0.001	0.443, 1.708
Self-perceived health level				
Low (ref)				
Medium	−0.108	−0.310	0.757	−0.794, 0.578
High	−0.513	−1.001	0.317	−1.521, 0.494
Institutional satisfaction				
Very satisfied (ref)				
Satisfied	1.366	3.777	<0.001	0.655, 2.076
General	2.975	5.447	<0.001	1.902, 4.048
Dissatisfied	3.357	4.731	<0.001	1.963, 4.751
Very dissatisfied	3.829	1.069	0.285	−3.206, 10.864
Social support	−0.048	−4.041	<0.001	−0.071, −0.025
Anxiety	0.894	17.191	<0.001	0.791, 0.996

of influence among key variables remained unchanged, and corresponding coefficients remained unchanged. Thus, the socio-demographic characteristics were not confounding factors and were excluded from the final model. To improve model fitness, the covariance between measurement errors was set based on modification indices. **Figure 2** displays the final modified model that examined the associations between depression and social support, institutional satisfaction, and anxiety. Standardized coefficients representing direct associations between variables are displayed over the arrows. The model demonstrated good fit: $\chi^2 = 631.57$ ($p < 0.001$), $\chi^2/df = 3.53$, CFI = 0.93, TLI = 0.92, SRMR = 0.06, RMSEA = 0.07.

The total, direct, and indirect effects between social support, institutional satisfaction, anxiety, and depression are displayed in **Table 5**. Institutional satisfaction directly affected the depression

FIGURE 2 | Structural analysis of social support, institutional satisfaction, anxiety and depression. All coefficients are significant ($P < 0.05$).
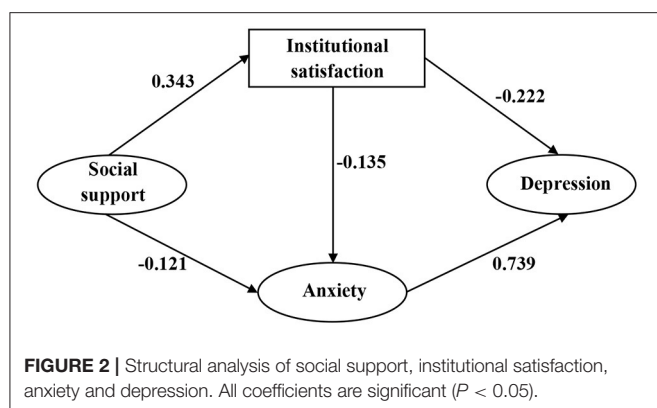
TABLE 5 | Direct, indirect, and total effects of key study variables.

Model pathways	Standardized coefficient	95% CI
Total effects		
Social support → Institutional satisfaction	0.343	0.250 to 0.435
Social support → Anxiety	−0.168	−0.270 to −0.070
Social support → Depression	−0.203	−0.289 to −0.124
Institutional satisfaction → Anxiety	−0.134	−0.256 to −0.011
Institutional satisfaction → Depression	−0.328	−0.432 to −0.216
Anxiety → Depression	0.745	0.670 to 0.808
Direct effects		
Social support → Institutional satisfaction	0.343	0.250 to 0.435
Social support → Anxiety	−0.122	−0.236 to −0.011
Institutional satisfaction → Anxiety	−0.134	−0.256 to −0.011
Institutional satisfaction → Depression	−0.228	−0.302 to −0.155
Anxiety → Depression	0.745	0.670 to 0.808
Indirect effects		
Social support → Anxiety	−0.046	−0.098 to −0.003
Social support → Depression	−0.203	−0.289 to −0.124
Institutional satisfaction → Depression	−0.100	−0.189 to −0.008

TABLE 6 | Significance of mediating pathways.

Model pathways	95% CI
Social support → Institutional satisfaction → Depression	−0.116 to −0.047
Social support → Anxiety → Depression	−0.179 to −0.008
Social support → Institutional satisfaction → Anxiety	−0.098 to −0.003
Institutional satisfaction → Anxiety → Depression	−0.189 to −0.008

($\beta = -0.228$, 95% CI: −0.302 to −0.155) of hypertension patients in elderly caring SOs, thus supporting Hypothesis 2. Anxiety was directly associated with depression ($\beta = 0.745$, 95% CI: 0.670–0.808), corroborating Hypothesis 3. However, social support was only indirectly associated with depression ($\beta = -0.203$, 95% CI:

−0.289 to −0.124), rather than directly associated, leading us to reject Hypothesis 1. Greater social support was linked to an enhanced likelihood of having higher institutional satisfaction ($\beta = 0.343$, 95% CI: 0.250–0.435) and a lower level of anxiety ($\beta = -0.122$, 95% CI: −0.236 to −0.011), corroborating Hypotheses 4 and 5. Institutional satisfaction exhibited a direct association with the anxiety of hypertension patients ($\beta = -0.134$, 95% CI: −0.256 to −0.011), corroborating Hypothesis 6.

Table 6 displays significance testing results of mediating pathways. A mediating effect was considered statistically significant if 95% confidence interval did not include zero. The results illustrated that institutional satisfaction and anxiety mediated the relationship between social support and depression (95% CI: −0.116 to −0.047 and −0.179 to −0.008, respectively), supporting Hypotheses 7 and 8. Besides, institutional satisfaction mediated the relationship between social support and anxiety (95% CI: −0.098 to −0.003), corroborating Hypothesis 9. Anxiety mediated the relationship between institutional satisfaction and depression (95% CI: −0.189 to −0.008), thus supporting Hypothesis 10.

DISCUSSION

To the best of our knowledge, this research is the first to explore the relationships between social support, institutional satisfaction, anxiety, and depression in hypertension patients in elderly caring SOs in China.

In the current study, lower institutional satisfaction was linked to an increased risk of depression in hypertension patients in elderly caring SOs. Lower institutional satisfaction may result in lower quality of life and trust, a weaker sense of happiness, and easy to produce negative emotions, which is similar to a study indicating a significant negative correlation between depression and life satisfaction in nursing home residents (Kim and Hwang, 2017). Additionally, high-level institutional satisfaction may be conducive to hypertension control and prognosis. A study found that the correlation between patient satisfaction and compliance to treatment is well documented (Calabro et al., 2018).

The present study found that anxiety was positively linked to depressive symptoms in study samples, consistent with previous research showing that anxiety was an independent predictor of depressive symptoms (Gay et al., 2017). Individuals with high anxiety levels often exhibit symptoms such as fear, worry, insomnia, and fatigue, leading to accumulation of negative emotions that cannot be resolved for a long time (Gay et al., 2017), which may contribute to depressive symptoms in this group. Interestingly, our study evidenced the mediating effect of anxiety on the relationship between institutional satisfaction and depression. Hypertension patients in elderly caring SOs with a high level of institutional satisfaction may have more trust in elderly caring SOs, promoting communication with others and improving interpersonal relationships, and ultimately reducing their risk of depression. In other words, anxiety not only has a direct positive relationship with depression but has also been shown to weaken the possible beneficial effects of institutional satisfaction on depression.

According to previous research, subjects with a lower level of social support are more likely to develop cardiovascular disease due to a history of hypertension. They are at increased risk of experiencing higher blood pressure, less nocturnal blood pressure decrease, and a worse prognosis after a cardiovascular event (Blumenthal et al., 1987; Rosengren et al., 2004; Barth et al., 2010). One study reported a threefold increase in the risk of all-cause mortality in hypertension patients with poor social support (Menéndez-Villalva et al., 2015). Consequently, insufficient social support offered to hypertension patients calls for more attention. In this study, participants received relatively little support from family and friends. Therefore, special attention needs to be given to hypertension patients in elderly caring SOs who lack the care of friends and family members and improve their social support to reduce negative emotions.

Multiple literature documented that lack of social support is a strong predictor of depression in hypertension patients (Dennis et al., 2008; Ma, 2018). However, different from other studies, our study indicated that the direct relationship between social support and depression was not significant in the study samples. Through the mediating effects of institutional satisfaction and anxiety, social support had an indirect effect on depression. A lack of social support was associated with a higher likelihood of having a low level of institutional satisfaction, suggesting that social support can increase the trust and sense of belonging in hypertension patients in elderly caring SOs, thereby enhancing institutional satisfaction should be emphasized. The mediating pathways revealed that lack of social support might impact the risk of institutional dissatisfaction and cause anxiety, thus potentially contributing to a higher prevalence of depression. This study contributes to our understanding of how social support affects depression and offers strategies that may benefit the mental health of hypertension patients.

Furthermore, linear regression revealed that comorbid chronic diseases were associated with depression among hypertension patients in elderly caring SOs. Participants with comorbid chronic diseases had a higher degree of depression than those without, which is consistent with previous studies (Findley et al., 2011; Ma, 2018). Higher physical comorbidities were associated with an increased risk of depression in hypertension patients in elderly caring SOs, resulting from persistent limitations in daily functioning associated with coexisting diseases.

Overall, relieving depressive symptoms in hypertension individuals in elderly caring SOs requires social support enhancement, institutional satisfaction, and anxiety reduction. In particular, more attention should be directed toward hypertension patients with comorbid chronic diseases in elderly caring SOs. More institution-based collective activities and social opportunities should be provided for hypertension individuals in elderly caring SOs to address the lack of social support caused by conditions. Moreover, care providers are an important social support resource whose activities in this regard should be encouraged (Chen et al., 2018). To enhance the institutional satisfaction of hypertension patients within elderly caring SOs, we suggest that elderly caring SOs should improve their environment and service quality while also expanding social capital into the elderly care sector to provide targeted elderly care services. The findings of previous study indicated that nursing home residents are more satisfied in smaller nursing homes and nursing homes with frequent opportunities for physical and social activity (Spangler et al., 2019). In addition, as artificial intelligence advances, applying data-driven intelligent platforms has huge potential in health management and health decision-making (Gu et al., 2019), effectively improving organizational performance and internal and external satisfaction. Elderly caring SOs should also pay attention to the anxiety of hypertension patients and take steps to reduce their anxiety levels.

This study has several limitations. First, the cross-sectional design of this study describes the relationships between depression and social support, anxiety, and institutional satisfaction; it does not enable one to infer causality of the three determinants on depression in hypertension individuals in elderly caring SOs. Further studies using a longitudinal or randomized control trial design are proposed. Second, since we conducted this study in Anhui Province, the generalizability of our findings is limited. Future studies that include expanded areas and larger sample size are required.

Despite the above limitations, our findings are reliable because the sample was representative and had high response rates. Furthermore, our study adds important findings regarding the factors that influence depression and mechanisms underlying these factors' relationships in hypertension patients in elderly caring SOs and provide insights into designing focused and effective measures for depression prevention in hypertension patients in elderly caring SOs and control work.

CONCLUSION

Our findings indicated that social support, institutional satisfaction, anxiety, and comorbid chronic diseases were significantly associated with depression in hypertension patients in elderly caring SOs and elucidated possible mechanisms behind these variables. Institutional satisfaction had a direct negative correlation with depression, whereas anxiety was directly positively associated with depression. Social support was indirectly negatively associated with depression, mediated by anxiety and institutional satisfaction. Institutional satisfaction also had an indirect negative effect on depression *via* anxiety. In addition, hypertension patients with comorbid chronic diseases in elderly caring SOs exhibited more depressive symptoms.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

This study was approved and ethical approval was obtained from the Biomedical Ethics Committee, Anhui Medical University (No. 20180181). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KJ and ZB: conceptualization. HY and GC: methodology. YZ and LT: investigation. KJ: writing—original draft preparation. KJ, ZB, and RC: writing—review and editing. All authors have read and agreed to the published version of the manuscript.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Alipour, Z., Kazemi, A., Kheirabadi, G., and Eslami, A. A. (2019). Relationship between marital quality, social support and mental health during pregnancy. *Commun. Ment. Health J.* 55, 1064–1070. doi: 10.1007/s10597-019-00387-8

Andresen, E. M., Malmgren, J. A., Carter, W. B., and Patrick, D. L. (1994). Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am. J. Prev. Med.* 10, 77–84.

Atienza-González, F. L., Martínez, N., and Silva, C. (2020). Life satisfaction and self-rated health in adolescents: the relationships between them and the role of gender and age. *Span. J. Psychol.* 23:e4. doi: 10.1017/sjp.2020.10

Barnett, M. D., Martin, K. J., and Garza, C. J. (2019). Satisfaction with work-family balance mediates the relationship between workplace social support and depression among hospice nurses. *J. Nurs. Scholarsh.* 51, 187–194. doi: 10.1111/jnu.12451

Barth, J., Schneider, S., and von Känel, R. (2010). Lack of social support in the etiology and the prognosis of coronary heart disease: a systematic review and meta-analysis. *Psychosom. Med.* 72, 229–238. doi: 10.1097/PSY.0b013e3181d01611

Benetos, A., Labat, C., Rossignol, P., Fay, R., Rolland, Y., Valbusa, F., et al. (2015). Treatment with multiple blood pressure medications, achieved blood pressure, and mortality in older nursing home residents: the PARTAGE study. *JAMA Intern. Med.* 175, 989–995. doi: 10.1001/jamainternmed.2014.8012

Berkman, L. F., Kawachi, I., and Glymour, M. (2000). *Social Epidemiology*. Oxford: Oxford University Press, 200–203.

Blumenthal, J. A., Burg, M. M., Barefoot, J., Williams, R. B., Haney, T., and Zimet, G. (1987). Social support, type A behavior, and coronary artery disease. *Psychosom. Med.* 49, 331–340. doi: 10.1097/00006842-198707000-00002

Brick, Y., and Clarfield, A. M. (2007). "JDC-ESHEL," a unique non-governmental organization dedicated to the elderly in Israel. *Arch. Gerontol. Geriatr.* 44, 225–234. doi: 10.1016/j.archger.2006.05.002

Calabro, K. A., Raval, M. V., and Rothstein, D. H. (2018). Importance of patient and family satisfaction in perioperative care. *Semin. Pediatr. Surg.* 27, 114–120. doi: 10.1053/j.sempedsurg.2018.02.009

Chen, Y. C., Chang, L. C., Liu, C. Y., Ho, Y. F., Weng, S. C., and Tsai, T. I. (2018). The roles of social support and health literacy in self-management among patients with chronic kidney disease. *J. Nurs. Scholarsh.* 50, 265–275. doi: 10.1111/jnu.12377

Cheung, B., Au, T., Chan, S., Lam, C., Lau, S., Lee, R., et al. (2005). The relationship between hypertension and anxiety or depression in Hong Kong Chinese. *Exp. Clin. Cardiol.* 10, 21–24. Available online at: https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC2716224/pdf/ecc10021.pdf

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L. Jr., et al. (2003). Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* 42, 1206–1252. doi: 10.1161/01.HYP.0000107251.49515.c2

Chu, L. W., and Chi, I. (2008). Nursing homes in China. *J. Am. Med. Dir. Assoc.* 9, 237–243. doi: 10.1016/j.jamda.2008.01.008

Cohen, S., Underwood, L. G., and Gottlieb, L. (2000). *Social Support Measurement and Intervention*. Oxford: Oxford University Press

Compare, A., Zarbo, C., Manzoni, G. M., Castelnuovo, G., Baldassari, E., Bonardi, A., et al. (2013). Social support, depression, and heart disease: a ten year literature review. *Front. Psychol.* 4:384. doi: 10.3389/fpsyg.2013.00384

Davidson, K., Jonas, B. S., Dixon, K. E., and Markovitz, J. H. (2000). Do depression symptoms predict early hypertension incidence in young adults in the CARDIA study? Coronary artery risk development in young adults. *Arch. Intern. Med.* 160, 1495–1500. doi: 10.1001/archinte.160.10.1495

Dennis, J. P., Markey, M. A., Johnston, K. A., Vander Wal, J. S., and Artinian, N. T. (2008). The role of stress and social support in predicting depression among a hypertensive African American sample. *Heart Lung* 37, 105–112. doi: 10.1016/j.hrtlng.2007.03.003

Fang, Y., Niu, Y., and Dong, Y. (2021). Exploring the relationship between narcissism and depression: the mediating roles of perceived social support and life satisfaction. *Personal. Indiv. Differ.* 173:110604. doi: 10.1016/j.paid.2020.110604

Findley, P., Shen, C., and Sambamoorthi, U. (2011). Multimorbidity and persistent depression among veterans with diabetes, heart disease, and hypertension. *Health Soc. Work* 36, 109–119. doi: 10.1093/hsw/36.2.109

Gay, M. C., Bungener, C., Thomas, S., Vrignaud, P., Thomas, P. W., Baker, R., et al. (2017). Anxiety, emotional processing and depression in people with multiple sclerosis. *BMC Neurol.* 17:43. doi: 10.1186/s12883-017-0803-8

Gay, M. C., Vrignaud, P., Garitte, C., and Meunier, C. (2010). Predictors of depression in multiple sclerosis patients. *Acta Neurol. Scand.* 121, 161–170. doi: 10.1111/j.1600-0404.2009.01232.x

Gómez-Restrepo, C., Rodríguez, M. N., Díaz, N., Cano, C., and Tamayo, N. (2013). Depression and life satisfaction in people over 60 years old in the City of Bogotá: Survey of health, wellbeing and aging (SABE). *Rev. Colomb. Psiquiatr.* 43(Suppl 1), 65–70. doi: 10.1016/j.rcp.2013.11.008

Gottlieb, B. H., and Bergen, A. E. (2010). Social support concepts and measures. *J. Psychosom. Res.* 69, 511–520. doi: 10.1016/j.jpsychores.2009.10.001

Gu, D., Deng, S., Zheng, Q., Liang, C., and Wu, J. (2019). Impacts of case-based health knowledge system in hospital management: the mediating role of group effectiveness. *Inform. Manag.* 56:103162. doi: 10.1016/j.im.2019.04.005

Harris-Kojetin, L., Sengupta, M., Park-Lee, E., Valverde, R., Caffrey, C., Rome, V., et al. (2016). Long-term care providers and services users in the United States: data from the National Study of Long-Term Care Providers, 2013–2014. *Vital Health Stat.* 3, 1–105. doi: 10.13140/RG.2.1.1207.6407

Hinz, A., Klein, A. M., Brähler, E., Glaesmer, H., Luck, T., Riedel-Heller, S. G., et al. (2017). Psychometric evaluation of the Generalized Anxiety Disorder Screener GAD-7, based on a large German general population sample. *J. Affect. Disord.* 210, 338–344. doi: 10.1016/j.jad.2016.12.012

Hughes, J. W., Tomlinson, A., Blumenthal, J. A., Davidson, J., Sketch, M. H., and Watkins, L. L. (2004). Social support and religiosity as coping strategies for anxiety in hospitalized cardiac patients. *Ann. Behav. Med.* 28, 179–185. doi: 10.1207/s15324796abm2803_6

Hunt, C., Issakidis, C., and Andrews, G. (2002). DSM-IV generalized anxiety disorder in the Australian National Survey of Mental Health and Well-Being. *Psychol. Med.* 32, 649–659. doi: 10.1017/s0033291702005512

Kavalniene, R., Deksnyte, A., Kasiulevičius, V., Šapoka, V., Aranauskas, R., and Aranauskas, L. (2018). Patient satisfaction with primary healthcare services: are there any links with patients' symptoms of anxiety and depression? *BMC Fam. Pract.* 19:90. doi: 10.1186/s12875-018-0780-z

Kim, K. H., and Hwang, E. H. (2017). Comparison of quality of sleep, depression, and life satisfaction between older adults in nursing homes and long-term care hospitals in Korea. *Geriatr. Gerontol. Int.* 17, 142–149. doi: 10.1111/ggi.12651

Könner, F., Kuhnert, R., Budnick, A., Kolloch, R., Scholze, J., Dräger, D., et al. (2014). Arterial hypertension, antihypertensive therapy, and visit-to-visit blood pressure variability of elderly nursing home residents. *Dtsch Med. Wochenschr.* 139, 2441–2447. doi: 10.1055/s-0034-1387422

Köttl, H., Fallahpour, M., Hedman, A., Nygård, L., and Kottorp, A. (2021). Depression, everyday technology use and life satisfaction in older adults with cognitive impairments: a cross-sectional exploratory study. *Scand. J. Caring Sci.* 35, 233–243. doi: 10.1111/scs.12838

Krousel-Wood, M. A., and Frohlich, E. D. (2010). Hypertension and depression: coexisting barriers to medication adherence. *J. Clin. Hypertens.* 12, 481–486. doi: 10.1111/j.1751-7176.2010.00302.x

Labarbera, P. A., and Mazursky, D. (1983). A longitudinal assessment of consumer satisfaction/dissatisfaction: the dynamic aspect of the cognitive process. *J. Market. Res.* 20, 393–404.

Li, Y., Yang, L., Wang, L., Zhang, M., Huang, Z., Deng, Q., et al. (2017). Burden of hypertension in China: a nationally representative survey of 174,621 adults. *Int. J. Cardiol.* 227, 516–523. doi: 10.1016/j.ijcard.2016.10.110

Long, J., Duan, G., Tian, W., Wang, L., Su, P., Zhang, W., et al. (2015). Hypertension and risk of depression in the elderly: a meta-analysis of prospective cohort studies. *J. Hum. Hypertens.* 29, 478–482. doi: 10.1038/jhh.2014.112

Ma, C. (2018). The prevalence of depressive symptoms and associated factors in countryside-dwelling older Chinese patients with hypertension. *J. Clin. Nurs.* 27, 2933–2941. doi: 10.1111/jocn.14349

Matud, M. P., García, M. C., and Fortes, D. (2019). Relevance of gender and social support in self-rated health and life satisfaction in elderly Spanish people. *Int. J. Environ. Res. Public Health* 16:2725. doi: 10.3390/ijerph16152725

Menéndez-Villalva, C., Gamarra-Mondelo, M. T., Alonso-Fachado, A., Naveira-Castelo, A., and Montes-Martínez, A. (2015). Social network, presence of cardiovascular events and mortality in hypertensive patients. *J. Hum. Hypertens.* 29, 417–423. doi: 10.1038/jhh.2014.116

Meurs, M., Groenewold, N. A., Roest, A. M., van der Wee, N. J., Veltman, D. J., van Tol, M. J., et al. (2015). The associations of depression and hypertension with brain volumes: independent or interactive? *Neuroimage Clin.* 8, 79–86. doi: 10.1016/j.nicl.2015.03.020

Mittal, B. V., and Singh, A. K. (2010). Hypertension in the developing world: challenges and opportunities. *Am. J. Kidney Dis.* 55, 590–598. doi: 10.1053/j.ajkd.2009.06.044

Mittal, V., Ross, W. T., and Baldasare, P. M. (1998). The asymmetric impact of negative and positive attribute-level performance on overall satisfaction and repurchase intentions. *J. Market.* 62, 33–47. doi: 10.1177/002224299806200104

Moon, M. J. (2010). Factors influencing depression in elderly people living at home. *J. Korean Acad. Nurs.* 40, 542–550. doi: 10.4040/jkan.2010.40.4.542

Naderi, S. H., Bestwick, J. P., and Wald, D. S. (2012). Adherence to drugs that prevent cardiovascular disease: meta-analysis on 376,162 patients. *Am. J. Med.* 125, 882–887.e881. doi: 10.1016/j.amjmed.2011.12.013

Nam, K. S., and Bok, L. S. (2013). Spiritual well-being, social support, life satisfaction and depression in the community dwelling elderly. *J. East-West Nurs. Res.* 19, 186–194. doi: 10.14370/jewnr.2013.19.2.186

Oganov, R. G., Pogosova, G. V., Koltunov, I. E., Romasenko, L. V., Deev, A. D., and Iufereva Iu, M. (2011). Depressive symptoms worsen cardiovascular prognosis and shorten length of life in patients with arterial hypertension and ischemic heart disease. *Kardiologiia* 51, 59–66. Available online at: https://europepmc.org/article/med/21627600

Ojo, O. S., Malomo, S. O., and Sogunle, P. T. (2016). Blood pressure (BP) control and perceived family support in patients with essential hypertension seen at a primary care clinic in Western Nigeria. *J. Family Med. Prim. Care* 5, 569–575. doi: 10.4103/2249-4863.197284

Perkovic, V., Huxley, R., Wu, Y., Prabhakaran, D., and MacMahon, S. (2007). The burden of blood pressure-related disease: a neglected priority for global health. *Hypertension* 50, 991–997. doi: 10.1161/HYPERTENSIONAHA.107.095497

Pinquart, M., and Duberstein, P. R. (2010). Associations of social networks with cancer mortality: a meta-analysis. *Crit. Rev. Oncol. Hematol.* 75, 122–137. doi: 10.1016/j.critrevonc.2009.06.003

Prince, M. J., Wu, F., Guo, Y., Gutierrez Robledo, L. M., O'Donnell, M., Sullivan, R., et al. (2015). The burden of disease in older people and implications for health policy and practice. *Lancet* 385, 549–562. doi: 10.1016/s0140-6736(14)61347-7

Roberts, R. E., and Vernon, S. W. (1983). The center for epidemiologic studies depression scale: its use in a community sample. *Am. J. Psychiatry* 140, 41–46. doi: 10.1176/ajp.140.1.41

Rogowska, A. M., Kuśnierz, C., and Bokszczanin, A. (2020). Examining anxiety, life satisfaction, general health, stress and coping styles during COVID-19 pandemic in Polish sample of University students. *Psychol. Res. Behav. Manag.* 13, 797–811. doi: 10.2147/prbm.S266511

Rosengren, A., Hawken, S., Ounpuu, S., Sliwa, K., Zubaid, M., Almahmeed, W. A., et al. (2004). Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control study. *Lancet* 364, 953–962. doi: 10.1016/s0140-6736(04)17019-0

Scuteri, A., Spazzafumo, L., Cipriani, L., Gianni, W., Corsonello, A., Cravello, L., et al. (2011). Depression, hypertension, and comorbidity: disentangling their specific effect on disability and cognitive impairment in older subjects. *Arch. Gerontol. Geriatr.* 52, 253–257. doi: 10.1016/j.archger.2010.04.002

Seabrook, E. M., Kern, M. L., and Rickard, N. S. (2016). Social networking sites, depression, and anxiety: a systematic review. *JMIR Ment. Health* 3:e50. doi: 10.2196/mental.5842

Shao, H., Mohammed, M. U., Thomas, N., Babazadeh, S., Yang, S., Shi, Q., et al. (2017). Evaluating excessive burden of depression on health status and health care utilization among patients with hypertension in a nationally representative sample from the medial expenditure panel survey (MEPS 2012). *J. Nerv. Ment. Dis.* 205, 397–404. doi: 10.1097/nmd.0000000000000618

Shi, L., Lu, Z. A., Que, J. Y., Huang, X. L., Liu, L., Ran, M. S., et al. (2020). Prevalence of and risk factors associated with mental health symptoms among the general population in China during the coronavirus disease 2019 pandemic. *JAMA Netw. Open* 3:e2014053. doi: 10.1001/jamanetworkopen.2020.14053

Simonson, W., Han, L. F., and Davidson, H. E. (2011). Hypertension treatment and outcomes in US nursing homes: results from the US National Nursing Home Survey. *J. Am. Med. Dir. Assoc.* 12, 44–49. doi: 10.1016/j.jamda.2010.02.009

Spangler, D., Blomqvist, P., Lindberg, Y., and Winblad, U. (2019). Small is beautiful? Explaining resident satisfaction in Swedish nursing home care. *BMC Health Serv. Res.* 19:886. doi: 10.1186/s12913-019-4694-9

Spitzer, R. L., Kroenke, K., Williams, J. B., and Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch. Intern. Med.* 166, 1092–1097. doi: 10.1001/archinte.166.10.1092

Stephenson, J. (1999). Noncompliance may cause half of antihypertensive drug "failures". *JAMA* 282, 313–314. doi: 10.1001/jama.282.4.313

Strogatz, D. S., and James, S. A. (1986). Social support and hypertension among blacks and whites in a rural, southern community. *Am. J. Epidemiol.* 124, 949–956. doi: 10.1093/oxfordjournals.aje.a114484

Taher, M., Abredari, H., Karimy, M., Abedi, A., and Shamsizadeh, M. (2014). The relation between social support and adherence to the treatment of hypertension. *J. Educ. Commun. Health* 1, 59–67. doi: 10.20286/jech-010348

Tsartsalis, D., Dragioti, E., Kontoangelos, K., Pitsavos, C., Sakkas, P., Papadimitriou, G. N., et al. (2016). The impact of depression and cardiophobia on quality of life in patients with essential hypertension. *Psychiatriki* 27, 192–203. doi: 10.22365/jpsych.2016.273.192

Wei, T. M., and Wang, L. (2006). Anxiety symptoms in patients with hypertension: a community-based study. *Int. J. Psychiatry Med.* 36, 315–322. doi: 10.2190/5lx9-d3bh-fua3-pqf0

Wu, S. F., Young, L. S., Yeh, F. C., Jian, Y. M., Cheng, K. C., and Lee, M. C. (2013). Correlations among social support, depression, and anxiety in patients with type-2 diabetes. *J. Nurs. Res.* 21, 129–138. doi: 10.1097/jnr.0b013e3182921fe1

Wu, Y., Huxley, R., Li, L., Anna, V., Xie, G., Yao, C., et al. (2008). Prevalence, awareness, treatment, and control of hypertension in China: data from the

China National Nutrition and Health Survey 2002. *Circulation* 118, 2679–2686. doi: 10.1161/circulationaha.108.788166

Yan, R., Xia, J., Yang, R., Lv, B., Wu, P., Chen, W., et al. (2019). Association between anxiety, depression, and comorbid chronic diseases among cancer survivors. *Psychooncology* 28, 1269–1277. doi: 10.1002/pon.5078

Yang, X., You, L., Jin, D., Zou, X., Yang, H., and Liu, T. (2020). A community-based cross-sectional study of sleep quality among internal migrant workers in the service industry. *Comprehen. Psychiatry* 97:152154. doi: 10.1016/j.comppsych.2019.152154

Yang, Y. (2018). The role of NGOs in enabling elderly activity and care in the Community: a case study of silver wings in South Korea. *J. Cross-Cult. Gerontol.* 33, 217–228. doi: 10.1007/s10823-017-9323-7

Yasin, A. S., and Dzulkifli, M. A. (2010). The relationship between social support and psychological problems among students. *Int. J. Bus. Soc. Sci.* 1, 110–117. Available online at: http://ijbssnet.com/journals/Vol._1_No._3_December_2010/11.pdf

Yi, Y. (1990). A critical review of consumer satisfaction. *Rev. Market.* 4, 68–123.

Yu, W., Singh, S. S., Calhoun, S., Zhang, H., Zhao, X., and Yang, F. (2018). Generalized anxiety disorder in urban China: Prevalence, awareness, and disease burden. *J. Affect. Disord.* 234, 89–96. doi: 10.1016/j.jad.2018.02.012

Zimet, G. D., Dahlem, N. W., Zimet, G., and Farley, G. K. (1988). The multidimensional scale of perceived social support. *J. Personal. Assess.* 52, 30–41.

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

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Gender Difference in the Relationship of Physical Activity and Subjective Happiness Among Chinese University Students

Wenning Jiang[1], Jin Luo[2,3] and Hannan Guan[4,5]*

[1] *Antai College of Economics and Management, Shanghai Jiao Tong University, Shanghai, China, [2] School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai, China, [3] Institute of Healthy Yangtze River Delta, Shanghai Jiao Tong University, Shanghai, China, [4] School of Education, Shanghai Jiao Tong University, Shanghai, China, [5] Department of Education Information Technology, East China Normal University, Shanghai, China*

Background: Gender makes a difference in health and physical activity (PA). This research aimed to identify the gender difference in the relationship of PA and subjective happiness among Chinese university students.

Methods: A cross-sectional survey was conducted in Shanghai Jiao Tong University from July 7 to 17 in 2021, using an anonymous online self-report questionnaire. The questionnaire included the Chinese version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF), the Subjective Happiness Scale (SHS), the Depression Anxiety Stress Scale-21(DASS-21). The demographic and health-related factors were also reported. Linear regression was carried out to identify the relationship of PA and subjective happiness.

Findings: In total, 1,512 students (1,108 males and 404 females) from three comprehensive schools completed the survey. The SHS score was 17.20 ± 3.44, and it was 17.00 ± 3.23 in males, and 17.75 ± 3.93 in females, respectively ($p < 0.001$). There was no gender difference in vigorous, moderate PA, or walk min/week, while female students had longer sedentary behavior hours/day than males. Male students scored higher in each subscale of DASS-21. After controlling for confounders, vigorous PA min/week ($\beta = 0.002$, $p = 0.002$) and sedentary behavior hours/day ($\beta = 0.168$, $p = 0.005$) were significantly positively associated with happiness in male students. In contrast, walk min/week ($2 = 0.002$, $p = 0.005$) was significantly positively associated with happiness in female students.

Interpretation: This research demonstrated a significant gender difference in the association between PA and happiness. Policymakers and college management should pay more attention to PA programs to promote students' happiness and mental health status.

Keywords: physical activity, happiness, gender difference, China, students

INTRODUCTION

Physical activity (PA) is generally defined as body movement produced by muscles resulting in energy expenditure. PA includes occupational, sports, conditioning, household, or other activities (Rhodes and Sui, 2021). The benefits of PA on mental health have been broadly explored (Zhang and Chen, 2019; Ai et al., 2021; Guan et al., 2021; Kemel et al., 2021; Zemlin et al., 2021). However, many studies focused on the effects of PA on negative emotions, for example, depression and anxiety (Ströhle, 2009) or mental disorders (Rosenbaum et al., 2014). In comparison, the relationship between PA and positive emotion has been explored insufficiently.

Happiness is a positive component of mental well-being, generally defined as subjective enjoyment and contentment (Helliwell and Aknin, 2018). Some people rank happiness as one of the most important goals of their lives (Diener and Seligman, 2004). Many studies demonstrated the health benefits of happiness. For example, happiness is associated with lower disease and mortality risk (Trudel-Fitzgerald et al., 2019; Jenkins et al., 2021).

Among the associated factors of happiness, it is believed that PA is a significant one. For example, Lathia et al. (2017) revealed that individuals with more PA are happier among 10,889 freely available app users. Another study in 15 European countries showed that walking and vigorous PA were positively associated with happiness, while moderate PA was not associated with happiness (Richards et al., 2015). Some studies indicated that the effects of PA on happiness would be a favorable research area (Zhang and Chen, 2019; van Woudenberg et al., 2020). Meanwhile, a few studies have showed that female university students are more inactive than male students, by showing longer sedentary time or lower levels of PA (Han et al., 2017; Castro et al., 2018; Zhou et al., 2021).

As gender makes a difference in PA and happiness (Drehmer, 2018; Molsted et al., 2021) and health (Stenberg et al., 2021), we hypothesize that gender difference may exist in the correlation between PA and happiness. According to our best knowledge, rare studies focused on the gender difference in the association of PA and happiness. Therefore, this study aimed to explore the association of happiness with gender and PA in university students.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional survey was conducted in Shanghai Jiao Tong University from July 7 to 17 in 2021. Three comprehensive schools were chosen as convenience samples, and all undergraduates in these schools were invited to complete an anonymous online self-administered questionnaire. The QR code and weblink of the survey were posted online via WeChat. Generally, it took the participants 5–8 min to complete the questionnaire.

The Ethics Committee in Shanghai Jiao Tong University approved the research protocol (approval number: H2021158I). Each participant obtained the consent form before the response to the questionnaire.

Measures

Socio-Demographic Characteristics

This part involved essential socio-demographic characteristics of university students, which were selected based on previous studies (Ráthonyi et al., 2021; Yang et al., 2021; Zhou et al., 2021), including age, gender, grade, place of hometown, ethnic groups, specialty, monthly allowances, marital status.

Physical Activity

PA was assessed by the Chinese version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF), which has adequate validity and reliability (Mengyu, Fan et al., 2014; Meh et al., 2021). The participants reported days and times of PA during the last 7 days. PA was divided into three intensities: vigorous, moderate, and walking. Participants also reported sedentary behavior hours of each day. The Chronbach's α of IPAQ-SF was 0.73 in this study.

Subjective Happiness

We measured subjective happiness through the Chinese version of the Subjective Happiness Scale (SHS), which contains four items about subjective happiness (Lyubomirsky and Lepper, 1999). Previous studies demonstrated the Chinese version of SHS had substantial reliability and validity for subjective happiness in general Chinese population (Nan et al., 2014; Guo et al., 2020). Students were asked to respond to a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total score of subjective happiness was computed by summing all four items, while the second and the fourth items were reverse-coded. The Chronbach's α of SHS in our samples was 0.79.

Other Related Factors

Meanwhile, we used a Chinese version of the Depression Anxiety Stress Scale-21 (DASS-21) to assess depression, anxiety, and stress level, according to the same cut-off values reported previously (Jiang et al., 2020). The Chronbach's α of DASS-21 was 0.96. Alcohol use and cigarette and frequency of insomnia were also reported.

Data Analysis

We used one-sample K-S test to examine the normality of obtained data. Descriptive analyses about the sample's socio-demographic, PA and sedentary behavior times, happiness level, depression, anxiety, stress status, and other related factors were conducted. Demographic, PA, happiness, and related variables of male and female students were compared using t-test or Mann-Whitney U-test for continuous variables and the chi-squared test for categorical variables. We used backward stepwise multiple regression analysis

TABLE 1 | Characteristics of participants by gender, n (%).

Characteristic		Total (1512)	Male (1108)	Female (404)	p
Grade					**0.027**
	Freshman	406 (26.85)	311 (76.60)	95 (23.40)	
	Sophomore	408 (26.98)	307 (75.25)	101 (24.75)	
	Junior	463 (30.62)	316 (68.25)	147 (31.75)	
	Senior	235 (15.54)	174 (74.04)	61 (25.96)	
Place of hometown					0.254
	Urban	993 (65.67)	737 (74.22)	256 (25.78)	
	Rural	519 (34.33)	371 (71.48)	148 (28.52)	
Ethnicity					0.060
	Han Chinese	1,388 (91.80)	1,026 (73.92)	362 (26.08)	
	Minority nationality	124 (8.20)	82 (66.13)	42 (33.87)	
Monthly allowances (RMB)					0.145
	<1,000	188 (12.43)	141 (75.00)	47 (25.00)	
	1,000–1,499	511 (33.80)	379 (74.17)	132 (25.83)	
	1,500–1,999	395 (26.12)	294 (74.43)	101 (25.57)	
	2,000–2,499	231 (15.28)	172 (74.46)	59 (25.54)	
	2,500–2,999	66 (4.37)	40 (60.61)	26 (39.39)	
	≥3,000	121 (8.00)	82 (67.77)	39 (32.23)	
Relationship status					0.387
	Not dating nor married	870 (57.54)	627 (56.59)	243 (60.15)	
	Dating but unmarried	537 (35.52)	398 (35.92)	139 (34.41)	
	Married	64 (4.23)	52 (4.69)	12 (2.97)	
	Others	41 (2.71)	31 (2.80)	10 (2.48)	
Insomnia					0.983
	No	630 (41.67)	465 (73.81)	165 (26.19)	
	Seldom (≤3 times/month)	451 (29.83)	327 (72.51)	124 (27.49)	
	Sometimes (1–2 times/week)	280 (18.52)	205 (73.21)	75 (26.79)	
	Often (3–5 times/week)	113 (7.47)	84 (74.34)	29 (25.66)	
	Daily	38 (2.51)	27 (71.05)	11 (28.95)	
Cigarette use					**<0.001**
	No	1187 (78.51)	822 (69.25)	365 (30.75)	
	Ex-smoker	190 (12.57)	162 (85.26)	28 (14.74)	
	Current smoker	135 (8.93)	124 (91.85)	11 (8.15)	
Alcohol use					**<0.001**
	Never	874 (57.80)	575 (65.79)	299 (34.21)	
	Sometimes (1–4 times/month)	559 (36.97)	470 (84.08)	89 (15.92)	
	Often (>4 times/month)	79 (5.22)	63 (79.75)	16 (20.25)	
		Mean ± SD	Mean ± SD	Mean ± SD	p
Age (years)		21.20 ± 4.25	21.27 ± 4.27	21.00 ± 4.19	0.273
DASS-Depression		27.03 ± 9.82	27.51 ± 9.82	25.73 ± 9.71	**<0.001**
DASS-Anxiety		26.21 ± 9.72	26.73 ± 9.69	24.80 ± 9.67	**<0.001**
DASS-Stress		23.59 ± 8.11	23.84 ± 8.10	22.89 ± 8.10	**0.022**

Bold value for p < 0.05.

using subjective happiness level as the dependent variable to assess the effects of variables including PA, sedentary behavior, demographic, and other related factors in male and female students.

All statistical analyses were performed through the STATA software version 16.0 (Stata Corporation, College Station, TX, United States), with the significance level at the p-value of 0.05 (two-tailed).

RESULTS

Sample Characteristics

In total, 4,561 students were invited to participate, and 1,534 students responded (response rate = 33.63%). Finally, 1,512 students completed the questionnaire without logical errors and were included in the statistical analysis. Their mean age was 21.20 ± 4.25 years, and 73.28% of them were male. The

	Total (mean ± SD)	Male (mean ± SD)	Female (mean ± SD)	*p*
SHS score	17.20 ± 3.44	17.00 ± 3.23	17.75 ± 3.93	**<0.001**
Sedentary behavior hours/day	6.27 ± 1.59	6.21 ± 1.53	6.44 ± 1.74	**0.006**
	Mean (median, IQR)	**Mean (median, IQR)**	**Mean (median, IQR)**	
Vigorous PA min/week	37.27 (0.0)	37.73 (0.0)	36.01 (0.0)	0.759[a]
Moderate PA min/week	50.32 (0.0)	47.25 (0.0)	58.74 (0.0)	0.345[a]
Walk min/week	108.92 (0.0)	106.38 (0.0)	115.92 (0.0)	0.556[a]

Bold value for p < 0.05; IQR, inter-quartile range. [a]Mann-Whitney test.

TABLE 3 | Association of subjective happiness and PA.

	Male				Female			
Subjective happiness	β	95% CI (Lower)	95% CI (Upper)	*p*	β	95% CI (Lower)	95% CI (Upper)	*p*
PA								
Vigorous PA min/week	0.002	0.001	0.004	**0.002**	0.001	−0.002	0.004	0.614
Moderate PA min/week	0.000	−0.002	0.001	0.605	0.000	−0.003	0.002	0.896
Walk min/week	0.000	0.000	0.001	0.465	0.002	0.001	0.003	**0.005**
Sedentary behavior hours/day	0.168	0.051	0.284	**0.005**	0.075	−0.124	0.273	0.459
Other factors								
Monthly allowances	0.245	0.113	0.378	**<0.001**				
DASS-depression	−0.110	−0.129	−0.092	**<0.001**	−0.165	−0.201	−0.130	**<0.001**
Place of hometown (Rural)					−0.882	−1.602	−0.163	**0.016**

Bold value for p < 0.05.

demographic characteristics and related data of male and female students are shown in **Table 1**. Compared with female students, male students had higher depression, anxiety, stress level and were more likely to use cigarettes/alcohol.

Male students reported having 6.21 ± 1.53 sedentary behavior hours/day, while female students had 6.44 ± 1.74 h/day, which was significantly higher. Meanwhile, female students have a higher level of happiness than males. There were no significant differences in times of PA between male and female students. **Table 2** shows the detailed characteristics.

Association of Physical Activity and Subjective Happiness

We used backward stepwise multiple linear regression analysis for further testing. Three kinds of PA activity minutes per week and sedentary behavior hours per day were purposely remained in the regression analysis.

In male students, monthly allowance (β = 0.245, *p* < 0.001) and DASS-Depression score (β = −0.110, *p* < 0.001) were independently associated with the subjective happiness level. Among PA and sedentary behavior times, only vigorous PA min/week (β = 0.002, *p* = 0.002) and sedentary behavior hours/day (β = 0.168, *p* = 0.005) were significantly positively associated with subjective happiness. These factors together explained a 14.85% variance in the subjective happiness level.

In female students, only DASS-Depression score (β = −0.165, *p* < 0.001), rural hometown (β = −0.882, *p* = 0.016) and walk

min/week (β = 0.002, *p* = 0.005) were independently associated with the happiness level. These factors explained a 21.37% variance in subjective happiness (**Table 3**).

DISCUSSION

This research was one of the first to compare the gender differences in the relationship between PA and subjective happiness among Chinese university students. Multivariate regression analyses showed that vigorous PA min/week and sedentary behavior hours/day were significantly associated with happiness in male students. In contrast, walk min/week was associated with happiness in female students. This research demonstrated that there was a significant gender difference in the association between PA and happiness.

Gender differences significantly impact depression, anxiety, and stress levels in this study, as male students have a higher score of depression, anxiety, and stress. This is an intriguing finding against several previous studies in other countries. Ochnik et al. (2021) surveyed 2,349 students in nine countries through Generalized Anxiety Disorder (GAD-7), Perceived Stress Scale (PSS-10), to demonstrate that female was a credible predictor for GAD-7 and PHQ-8 scores. Another survey in 1,224 Brazilian university students also showed that female predictors for symptoms of depression, anxiety, and stress according to DASS-21 (Lopes and Nihei, 2021). A study in 515 Malaysian university students demonstrates that female students scored significantly

higher in DASS-21 (Pang et al., 2021). This kind of difference may be due to cultural factors and role expectations. In China, males generally have more aggressive norms and expectations than females, while females are more demanding for their household management than males (Zhou, 2018; Liu et al., 2021).

This study found that vigorous physical activity was significantly associated with subjective happiness in male students, and walk was associated with females. It suggests that male students should spend more time in vigorous PA and females more walking for optimal mental health. The relationship between PA and happiness has been widely documented (Zhang and Chen, 2019; Le et al., 2021). In most studies, the intensity of the physical activities had not been distinguished in the relationship. Furthermore, another research showed that moderate-intensity physical activity was not associated with happiness (Richards et al., 2015), which is aligned with this study. Meanwhile, Fisher et al. (2019) found out that vigorous-intensity PA was positively associated with happiness among female first-year medical students but not males, which is contrary to this study. In the future, more robust research is needed to determine the relationship.

The gender differences in the relationship could be explained by biological factors such as dopamine. As the dopaminergic system plays essential roles in many brain functions, including rewards and happy mood, it is hypothesized that dopaminergic signals act to regulate PA and happiness (Marques et al., 2021). Several studies suggested gender differences in microcircuit regulatory mechanisms, which can change dopamine dynamics (Hasbi et al., 2020; Robinson and Banks, 2021; Shin et al., 2021; Zachry et al., 2021). Nonetheless, the effects of dopamine on PA and happiness were unclear. More studies are needed to clarify the mechanism of gender differences in the association of PA and happiness.

This study has several limitations. First, as a cross-sectional survey, the causal relationship between PA and happiness cannot be addressed. Second, this study did not control factors such as family income, social status, and Body Mass Index, which can affect the relationship between PA and happiness. Third, all students were recruited from Shanghai Jiao Tong University in Shanghai, China. As a result, the generalizability of the research conclusions is limited. Fourth, the recall bias and response bias cannot be ruled out in this study.

CONCLUSION

The current study demonstrated that vigorous PA was significantly associated with happiness in male students, while walk was associated with happiness in female students. Policymakers and college management should pay more attention to PA programs to promote students' happiness and mental health status.

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 in Shanghai Jiao Tong University. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this manuscript.

AUTHOR CONTRIBUTIONS

JL made substantial contributions to the study design and critically revised the manuscript. All authors have read and approved the published version of the manuscript.

ACKNOWLEDGMENTS

The participating institutions and students are thanked for their contribution.

REFERENCES

Ai, X., Yang, J., Lin, Z., and Wan, X. (2021). Mental health and the role of physical activity during the COVID-19 pandemic. *Front. Psychol.* 12:759987. doi: 10.3389/fpsyg.2021.759987

Castro, O., Bennie, J., Vergeer, I., Bosselut, G., and Biddle, S. J. H. (2018). Correlates of sedentary behaviour in university students: a systematic review. *Prev. Med.* 116, 194–202. doi: 10.1016/j.ypmed.2018.09.016

Diener, E., and Seligman, M. E. (2004). Beyond money: toward an economy of well-being. *Psychol. Sci. Public Interest* 5, 1–31. doi: 10.1111/j.0963-7214.2004.00501001.x

Drehmer, J. E. (2018). Sex differences in the association between countries' smoking prevalence and happiness ratings. *Public Health* 160, 41–48. doi: 10.1016/j.puhe.2018.03.027

Fan, M., Lyu, J., and He, P. (2014). Chinese guidelines for data processing and analysis concerning the international physical activity questionnaire. *Chin. J. Epidemiol.* 35, 961–964. doi: 10.3760/cma.j.issn.0254-6450.2014.08.01

Fisher, J. J., Kaitelidou, D., and Samoutis, G. (2019). Happiness and physical activity levels of first year medical students studying in Cyprus: a cross-sectional survey. *BMC Med. Educ.* 19:475. doi: 10.1186/s12909-019-1790-9

Guan, C., Cheng, Z., Xie, F., Wang, R., Zhang, J., Yao, F., et al. (2021). Efficacy of abdomen-rubbing qigong exercise for chronic insomnia: study protocol for a randomized controlled trial. *Trials* 22:774. doi: 10.1186/s13063-021-05528-7

Guo, N., Luk, T. T., Ho, S. Y., Lee, J. J., Shen, C., Oliffe, J., et al. (2020). Problematic Smartphone use and mental health in Chinese adults: a population-based study. *Int. J. Environ. Res. Public Health* 17:844. doi: 10.3390/ijerph17030844

Han, H., Pettee Gabriel, K., and Kohl, H. W. III (2017). Application of the transtheoretical model to sedentary behaviors and its association with physical activity status. *PLoS One* 12:e0176330. doi: 10.1371/journal.pone.0176330

Hasbi, A., Nguyen, T., Rahal, H., Manduca, J. D., Miksys, S., Tyndale, R. F., et al. (2020). Sex difference in dopamine D1-D2 receptor complex expression and signaling affects depression- and anxiety-like behaviors. *Biol. Sex Differ.* 11:8. doi: 10.1186/s13293-020-00285-9

Helliwell, J. F., and Aknin, L. B. (2018). Expanding the social science of happiness. *Nat. Hum. Behav.* 2, 248–252. doi: 10.1038/s41562-018-0308-5

Jenkins, B. N., Moskowitz, J., Halterman, J. S., and Kain, Z. N. (2021). Applying theoretical models of positive emotion to improve pediatric asthma: a positive psychology approach. *Pediatr. Pulmonol.* 56, 3142–3147. doi: 10.1002/ppul.25600

Jiang, L. C., Yan, Y. J., Jin, Z. S., Hu, M. L., Wang, L., Song, Y., et al. (2020). The depression anxiety stress scale-21 in Chinese hospital workers: reliability, latent structure, and measurement invariance across genders. *Front. Psychol.* 11:247. doi: 10.3389/fpsyg.2020.00247

Kemel, P. N., Porter, J. E., and Coombs, N. (2021). Improving youth physical, mental and social health through physical activity: a systematic literature review. *Health Promot. J. Austr.* 1–12 doi: 10.1002/hpja.553

Lathia, N., Sandstrom, G. M., Mascolo, C., and Rentfrow, P. J. (2017). Happier people live more active lives: using smartphones to link happiness and physical activity. *PLoS One* 12:e0160589. doi: 10.1371/journal.pone.0160589

Le, F., Yap, Y., Tung, N. Y. C., Bei, B., and Wiley, J. F. (2021). The associations between daily activities and affect: a compositional isotemporal substitution analysis. *Int. J. Behav. Med.* doi: 10.1007/s12529-021-10031-z

Liu, D., Wu, Y., Jiang, F., Wang, M., Liu, Y., and Tang, Y. L. (2021). Gender differences in job satisfaction and work-life balance among Chinese physicians in tertiary public hospitals. *Front. Public Health* 9:635260. doi: 10.3389/fpubh.2021.635260

Lopes, A. R., and Nihei, O. K. (2021). Depression, anxiety and stress symptoms in Brazilian university students during the COVID-19 pandemic: predictors and association with life satisfaction, psychological well-being and coping strategies. *PLoS One* 16:e0258493. doi: 10.1371/journal.pone.0258493

Lyubomirsky, S., and Lepper, H. S. (1999). A measure of subjective happiness: preliminary reliability and construct validation. *Soc. Indic. Res.* 46, 137–155. doi: 10.1023/A:1006824100041

Marques, A., Marconcin, P., Werneck, A. O., Ferrari, G., Gouveia, É, R., Kliegel, M., et al. (2021). Bidirectional association between physical activity and dopamine across adulthood-a systematic review. *Brain Sci.* 11:829. doi: 10.3390/brainsci11070829

Meh, K., Jurak, G., Sorić, M., Rocha, P., and Sember, V. (2021). Validity and reliability of IPAQ-SF and GPAQ for Assessing sedentary behaviour in adults in the European Union: a systematic review and meta-analysis. *Int. J. Environ. Res. Public Health* 18:4602. doi: 10.3390/ijerph18094602

Molsted, S., Eidemak, I., and Aadahl, M. (2021). Sex difference in the association between physical activity and all-cause mortality in ambulatory patients with chronic kidney disease. *Int. J. Environ. Res. Public Health* 18:3698. doi: 10.3390/ijerph18073698

Nan, H., Ni, M. Y., Lee, P. H., Tam, W. W., Lam, T. H., Leung, G. M., et al. (2014). Psychometric evaluation of the Chinese version of the Subjective happiness scale: evidence from the Hong Kong FAMILY Cohort. *Int. J. Behav. Med.* 21, 646–652. doi: 10.1007/s12529-014-9389-3

Ochnik, D., Rogowska, A. M., Kuśnierz, C., Jakubiak, M., Schütz, A., Held, M. J., et al. (2021). Mental health prevalence and predictors among university students in nine countries during the COVID-19 pandemic: a cross-national study. *Sci. Rep.* 11:18644. doi: 10.1038/s41598-021-97697-3

Pang, N. T. P., James, S., Giloi, N., Rahim, S., Omar, A., Jeffree, M. S., et al. (2021). Relationships between psychopathology, psychological process variables, and sociodemographic variables and comparison of quarantined and non-quarantined groups of Malaysian University Students in the COVID-19 pandemic. *Int. J. Environ. Res. Public Health* 18:9656. doi: 10.3390/ijerph18189656

Ráthonyi, G., Takács, V., Szilágyi, R., Bácsné Bába, É, Müller, A., Bács, Z., et al. (2021). Your physical activity is in your hand-objective activity tracking among university students in Hungary, one of the most obese countries in Europe. *Front. Public Health* 9:661471. doi: 10.3389/fpubh.2021.661471

Rhodes, R. E., and Sui, W. (2021). Physical activity maintenance: a critical narrative review and directions for future research. *Front. Psychol.* 12:725671. doi: 10.3389/fpsyg.2021.725671

Richards, J., Jiang, X., Kelly, P., Chau, J., Bauman, A., and Ding, D. (2015). Don't worry, be happy: cross-sectional associations between physical activity and happiness in 15 European countries. *BMC Public Health* 15:53. doi: 10.1186/s12889-015-1391-4

Robinson, H. L., and Banks, M. L. (2021). Adding dopamine to the complexity of sex differences in opioid reinforcement. *Neuropsychopharmacology* 46, 1705–1706. doi: 10.1038/s41386-021-01060-z

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., and Ward, P. B. (2014). Physical activity interventions for people with mental illness: a systematic review and meta-analysis. *J. Clin. Psychiatry* 75, 964–974. doi: 10.4088/JCP.13r08765

Shin, S., Nam, H. Y., Lee, M. J., Pak, K., Kim, K., and Kim, I. J. (2021). Effect of sex on aging-related decline of dopamine transporter in healthy subjects. *Ann. Nucl. Med.* 35, 76–82. doi: 10.1007/s12149-020-01538-8

Stenberg, G., Fjellman-Wiklund, A., Strömbäck, M., Eskilsson, T., From, C., Enberg, B., et al. (2021). Gender matters in physiotherapy. *Physiother. Theory Pract.* 1–14. doi: 10.1080/09593985.2021.1970867 [Epub ahead of print].

Ströhle, A. (2009). Physical activity, exercise, depression and anxiety disorders. *J. Neural Transm. (Vienna)* 116, 777–784. doi: 10.1007/s00702-008-0092-x

Trudel-Fitzgerald, C., Millstein, R. A., Von Hippel, C., Howe, C. J., Tomasso, L. P., Wagner, G. R., et al. (2019). Psychological well-being as part of the public health debate? Insight into dimensions, interventions, and policy. *BMC Public Health* 19:1712. doi: 10.1186/s12889-019-8029-x

van Woudenberg, T. J., Bevelander, K. E., Burk, W. J., and Buijzen, M. (2020). The reciprocal effects of physical activity and happiness in adolescents. *Int. J. Behav. Nutr. Phys. Act.* 17:147. doi: 10.1186/s12966-020-01058-8

Yang, G., Li, Y., Liu, S., Liu, C., Jia, C., and Wang, S. (2021). Physical activity influences the mobile phone addiction among Chinese undergraduates: the moderating effect of exercise type. *J. Behav. Addict.* 10, 799–810. doi: 10.1556/2006.2021.00059

Zachry, J. E., Nolan, S. O., Brady, L. J., Kelly, S. J., Siciliano, C. A., and Calipari, E. S. (2021). Sex differences in dopamine release regulation in the striatum. *Neuropsychopharmacology* 46, 491–499. doi: 10.1038/s41386-020-00915-1

Zemlin, C., Stuhlert, C., Schleicher, J. T., Wörmann, C., Altmayer, L., Lang, M., et al. (2021). Longitudinal assessment of physical activity, fitness, body composition, immunological biomarkers, and psychological parameters during the first year after diagnosis in women with non-metastatic breast cancer: the BEGYN study protocol. *Front. Oncol.* 11:762709. doi: 10.3389/fonc.2021.762709

Zhang, Z., and Chen, W. (2019). A systematic review of the relationship between physical activity and happiness. *J. Happiness Stud.* 20, 1305–1322. doi: 10.1007/s10902-018-9976-0

Zhou, H., Dai, X., Lou, L., Zhou, C., and Zhang, W. (2021). Association of sedentary behavior and physical activity with depression in sport university students. *Int. J. Environ. Res. Public Health* 18:9881. doi: 10.3390/ijerph18189881

Zhou, Y. (2018). The Dual demands: gender equity and fertility intentions after the one-child policy. *J. Contemp. China* 28, 367–384. doi: 10.1080/10670564.2018.1542219

Psychological Impact of the COVID-19 Pandemic on Healthcare Professionals in Tunisia: Risk and Protective Factors

Ahmed Sami Hammami[1,2*†], Mohamed Jellazi[1†], Lobna Mahjoub[1], Maya Fedhila[3] and Sonia Ouali[1,2]

[1] Department of Internal Medicine, CHU F Bourguiba Monastir, Monastir, Tunisia, [2] Biochemistry Laboratory, LR12ES05 LR-NAFS "Nutrition – Functional Food and Vascular Health", Faculty of Medicine, University of Monastir, Monastir, Tunisia, [3] Faculty of Dental Medicine of Monastir, Monastir, Tunisia

Background: Our study aimed to evaluate the magnitude of different psychological outcomes among Tunisian healthcare professionals (HCPs) during the first wave of the coronavirus disease 2019 (COVID-19) pandemic, and to identify the associated factors.

Methods: Healthcare professionals completed a cross-sectional questionnaire during a 3-week period in the first wave of the COVID-19 pandemic in Tunisia. The survey collected demographic information, factors that may interfere with the psychological outcomes, behavioral changes, and mental health measures. Mental health was assessed using three scales: the Seven-Item Insomnia Severity Index, the Two-Item Patient Health Questionnaire, and the Two-Item Generalized Anxiety Disorder instrument. Multivariable logistic regression was conducted to identify factors associated with psychological outcomes.

Results: A total of 503 HCPs successfully completed the survey, and 493 agreed to enroll in the study: 411 (83.4%) physicians, 323 (64.2%) women, and 271 (55%) with a second-line work position. A significant proportion of HCPs had anxiety (35.7%), depression (35.1%), and insomnia (23.7%). Women, those with a psychiatric history, and those using public transportation had higher proportions for overall symptoms compared with other groups, for example, depression in 44.9% of female participants vs. 18.2% of male participants ($p = 0.00$). Those with a previous medical history and nurses had more anxiety and insomnia compared with other groups, for example, anxiety in 45.1% of nurses, 36.1% of interns/residents, and 27.5% of attending physicians ($p = 0.04$). Multivariable logistic regression showed that female gender was a risk factor for all psychological outcomes, whereas psychiatric history was a risk factor for both anxiety and insomnia [odds ratio (OR) = 2.86, 95% CI 1.78–4.60, $p = 0.00$ for insomnia]. Using protective equipment was associated with a lower risk for depression (OR = 0.41, 95% CI 0.27–0.62, $p = 0.00$) and anxiety. Physical activity was also protective against depression and anxiety (OR = 0.41, 95% CI 0.25–0.67, $p = 0.00$).

Conclusion: Psychological symptoms are usually overlooked or dismissed by HCPs, although the COVID-19 pandemic played a major role in exacerbating this burden. Prompt psychological support should be endorsed and simple measures, such as physical activity and ensuring the availability of personal protective equipment, are paramount to improve mental health outcomes and the quality of care provided to patients.

Keywords: psychological symptoms, mental health, healthcare professionals, COVID-19 pandemic, risk factors, protective factors

INTRODUCTION

At the end of December 2019, a novel coronavirus was reported to be the cause of a myriad of pneumonia cases in the Chinese city of Wuhan. The responsible agent was a virus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In this article, we will refer to the associated disease as the coronavirus disease 2019 (COVID-19) (Lai et al., 2020).

This rapidly spreading infection resulted in an epidemic throughout the entire region and subsequently the entire country of China, followed by a surging number of cases in other countries around the world, which progressively overwhelmed healthcare systems worldwide (Armocida et al., 2020; Xie et al., 2020). By the beginning of March 2020, it was identified as a pandemic (WHO, 2019). Consequently, the WHO highlighted the excessively high burden on healthcare professionals (HCPs), and called for an intervention to address the immediate needs and prevent serious impacts on both physical and mental health in this particular population (Covid 19 Public Health Emergency of International Concern (PHEIC), 2020).

Tunisia was not an exception to the spread of the pandemic, with the first case recorded on March 02, 2020 (Corona virus cases in Tunisia, 2020). As in other affected countries, psychological distress began to propagate, and quickly expanded among HCPs who are directly or indirectly involved in the diagnosis, treatment, and care of patients with COVID-19, and are therefore at high risk of infection (Xiao et al., 2020). Tunisia faced a specific challenge in preparing for the emerging pandemic: a context of political and economic fragility with a precarious financial situation following the democratic transition resulted in the deterioration of the healthcare system and decreasing motivation among HCPs (Zedini et al., 2016; Weilandt, 2018). Among the factors reported to contribute to the mental health burden of these healthcare workers are the overwhelming spread of the life-threatening disease, the gradual increase in numbers of newly diagnosed and suspected cases, the surge in mortality rates, the fear of becoming infected and transmitting the infection to loved ones, the enormous workload, the potential lack of personal protective equipment (PPE), the depletion of certain drugs, the lack of an effective treatment, and

feelings of being inadequately supported (Muller et al., 2020). Accordingly, it has been reported that during previous viral outbreaks, HCPs endured a high degree of both physical (Xiao et al., 2020) and mental stress during and even years after the end of epidemics (Lancee et al., 2008). The current pandemic has had several psychiatric consequences among healthcare practitioners who treat patients with confirmed or suspected COVID-19 infection (Xiang et al., 2020). Clearly, HCPs should be regarded as a high-risk population because of their higher anxiety, depression, and insomnia levels compared with the general population (Vindegaard and Benros, 2020). In addition, occupational stress in HCPs may exacerbate previously diagnosed psychological problems, and can lead to long-term psychological consequences; most importantly, it may adversely affect the quality of healthcare provided to patients.

A large number of studies in many different countries describe the prevalence of mental health sequelae associated with the COVID-19 pandemic (Brailovskaia et al., 2021). Those research have documented the magnitude of the psychological burden among healthcare workers (Wei et al., 2020; Busch et al., 2021), and have identified risk and protective factors (Wei et al., 2020; Brailovskaia et al., 2021). For instance, an Italian cross-sectional survey-based study with a retrospective assessment showed that the COVID-19 outbreak led to life changes in Italian healthcare workers in terms of increase in negative mood, worry, loneliness, fatigue, restlessness, and decrease in happiness (Mansueto et al., 2021). However, none of those studies provided data about the impact of this pandemic on mental health in the Maghreb region. In Tunisia, maintaining health workers' motivation is particularly challenging against a background of low levels of trust in the health system and the government, and this is also the case in other areas of the Middle East and North Africa (MENA) region where governments are perceived to be corrupt. Therefore, estimating the prevalence of risk factors in this population is important to guide public health measures intended to protect health professionals and their families, and to maintain a functioning healthcare system.

Addressing the needs of frontline HCPs during the COVID-19 pandemic is an important priority (Remuzzi and Remuzzi, 2020). Accordingly, the aims of our study were to screen for depression, anxiety, and insomnia among Tunisian HCPs during the first wave, and to detect potential risk factors associated with these psychological outcomes. Our findings will, we hope, help to maintain a sustainable, robust healthcare response to

---

Abbreviations: HCPs, healthcare professionals; COVID-19, novel coronavirus disease; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; PPE, personnel protective equipment; ISI, Insomnia Severity Index; PHQ-2, Two-Item Patient Health Questionnaire; GAD-2, Two-Item Generalized Anxiety Disorder instrument; MERS-CoV, Middle East respiratory syndrome coronavirus.

the pandemic while safeguarding the wellbeing of HCPs in our country and elsewhere.

MATERIALS AND METHODS

We conducted an online cross-sectional survey at a crucial time when the first wave of the COVID-19 pandemic was sweeping North Africa and Tunisia.

The eligibility criteria were employment as an HCP at any type of public or private health institution in all 24 Tunisian governorates that were registered with the Ministry of Health, and consent for data collection and analysis.

To reach a large number of HCPs, we released information about our survey through the official mailing list of the medical and paramedical professional network in Tunisia, and through health professional groups on Facebook. This approach allowed us to reach large numbers of survey respondents quickly and continuously in all governorates.

All participants were required to provide their consent electronically before responding to the questionnaire. Those who agreed were directed to the questionnaire, and those who declined automatically exited the survey.

Participants were required to respond to all the questions to submit their survey.

All 24 Tunisian governorates were involved, and the responses were then reassembled into three main subgroups according to the Tunisian health department, depending on the prevalence rate in each governorate, i.e., low-, moderate-, or high-prevalence regions (Corona virus cases in Tunisia, 2020).

This study received approval from the research ethics committee of the Faculty of Medicine of Monastir, Tunisia, before the survey was conducted.

The questionnaire was an Internet-based survey containing four sections: basic demographic information, factors that may interfere with psychological outcomes, psychological impact questions, and psychological screening tests.

Demographics

Data were collected for age (years), gender (male or female), marital status (married or unmarried), medical and psychological history, type of hospital (primary or secondary care center, or tertiary care hospital), technical title (intern/resident, attending/primary care physician, or nurse), and prevalence at the work location (low, moderate, or high).

Factors That May Interfere With Psychological Outcomes

These factors include work position (frontline for those who work on wards with COVID-19-positive patients and those who staff fever clinic nightshifts, second line for those working in other departments), working in the fever clinic (yes or no), type of transportation used to travel to work (public or private), having children (yes or no), living with family (yes or no), physical activity (yes or no), and the availability of PPE (yes or no).

Fever clinics are facilities usually established outside an emergency department to perform triage and classify patients according to their likelihood of having COVID-19 infection. These clinics have the authority to hospitalize high-risk patients as an interim solution until their subsequent assignment to a specialized unit.

Physical activity in the form of moderate aerobic exercise or more vigorous activity was considered activity performed two or more days per week and lasting at least 40 min per session. The type of physical activity was not specified in this survey.

Psychological Impact Questions

These items inquired about experiencing nightmares related to the virus, and about noticeable changes in how respondents performed regular physical examinations for patients.

Psychological Screening Tests

We used three tests to screen for potential mental disorders among HCPs: the Seven-Item Insomnia Severity Index (ISI), the Two-Item Patient Health Questionnaire (PHQ-2), and the Two-Item Generalized Anxiety Disorder instrument (GAD-2).

The ISI is a concise self-reporting tool that measures the respondent's perception of insomnia. Scores range from 0 to 28, with 0–7 indicating no significant insomnia, 8–14 indicating subthreshold insomnia, 15–21 indicating moderate insomnia, and 22–28 indicating severe insomnia (Morin et al., 2011). We defined clinically significant insomnia as a score ≥ 15 (merging the latter two categories), and non-clinically significant insomnia as a score < 15 (merging the first two categories).

Depression and anxiety were assessed with the PHQ-2 and the GAD-2 instrument, respectively. A score of three points was the preferred cut-off to positively screen for depression (Löwe et al., 2010) and anxiety (Kroenke et al., 2007). We divided participants into 2 groups: those who screened positively for depression and anxiety (score ≥ 3) and those whose score was < 3.

Statistical Analysis

All data were analyzed with SPSS statistical software, version 26.0 (IBM Corp, Monastir, Tunisia). The significance level was set at $p \leq 0.05$, and all tests were two-tailed. The ranked data were calculated from the counts of each level of symptoms of anxiety, depression, and insomnia in accordance with the pre-established scales we used, and all descriptive data are expressed as numbers (n) and frequencies (%). Quantitative variables were compared between two groups with the t-test, and between more than two groups with analysis of variance. Categorical variables were compared with Fisher's exact test. Univariate analysis was used to evaluate candidate predictors of mental health disorders, and variables with p values < 0.2 were selected for the multivariable analysis. The associations between outcomes and risk factors are presented as odds ratios (OR) and 95% CI, after adjustment for confounders.

RESULTS

The initial total number of participants was 503 (100%), of whom 10 (2%) declined to participate in the survey. The final number of participants was 493.

TABLE 1 | Demographic and occupational characteristics of participants.

Characteristics	No. (%)								
		Workplace (COVID risk)			Occupation		Technical title (3 subgroups)		
	Total	Low	Moderate	High	Physician	Nurse	Intern/Resident	Attending	Nurse
Overall	493 (100)	96 (19.5)	234 (47.5)	163 (33.1)	411 (83.4)	82 (16.6)	302 (61.3)	109 (22.1)	82 (16.6)
Gender									
Male	170 (33.8)	38 (39.6)	74 (31.6)	58 (35.6)	145 (35.3)	25 (30.5)	97 (32.1)	48 (44)	25 (30.5)
Female	323 (64.2)	58 (60.4)	160 (68.4)	105 (64.4)	266 (64.7)	57 (69.5)	205 (67.9)	61 (56)	57 (69.5)
Age (years)									
<30	330 (66.9)	58 (60.4)	165 (70.5)	107 (65.6)	284 (69.1)	46 (56.1)	265 (87.7)	19 (17.4)	46 (56.1)
≥30	163 (33.1)	38 (39.6)	69 (29.5)	56 (34.4)	127 (30.9)	36 (43.9)	37 (12.3)	90 (82.6)	36 (43.9)
Marital status									
Unmarried	351 (69.8)	65 (67.7)	168 (71.8)	118 (72.4)	299 (72.7)	52 (63.4)	252 (83.4)	47 (43.1)	52 (63.4)
Married	142 (28.2)	31 (32.3)	66 (28.2)	45 (27.6)	112 (27.3)	30 (36.6)	50 (16.6)	62 (56.9)	30 (36.6)
Pregnant	5 (1)	2 (2.1)	1 (0.4)	2 (1.2)	5 (1.2)	0 (0)	3 (1)	2 (1.8)	0 (0)
Children									
Yes	113 (22.5)	25 (26)	52 (22.2)	26 (22.1)	86 (20.9)	27 (32.9)	24 (7.9)	62 (56.9)	27 (32.9)
No	380 (75.5)	71 (74)	182 (77.8)	127 (77.9)	325 (79.1)	55 (67.1)	278 (92.1)	47 (43.1)	55 (67.1)
Living with family									
No	202 (41)	37 (38.5)	95 (40.6)	70 (42.9)	186 (45.3)	16 (19.5)	160 (53)	26 (23.9)	16 (19.5)
Yes	291 (59)	59 (61.5)	139 (59.4)	93 (57.1)	225 (54.7)	66 (80.5)	142 (47)	83 (76.1)	66 (80.5)
Medical history									
Yes	106 (21.5)	22 (22.9)	49 (20.9)	35 (21.5)	94 (22.9)	12 (14.6)	58 (19.2)	36 (33)	12 (14.6)
No	387 (78.5)	74 (77.1)	185 (79.1)	128 (78.5)	317 (77.1)	70 (85.4)	244 (80.8)	73 (67)	70 (85.4)
Psychiatric history									
Yes	63 (12.8)	12 (12.5)	34 (14.5)	17 (10.4)	54 (13.1)	9 (11)	45 (14.9)	9 (8.3)	9 (11)
No	430 (87.2)	84 (87.5)	200 (85.5)	146 (89.6)	357 (86.9)	73 (89)	257 (85.1)	100 (91.7)	73 (89)
Work position									
Frontline	222 (45)	47 (49)	111 (47.4)	64 (39.3)	176 (42.8)	46 (56.1)	140 (46.4)	36 (33)	46 (56.1)
Second line	271 (55)	49 (51)	123 (52.6)	99 (60.7)	235 (57.2)	36 (43.9)	162 (53.6)	73 (67)	36 (43.9)
Type of hospital									
Primary and secondary care center	130 (26.4)	31 (32.3)	62 (26.5)	37 (22.7)	90 (21.9)	40 (48.8)	23 (7.6)	67 (61.5)	40 (48.8)
Tertiary care center	363 (73.6)	65 (67.7)	47.4 (73.5)	126 (77.3)	321 (78.1)	42 (51.2)	279 (92.4)	42 (38.5)	42 (51.2)

Demographic Characteristics

The characteristics of the participants are presented in **Table 1**.

The final number of participants enrolled in this study was 493, of whom 411 (83.4%) were physicians and 82 (16.6%) were nurses. The majority of respondents (47.5%) worked in moderate-prevalence regions. Most participants were women (323, 64.2%), were younger than 30 years old (330, 66.9%), were unmarried (351, 69.8%), and worked in tertiary care centers (363, 73.6%). In most participants, there was no history of medical (387, 78.5%) or psychiatric illness (430, 87.2%), and a majority worked as second-line HCPs (271, 55%).

Factors Associated With Psychological Findings

A significant proportion of HCPs had depression (35.1%), anxiety (35.7%), and insomnia (23.7%); overall, at least one of these psychological outcomes was present in 45.8% of HCPs. Women, respondents who had a history of psychiatric illness, and HCPs who used public transportation had higher overall frequencies for

all symptoms. Anxiety was noted by 44.9% of women vs. 18.2% of men, and insomnia was noted by 29.1% of women vs. 13.5% of men (both $p = 0.00$). Among participants with a history of psychiatric illness, anxiety was noted by 63.5% vs. 31.6% of those with no such history ($p = 0.00$), and depression was noted by 54.0% of the former vs. 32.3% of the latter ($p = 0.01$). Among those who used public transportation, anxiety was present in 50.4% vs. 31.2% of participants who used private transportation ($p = 0.00$) (**Table 2**). Among HCPs who were ≥ 30 years old, symptoms of anxiety were more frequent (73.0%) compared with younger participants (60.0%, $p = 0.00$).

A previous history of medical illness and being employed as a nurse were both associated with a higher frequency of anxiety and insomnia compared with employment as an intern or resident, or as an attending physician. Anxiety was found in 45.1% of nurses vs. 36.1% of interns/residents and 27.5% of attending physicians ($p = 0.04$), and insomnia was seen in 23.7% of nurses, 19.9% of interns/residents, and 21.1% of attending physicians ($p = 0.00$). In addition, participants with a history of medical illness showed more anxiety and insomnia compared with those with no such

TABLE 2 | Anxiety, depression, and insomnia measures in the total cohort and subgroups.

Variables	PHQ-2, depression			GAD-2, anxiety			ISI, insomnia		
	Depressed	Not depressed	p value	Anxiety	No anxiety	p value	Insomnia	No insomnia	p value
Total	173 (35.1)	320 (64.9)		176 (35.7)	317 (64.3)		117 (23.7)	367 (76.3)	
Age (years)									
<30	122 (37)	208 (63)	0.214	198 (60)	132 (40)	<0.01	74 (22.4)	256 (77.6)	0.331
≥30	51 (31.3)	112 (68.7)		119 (73)	44 (27)		43 (26.4)	120 (73.6)	
Gender									
Male	42 (24.7)	128 (75.3)	<0.01	31 (18.2)	139 (81.8)	<0.01	23 (13.5)	147 (86.5)	<0.01
Female	131 (40.6)	192 (59.4)		145 (44.9)	178 (55.1)		94 (29.1)	229 (70.9)	
Medical history									
Yes	44 (41.5)	62 (58.5)	0.118	48 (45.3)	58 (54.7)	0.02	34 (32.1)	72 (67.9)	0.023
No	129 (33.3)	258 (66.7)		128 (33.1)	259 (66.9)		83 (21.4)	304 (78.6)	
Psychiatric history									
Yes	34 (54)	29 (46)	<0.01	40 (63.5)	23 (36.5)	<0.01	33 (52.4)	30 (47.6)	<0.01
No	139 (32.3)	291 (67.7)		136 (31.6)	294 (68.4)		84 (19.5)	346 (80.5)	
Work position									
Frontline	88 (39.6)	134 (60.4)	0.055	76 (34.2)	146 (65.8)	0.539	62 (27.9)	160 (72.1)	0.047
Second line	85 (31.4)	186 (68.6)		100 (36.9)	171 (63.1)		55 (20.3)	216 (79.7)	
Fever clinic									
Yes	65 (41.1)	93 (58.9)	0.034	97 (61.4)	61 (38.6)	0.204	46 (29.1)	112 (70.9)	0.036
No	108 (32.2)	227 (67.8)		220 (65.7)	115 (34.3)		71 (21.2)	264 (78.8)	
Technical title									
Interns and residents	103 (34.1)	199 (65.9)	0.161	109 (36.1)	193 (63.9)	0.042	60 (19.9)	242 (80.1)	<0.01
Attending and primary care physicians	34 (31.2)	75 (68.8)		30 (27.5)	79 (72.5)		23 (21.1)	86 (78.9)	
Nurses	36 (43.9)	46 (56.1)		37 (45.1)	45 (54.9)		34 (23.7)	48 (76.3)	
Protective equipment									
Yes	71 (26.4)	198 (73.6)	<0.01	80 (29.7)	189 (70.3)	<0.01	53 (19.7)	216 (80.3)	0.021
No	102 (45.5)	122 (54.5)		96 (42.9)	128 (57.1)		64 (28.6)	160 (71.4)	
Physical activity									
Yes	39 (24.8)	118 (75.2)	<0.01	36 (22.9)	121 (77.1)	<0.01	28 (17.8)	129 (82.2)	0.035
No	134 (39.9)	202 (60.1)		140 (41.7)	196 (58.3)		89 (26.5)	247 (73.5)	
Children									
Yes	36 (31.9)	77 (68.1)	0.434	30 (26.5)	83 (74.3)	0.021	29 (25.7)	84 (74.3)	0.583
No	137 (36.1)	243 (63.9)		146 (38.4)	234 (61.6)		88 (23.2)	292 (76.8)	
Public transportation									
Yes	54 (47)	61 (53)	<0.01	58 (50.4)	57 (49.6)	<0.01	35 (30.4)	80 (69.6)	0.037
No	119 (31.5)	259 (68.5)		118 (31.2)	260 (68.8)		82 (21.7)	296 (78.3)	
Living with family									
Yes	102 (59)	71 (41)	0.529	113 (38.83)	178 (61.17)	0.049	73 (25.1)	218 (74.9)	0.23
No	189 (59.1)	131 (40.9)		63 (31.18)	139 (68.81)		44 (21.8)	158 (78.2)	

history. Among the former, anxiety was seen in 45.3% vs. 33.1% of the latter ($p = 0.02$). Insomnia was seen in 32.1% of respondents with a previous medical history vs. 21.4% of those with no such history ($p = 0.02$).

Healthcare professionals employed in frontline positions had more frequent insomnia (27.9%) than those working in second-line positions (20.3%, $p = 0.04$). Individuals working in fever clinics were more prone to have symptoms of depression (41.1% vs. 32.2%, $p = 0.03$) and insomnia (29.1% vs. 21.2%, $p = 0.03$) compared with those who did not work in this clinical setting. We highlight the finding that 33.7% of all participants had nightmares related to the virus, and 66.3% reported

behavioral changes in performing routine clinical examinations of their patients.

Compared with those who lived alone, HCPs who lived with their family were more prone to anxiety. Among HCPs living with their family, anxiety was found in 38.8% vs. 31.18% of those who lived alone ($p = 0.04$).

Physical activity and the availability of PPE were associated with a lower frequency of psychiatric outcomes. Anxiety was noted in 22.9% of participants who were physically active vs. 41.7% of those who were not ($p = 0.00$). Depression was noted in 26.4% of those who had access to PPE vs. 45.5% of those who did not ($p = 0.00$).

TABLE 3 | Risk and protective factors for mental health outcomes identified by multivariable regression.

Variable	No. cases/No. total cases (%)	Adjusted OR (95% CI)	p value
PHQ-2, depression symptoms			
Gender			
Men	42/170 (24.7)	1 (reference)	0.005
Women	131/323 (40.6)	1.88 (1.21–2.92)	
Physical activity			
Yes	39/157 (24.8)	0.49 (0.31–0.78)	0.002
No	134/336 (39.9)	1 (reference)	
Protective equipment			
Yes	71/269 (26.4)	0.41 (0.27–0.62)	0.000
No	102/124 (45.5)	1 (reference)	
Public transportation			
Yes	54/115 (47)	1.69 (1.06–2.69)	0.027
No	119/378 (31.5)	1 (reference)	
GAD-2, Anxiety symptoms			
Gender			
Men	31/170 (18.2)	1 (reference)	0.000
Women	145/323 (44.9)	2.86 (1.78–4.60)	
Psychiatric history			
Yes	40/63 (63.5)	3.05 (1.66–5.63)	0.000
No	136/430 (31.6)	1 (reference)	
Physical activity			
Yes	36/157 (22.9)	0.41 (0.25–0.67)	0.000
No	140/336 (41.7)	1 (reference)	
Protective equipment			
Yes	80/269 (29.7)	0.65 (0.43–0.98)	0.044
No	96/224 (42.9)	1 (reference)	
Type of hospital			
Primary and secondary care center	53/130 (40.8)	1.76 (1.01–3.08)	0.045
Tertiary care center	123/363 (33.9)	1 (reference)	
Living with family			
Yes	113/291 (64.2)	1.62 (1.02–2.60)	0.041
No	63/202 (35.8)	1 (reference)	
Public transportation			
Yes	58/115 (50.4)	1.73 (1.06–2.83)	0.029
No	118/378 (31.2)	1 (reference)	
ISI, insomnia symptoms			
Gender			
Men	23/170 (13.5)	1 (reference)	0.002
Women	94/323 (29.1)	2.29 (1.34–3.92)	
Psychiatric history			
Yes	33/63 (52.4)	3.82 (2.09–6.96)	0.000
No	84/430 (19.5)	1 (reference)	

Multivariable logistic regression (**Table 3**), after confounders were controlled, identified the following risk factors for depression: female gender (OR 1.88, 95% CI 1.21–2.92, $p = 0.01$) and using public transportation (OR 1.69, 95% CI 1.06–2.69, $p = 0.03$). As protective factors, this analysis identified physical activity (OR 0.49, 95% CI 0.31–0.78, $p = 0.00$) and availability of appropriate PPE (OR 0.41, 95% CI 0.27–0.62, $p = 0.00$).

Five risk factors were independently related to anxiety among HCPs: history of psychiatric illness (OR 3.05, 95% CI 1.66–5.63,

$p = 0.00$), female gender (OR 2.86, 95% CI 1.78–4.60, $p = 0.00$), working in primary or secondary care centers (OR 1.76, 95% CI 1.01–3.08, $p = 0.05$), using public transportation (OR 1.73, 95% CI 1.06–2.83, $p = 0.03$), and living with family (OR 1.62, 95% CI 1.02–2.60, $p = 0.04$). Conversely, the factors found to be protective against anxiety were physical activity (OR 0.41, 95% CI 0.25–0.67, $p = 0.00$) and PPE (OR 0.65, 95% CI 0.43–0.98, $p = 0.04$).

Regarding insomnia, we identified two risk factors. A history of a psychiatric illness showed the strongest association (OR 3.82, 95% CI 2.09–6.96, $p = 0.00$), followed by female gender (OR 2.29; 95% CI 1.34–3.92, $p = 0.00$).

DISCUSSION

This study examined the presence of anxiety, depression, and insomnia symptoms among health workers in Tunisia during the early phase of the COVID-19 pandemic. During the previous decade, Tunisia faced few epidemics without a significant impact on its healthcare system. The 2012 West Nile virus epidemics (Hammami et al., 2017) and the 2013 MERS-COV outbreaks (Abroug et al., 2014) are two examples, but neither of them was comparable to the COVID-19 pandemic in terms of amplitude and consequences on country-wide aspects of healthcare, economy, the agri-food system, and households (Zouhair et al., 2020).

The current pandemic emerged in Tunisia at a time when the country was grappling with an economic crisis, in addition to the political instability (Weilandt, 2018). In fact, Tunisia is facing an unprecedented crisis due to continuous political turmoil and the unfolding economic and financial meltdown, exacerbated by COVID-19 pandemic.

The pandemic started with a significant delay compared with the European countries that had already reached the exponential phase of infection distribution. However, in the setting of a fragile healthcare system, Tunisian HCPs found themselves unprepared either psychologically or logistically to face this rapidly evolving pandemic (Chaari and Golubnitschaja, 2020), especially at its first onset.

Furthermore, as a lower middle-income country (Classification of countries according to their income, 2019), Tunisia has very limited resources; hence, HCPs struggled with a lack of available tests and with discrepancies in test performance between different regions, which led to a heterogeneous picture of the infection distribution and mortality rates (Chaari and Golubnitschaja, 2020). They also faced difficulties due to insufficient medical equipment and PPE, and limited hospitalization capacity (Fredj and Chérif, 2020). These factors consequently made HCPs susceptible to negative mental health outcomes.

This study is the first of its kind in the Maghreb region. Countries in this region (Algeria, Morocco, Tunisia, and Libya) are characterized by generally similar healthcare systems, thus our sample may reflect, to some extent, the mental health situation among HCPs during this pandemic in other Maghreb countries.

This Tunisian study characterizes the impact of the pandemic during its early phase on mental health in HPCs, including a wide range of medical professionals from all over the country. Previous studies in different parts of the world were cross-sectional or longitudinal, and included essentially doctors and nurses. A meta-analysis of this earlier research showed that on average, two out of every five HCPs endured negative psychological outcomes during the COVID-19 pandemic, for example, anxiety, depression, insomnia, and other worrisome outcomes (Muller et al., 2020). Another meta-analysis was undertaken on a global scale combined studies of influenza and coronavirus epidemics, and reported substantial proportions of psychological symptoms among HCPs (Serrano-Ripoll et al., 2020). Thus, HCPs, worldwide have been challenged psychologically in the context of the current global health crisis.

As previously highlighted in other research (Lai et al., 2020), our survey documented significant frequencies of psychological symptoms among HCPs during the COVID-19 pandemic: 35.7% had anxiety, 35.1% had depression, and 23.7% had insomnia. Fekih-Romdhane et al. (2020) conducted a cross-sectional study among solely residents ($n = 210$) in Tunisia, and the Depression, Anxiety and Stress Scale (DASS) scores they obtained disclosed severe or extremely severe levels of depression in 30.5%, anxiety in 24.3%, and stress in 18.6% of their participants. The ISI scores in their study revealed a high prevalence rate of insomnia (41.4%) (Fekih-Romdhane et al., 2020). Similarly, Dong and Gao (2021) reported a high prevalence of anxiety (24.15%) and insomnia (39.83%). These authors used the Self-Reported Anxiety Scale (SAS) and the ISI to screen for anxiety and insomnia, respectively.

In a study by Khanal et al. (2020), health workers in Nepal completed an online questionnaire; the findings disclosed symptoms of anxiety in 41.9%, depression symptoms in 37.5%, and symptoms of insomnia in 33.9%. Anxiety and depression were measured with the 14-item Hospital Anxiety and Depression Scale (HADS: 0–21), and insomnia was measured with the seven-item ISI (range 0–28).

Pappa et al. (2020) in their systematic review and meta-analysis of 13 cross-sectional studies ($n = 33,062$), reported a high prevalence rate of anxiety, depression, and insomnia during the COVID-19 pandemic. On the other hand, other researchers reported much lower rates. In Singapore, only 14.5% of HCPs screened positive for anxiety, and only 8.9% had depression. These results may be explained by the fact that new protective equipment was available in Singapore to protect HCPs and help them deal with the COVID-19 calamity (Tan et al., 2020). Differences in prevalence rates between studies can also be explained by the different settings where each study was conducted. Another contributing factor may be the use of different scoring scales.

In the present study, health workers who were women, and those with a history of mental health problems, had a higher odds of exhibiting anxiety, depression, and insomnia symptoms compared with men and to participants with no such history. Similar findings were observed in other studies (Lai et al., 2020; Prasad et al., 2021). The difference between genders may be explained in part by women's greater propensity to express psychological distress compared with

men (Zhang and Wing, 2006; McLean et al., 2011; Abate, 2013; Mansueto and Faravelli, 2021). These findings may also reflect the predominance of women in patient-facing roles. Other factors that can affect women healthcare workers' wellbeing include role strain, difficulties maintaining work–life balance, the consequences associated with family members, gender-related discrimination, and a lack of sufficient support systems.

Healthcare professionals with a history of mental illness experienced more anxiety and insomnia, which is consistent with the results of Zhang W.R. et al. (2020). Khanal et al. (2020) conducted a cross-sectional study among 475 health workers who treated patients with COVID-19 in Nepal and noted that a history of medication for mental health problems was significantly associated with a higher likelihood of experiencing symptoms of anxiety, depression, and insomnia compared with colleagues with no such history.

A similar finding was observed in a study by Zhu et al. (2020) who noted that workers with a history of mental health problems were more likely to have anxiety, depression, and stress. A recent study of 1,685 participants in the USA showed that HCPs with a history of psychiatric illness were at a greater risk for significant mental burden (Young et al., 2021). In fact, HCPs with a mental illness are inherently predisposed and more vulnerable to the appearance of psychiatric symptoms because of their mental fragility, and hence their lower threshold for distress.

Healthcare professionals with medical history experienced more anxiety and insomnia which is consistent with the results of Zhang W.R. et al. (2020). We believe that this is due to their assumption of having potentially worse outcomes if they get infected with COVID-19 (Wei et al., 2020; Wolff et al., 2020), especially, during the first wave when there was no previously established information about the COVID-19 sequelae and its interference with other illnesses. Our findings are supported by Zhang et al., who showed that having an organic disease was an independent factor for insomnia, anxiety, and depression.

Based on the multivariable regression model, we found that female gender and psychiatric history were independent risk factors for mental health outcomes in nearly all measures.

In the present study, nurses reported more symptoms of anxiety and insomnia than their colleagues (69.5% of whom were women). Nurses are considered essential HCPs deeply involved in patient management with close, constant physical proximity (e.g., repeated monitoring and recording signs, drug administration, and blood sampling, etc.) and hence frequently exposed to the highest risk of contagion (Barrett et al., 2020). Similarly, another highly exposed group were those working as frontline HCPs or in fever clinics, who experienced more insomnia than second-line workers. These subgroups are responsible for providing direct care to patients with COVID-19 and for collecting sputum specimens for virus detection.

Interestingly, we found that using public transportation to go to work was a source of worse mental health outcomes in all measures, and it was shown by multivariable regression that public transport was a major risk factor for depression and anxiety. These results are mainly due to the heightened stress level caused by the risk of contagion when in close contact with people who might be infected (Arora et al., 2020).

Similarly, HCPs who were in close contact with their family members expressed heightened levels of anxiety compared with those who did not live with their families. This finding is attributable to the fear of being COVID-19-positive and the consequent risk of transmitting the virus to their families.

Coping psychologically with a pandemic can be arduous for healthcare workers (Wong et al., 2005). The origin of psychological issues may be related with fear of infection, fear of transmitting the virus to their relatives (we note that residing with family members was an independent risk factor for anxiety in our participants), lack of information about the virus, concerns about the shortage of PPE, absence of psychological support, and the burden of long working hours (Muller et al., 2020). Additionally, one-third of our participants reported experiencing nightmares related to the virus, and this may further indicate the overwhelming affliction endured by healthcare workers during the pandemic, in consonance with similar results published by Herrero et al. (2020). A large proportion of HCPs (66.3%) also adopted a different attitude toward patients (e.g., eviction or incomplete routine clinical examination), which further highlights their fear of infection owing to the lack of PPE (45.4% of HCPs reported insufficient PPE). It is important to note that a fearful or suspicious attitude may jeopardize the quality of care provided to all types of patients.

Our findings showed that HCPs who were physically active reported fewer symptoms in all mental health measures. This result parallels findings reported by Maugeri et al. (2020), who noted a significant positive correlation between physical activity and mental wellbeing in the general population during the current pandemic. Other studies support the benefits of physical activities and show that it buffers the negative effects of bad experiences and traumatic events, and can provide resilience in facing challenges (Richards et al., 2015; Brailovskaia and Margraf, 2017). In the current pandemic, physical activity has been shown to be negatively associated with the psychological burden induced by COVID-19: those who engage in a regular exercise routine may have a less stressful pandemic experience, and thus tend to cope better with everyday distress (Brailovskaia et al., 2021).

Our results also indicated that the availability of appropriate PPE was a protective factor against depression and anxiety. This finding is consistent with a study by Zhang S.X. et al. (2020), who showed that having PPE was associated with less distress. Also, Dong and Gao (2021) identified the unavailability of PPE as a significant risk factor for both anxiety and insomnia.

In the light of our findings and as the COVID-19 pandemic continues, providing appropriate strategies will be of great importance in supporting HCPs, especially those who are involved in the treatment of patients with COVID-19. To avoid negative psychological outcomes, efforts should be tailored and directed toward high-risk groups, i.e., female nurses who have a history of psychiatric illness, and HCPs with comorbidities.

For example, female nurses working in frontline positions during the health crisis should be allowed more rest and more days off, their psychological symptoms should be regularly monitored, and the threshold for seeking psychological specialist support should be lowered. In addition, HCPs with a known psychiatric history should be screened for any aggravation of

their symptoms, and care should be sought immediately if their symptoms worsen.

The use of public transportation during the pandemic was shown to be an important contributor to the mental burden borne by our participants; thus policymakers should endorse measures that favor social distancing and frequent sanitization of public transportation. If economically feasible, dedicated private transportation should be used by HCPs. Finally, to ensure that optimum healthcare is provided to patients, more advocacy tools should be implemented to persuade decision-makers and healthcare administration officials of the importance of PPE availability, which is known to be a prominent protective factor against the mental burden faced by HCPs.

Our study has several limitations. First, because this was a cross-sectional survey-based study, casual inferences are limited. Second, the possibility of selection bias was non-negligible because all HCPs were invited to participate, and those who participated may have been more aware of their mental health issues than those who did not. Third, the PHQ-2 and GAD-2 psychological scales were used mainly for screening purposes; they do not evaluate the degree or the severity of symptoms. Fourth, we did not screen for any aggravation of symptoms during the pandemic, e.g., preexisting mental health symptoms vs. new symptoms, and this limitation applies particularly to participants with a previous history of psychiatric illness. Moreover, other potential confounding variables including past or current pharmacologic treatment or data on past psychological intervention in HCPs could have impacted the outcome of the present study reflecting the mental health consequences of COVID-19 (Carvalho et al., 2016; Cosci et al., 2016; Swartz, 2020). Additionally, the 3-week duration of the data collection process may have affected the quality of the responses, given that the incidence of COVID-19 and perceptions related to infection may have differed between the first and last day of the survey.

Despite these limitations, our study provides important baseline information on many psychological morbidities endured by healthcare workers during this critical period. Our findings can serve as an important tool enabling policymakers to provide guidance to HCPs about effective strategies to protect their mental health. Because of the increasingly worrisome mental health outcomes among HCPs, their symptoms may become more severe with time, thus we recommend conducting further research on the long-term psychological implications.

CONCLUSION

The COVID-19 pandemic has had a deleterious effect on healthcare workers' mental health, with evidence of an increase in depressive, anxiety, and insomnia symptoms negatively impacting the quality of care they provide to patients. Hence, special attention should be paid to HCPs who are female nurses, and to those who have a history of psychiatric illness and are prone to mental disorders. Also, urgent measures

should be implemented toward more rapid and effective risk communication, endorsement of protective factors that could help to manage this burden, and more efficient identification of those who are in distress.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

This study was approved by the Institutional Committee of Fattouma Bourguiba University Hospital in accordance with the Declaration of Helsinki. Electronic informed consent was obtained from the participants. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AH and MJ conceptualized and designed the study and supervised the writing and analyses. LM and MF contributed to data collection and analysis. SO critically reviewed the manuscript. All authors approved the final manuscript as submitted.

ACKNOWLEDGMENTS

REFERENCES

Abate, K. H. (2013). Gender disparity in prevalence of depression among patient population: a systematic review. *Ethiop. J. Health Sci.* 23, 283–288. doi: 10.4314/ejhs.v23i3.11

Abroug, F., Slim, A., and Ouanes-Besbes, L. (2014). Family cluster of Middle East respiratory syndrome coronavirus infections, Tunisia, 2013. *Emerg. Infect. Dis.* 20, 1527–1530. doi: 10.3201/eid2009.140378

Armocida, B., Formenti, B., Ussai, S., Palestra, F., and Missoni, E. (2020). The Italian health system and the COVID-19 challenge. *Lancet Public Health* 5:e253. doi: 10.1016/S2468-2667(20)30074-8

Arora, A., Jha, A. K., Alat, P., and Das, S. S. (2020). Understanding coronaphobia. *Asian J. Psychiatry* 54:102384. doi: 10.1016/j.ajp.2020.102384

Barrett, E. S., Horton, D. B., Roy, J., Gennaro, M. L., Brooks, A., Tischfield, J., et al. (2020). Prevalence of SARS-CoV-2 infection in previously undiagnosed health care workers at the onset of the U.S. COVID-19 epidemic. *medRxiv* doi: 10.1101/2020.04.20.20072470

Brailovskaia, J., Cosci, F., Mansueto, G., Miragall, M., Herrero, R., Baños, R. M., et al. (2021). The association between depression symptoms, psychological burden caused by Covid-19 and physical activity: An investigation in Germany, Italy, Russia, and Spain. *Psychiatry Res.* 295:113596. doi: 10.1016/j.psychres.2020.113596

Brailovskaia, J., and Margraf, J. (2017). Facebook Addiction Disorder (FAD) among German students-A longitudinal approach. *PLoS One* 12:e0189719. doi: 10.1371/journal.pone.0189719

Busch, I. M., Moretti, F., Mazzi, M., Wu, A. W., and Rimondini, M. (2021). What We Have Learned from Two Decades of Epidemics and Pandemics: A Systematic Review and Meta-Analysis of the Psychological Burden of Frontline Healthcare Workers. *Psychother. Psychosom.* 90, 178–190. doi: 10.1159/000513733

Carvalho, A. F., Sharma, M. S., Brunoni, A. R., Vieta, E., and Fava, G. A. (2016). The Safety, Tolerability and Risks Associated with the Use of Newer Generation Antidepressant Drugs: A Critical Review of the Literature. *Psychother. Psychosom.* 85, 270–288. doi: 10.1159/000447034

Chaari, L., and Golubnitschaja, O. (2020). Covid-19 pandemic by the "real-time" monitoring: the Tunisian case and lessons for global epidemics in the context of 3PM strategies. *Epma J.* 11, 1–6. doi: 10.1007/s13167-020-00207-0

Classification of Countries According to Their Income (2019). Available online at: https://data.worldbank.org/country/tunisia?display=graph%22%3EBanco (accessed March, 2019).

Corona Virus Cases in Tunisia (2020). Available online at: https://www.worldometers.info/coronavirus/country/tunisia/ (accessed March, 2020).

Cosci, F., Mansueto, G., Faccini, M., Casari, R., and Lugoboni, F. (2016). Socio-demographic and clinical characteristics of benzodiazepine long-term users: Results from a tertiary care center. *Compr. Psychiatry* 69, 211–215. doi: 10.1016/j.comppsych.2016.06.008

Covid 19 Public Health Emergency of International Concern [PHEIC] (2020). *Global Research and Innovation Forum: Towards a Research Roadmap*. Available online at: https://covid19-evidence.paho.org/handle/20.500.12663/714 (accessed January, 2020).

Dong, H. S., and Gao, J. J. (2021). Prevalence of insomnia and anxiety among healthcare workers during the COVID-19 pandemic in Jilin Province. *Braz. J. Med. Biol. Res.* 54:e10602. doi: 10.1590/1414-431X2020e10602

Fekih-Romdhane, F., Snene, H., Jebri, A., Ben Rhouma, M., and Cheour, M. (2020). Psychological impact of the Pandemic COVID-19 Outbreak Among Medical Residents in Tunisia. *Asian J. Psychiatr.* 53:102349. doi: 10.1016/j.ajp.2020.102349

Fredj, H. B., and Chérif, F. (2020). Novel Corona virus disease infection in Tunisia: Mathematical model and the impact of the quarantine strategy. *Chaos Solitons Fractals* 138:109969. doi: 10.1016/j.chaos.2020.109969

Hammami, S., Hassine, T. B., Conte, A., Amdouni, J., De Massis, F., Sghaier, S., et al. (2017). West Nile disease in Tunisia: an overview of 60 years. *Vet. Ital.* 53, 225–234. doi: 10.12834/VetIt.1181.6565.2

Herrero, S. M. A., Parra, S. J., Diaz, C. T., Arias, A. E. M., Muñoz, M. J., Alvarez, D. Y. M. J., et al. (2020). Sleep characteristics in health workers exposed to the COVID-19 pandemic. *Sleep Med.* 75, 388–394. doi: 10.1016/j.sleep.2020.08.013

Khanal, P., Devkota, N., Dahal, M., Paudel, K., and Joshi, D. (2020). Mental health impacts among health workers during COVID-19 in a low resource setting: a cross-sectional survey from Nepal. *Global Health* 16:89. doi: 10.1186/s12992-020-00621-z

Kroenke, K., Spitzer, R. L., Williams, J. B., Monahan, P. O., and Löwe, B. (2007). Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann. Intern. Med.* 146, 317–325. doi: 10.7326/0003-4819-146-5-200703060-00004

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., et al. (2020). Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Netw. Open* 3:e203976. doi: 10.1001/jamanetworkopen.2020.3976

Lancee, W. J., Maunder, R. G., and Goldbloom, D. S. (2008). Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr. Serv.* 59, 91–95. doi: 10.1176/ps.2008.59.1.91

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., et al. (2010). A 4-item measure of depression and anxiety: validation and standardization of

the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J. Affect Disord.* 122, 86–95. doi: 10.1016/j.jad.2009.06.019

Mansueto, G., and Faravelli, C. (2021). Stressful life events and psychosis gender differences. *Stress Health* 2021:3067. doi: 10.1002/smi.3067

Mansueto, G., Lopes, F. L., Grassi, L., and Cosci, F. (2021). Impact of COVID-19 outbreak on Italian healthcare workers versus general population: Results from an online survey. *Clin. Psychol. Psychother.* 2021:13. doi: 10.1002/cpp.2644

Maugeri, G., Castrogiovanni, P., Battaglia, G., Pippi, R., D'Agata, V., Palma, A., et al. (2020). The impact of physical activity on psychological health during Covid-19 pandemic in Italy. *Heliyon* 6:e04315. doi: 10.1016/j.heliyon.2020.e04315

McLean, C. P., Asnaani, A., Litz, B. T., and Hofmann, S. G. (2011). Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. *J. Psychiatr. Res.* 45, 1027–1035. doi: 10.1016/j.jpsychires.2011.03.006

Morin, C. M., Belleville, G., Bélanger, L., and Ivers, H. (2011). The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep* 34, 601–608. doi: 10.1093/sleep/34.5.601

Muller, A. E., Hafstad, E. V., Himmels, J. P. W., Smedslund, G., Flottorp, S., Stensland, S., et al. (2020). The mental health impact of the covid-19 pandemic on healthcare workers, and interventions to help them: A rapid systematic review. *Psychiatry Res.* 293:113441. doi: 10.1016/j.psychres.2020.113441

Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V. G., Papoutsi, E., and Katsaounou, P. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav. Immun.* 88, 901–907.

Prasad, K., McLoughlin, C., Stillman, M., Poplau, S., Goelz, E., Taylor, S., et al. (2021). Prevalence and correlates of stress and burnout among U.S. healthcare workers during the COVID-19 pandemic: A national cross-sectional survey study. *EClin. Med.* 35:100879. doi: 10.1016/j.eclinm.2021.100879

Remuzzi, A., and Remuzzi, G. (2020). COVID-19 and Italy: what next? *Lancet* 395, 1225–1228.

Richards, J., Jiang, X., Kelly, P., Chau, J., Bauman, A., and Ding, D. (2015). Don't worry, be happy: Cross-sectional associations between physical activity and happiness in 15 European countries. *BMC Public Health* 15:53. doi: 10.1186/s12889-015-1391-4

Serrano-Ripoll, M. J., Meneses-Echavez, J. F., Ricci-Cabello, I., Fraile-Navarro, D., Fiol-deRoque, M. A., Pastor-Moreno, G., et al. (2020). Impact of viral epidemic outbreaks on mental health of healthcare workers: a rapid systematic review and meta-analysis. *J. Affect Disord* 277, 347–357. doi: 10.1016/j.jad.2020.08.034

Swartz, H. A. (2020). The Role of Psychotherapy During the COVID-19 Pandemic. *Am J Psychother* 73, 41–42. doi: 10.1176/appi.psychotherapy.20200015

Tan, Z., Khoo, D. W. S., Zeng, L. A., Tien, J. C., Lee, A. K. Y., Ong, Y. Y., et al. (2020). Protecting health care workers in the front line: Innovation in COVID-19 pandemic. *J. Glob. Health* 10:010357. doi: 10.7189/jogh.10.010357

Vindegaard, N., and Benros, M. E. (2020). COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain Behav. Immun.* 89, 531–542. doi: 10.1016/j.bbi.2020.05.048

Wei, Y. Y., Wang, R. R., Zhang, D. W., Tu, Y. H., Chen, C. S., Ji, S., et al. (2020). Risk factors for severe COVID-19: Evidence from 167 hospitalized patients in Anhui, China. *J. Infect.* 81, e89–e92. doi: 10.1016/j.jinf.2020.04.010

Weilandt, R. (2018). Socio-economic challenges to Tunisia's democratic transition. *Eur. View* 17, 210–217. doi: 10.1177/1781685818805681

WHO (2019). *Timeline: WHO's COVID-19 response.* Geneva: WHO.

Wolff, D., Nee, S., Hickey, N. S., and Marschollek, M. (2020). Risk factors for Covid-19 severity and fatality: a structured literature review. *Infection* 2020, 1–14. doi: 10.1007/s15010-020-01509-1

Wong, T. W., Yau, J. K., Chan, C. L., Kwong, R. S., Ho, S. M., Lau, C. C., et al. (2005). The psychological impact of severe acute respiratory syndrome outbreak on healthcare workers in emergency departments and how they cope. *Eur. J. Emerg. Med.* 12, 13–18. doi: 10.1097/00063110-200502000-00005

Xiang, Y. T., Jin, Y., and Cheung, T. (2020). Joint International Collaboration to Combat Mental Health Challenges During the Coronavirus Disease 2019 Pandemic. *JAMA Psychiatry* 77, 989–990. doi: 10.1001/jamapsychiatry.2020.1057

Xiao, J., Fang, M., Chen, Q., and He, B. (2020). SARS, MERS and COVID-19 among healthcare workers: A narrative review. *J. Infect. Public Health* 13, 843–848. doi: 10.1016/j.jiph.2020.05.019

Xie, J., Tong, Z., Guan, X., Du, B., and Qiu, H. (2020). Critical care crisis and some recommendations during the COVID-19 epidemic in China. *Intensive Care Med.* 46, 837–840. doi: 10.1007/s00134-020-05979-7

Young, K. P., Kolcz, D. L., O'Sullivan, D. M., Ferrand, J., Fried, J., and Robinson, K. (2021). Health Care Workers' Mental Health and Quality of Life During COVID-19: Results From a Mid-Pandemic, National Survey. *Psychiatr. Serv.* 72, 122–128. doi: 10.1176/appi.ps.202000424

Zedini, C., Ben Cheikh, A., Limam, M., Henrichi, Y., Mellouli, M., El Ghardallou, M., et al. (2016). Determinants of Paramedical Staff Motivation in a Tunisian Hospital. *Sante Publique* 28, 613–622.

Zhang, B., and Wing, Y. K. (2006). Sex differences in insomnia: a meta-analysis. *Sleep* 29, 85–93. doi: 10.1093/sleep/29.1.85

Zhang, S. X., Liu, J., Afshar Jahanshahi, A., Nawaser, K., Yousefi, A., Li, J., et al. (2020). At the height of the storm: Healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. *Brain Behav. Immun.* 87, 144–146. doi: 10.1016/j.bbi.2020.05.010

Zhang, W. R., Wang, K., Yin, L., Zhao, W. F., Xue, Q., Peng, M., et al. (2020). Mental Health and Psychosocial Problems of Medical Health Workers during the COVID-19 Epidemic in China. *Psychother. Psychosom.* 89, 242–250. doi: 10.1159/000507639

Zhu, Z., Xu, S., Wang, H., Liu, Z., Wu, J., Li, G., et al. (2020). COVID-19 in Wuhan: Sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers. *EClinicalMedicine* 24:100443. doi: 10.1016/j.eclinm.2020.100443

Zouhair, E. D. E., Aymen, F., Thouraya, L., Manfred, W., and Breisinger, A. C. (2020). *The Impact of COVID-19 on Tunisia's Economy, Agri-food System, and Households. Tunisian Institute of Competitiveness and Quantitative Studies.* Washington, D.C: Intl Food Policy Res Inst.

Check for
updates

The Impact of COVID-19-Related Work Stress on the Mental Health of Primary Healthcare Workers: The Mediating Effects of Social Support and Resilience

Lu-shao-bo Shi[1], Richard Huan Xu[2,3], Yi Xia[1], Dong-xue Chen[1] and Dong Wang[1,4]*

[1] School of Health Management, Southern Medical University, Guangzhou, China, [2] Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong, Hong Kong SAR, China, [3] Jockey Club School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, Hong Kong SAR, China, [4] Institute of Health Management, Southern Medical University, Guangzhou, China

Objective: The psychological condition of healthcare workers since the COVID-19 pandemic has attracted the attention of many studies. However, few have reported on psychosocial problems of primary healthcare workers in the COVID-19 pandemic. This study aimed to examine the mediating roles of social support and resilience in COVID-19-related work stress and symptoms of anxiety and depression.

Methods: A total of 840 primary healthcare workers in 17 community health centers in Guangzhou, China, were recruited from May to July 2021. Data on demographic characteristics, COVID-19-related work stress, social support, resilience, anxiety and depression were collected. A structural equation model was used for mediation analysis.

Results: More than half of participants reported mild or more severe (at least borderline abnormal) symptoms of anxiety (68.1%) and depression (55.6%). Social support and resilience mediate the association between COVID-19-related work stress and symptoms of anxiety and depression, respectively. Furthermore, the association between work stress and symptoms of anxiety and depression was also mediated by an accumulation of social support and resilience. The indirect effect of COVID-19-related work stress on anxiety and depression through resilience was much greater than other indirect effects.

Conclusion: Anxiety and depression were prevalent among primary healthcare workers. This study highlights the psychological impact of the COVID-19-related psychosocial work environment on primary healthcare workers. There is an urgent need to improve working conditions for primary healthcare workers in the COVID-19 and to implement intervention strategies aimed at increasing individual resilience alongside the establishment of external supportive work environments.

Keywords: COVID-19, primary healthcare workers, work stress, social support, resilience, mental health

INTRODUCTION

COVID-19 is still raging in much of the world, posing a huge challenge for populations and societies worldwide to manage their health (Pfefferbaum and North, 2020; Robbins et al., 2021). As of 15 December 2021, a global total of 270,791,973 confirmed cases and 5,318,216 deaths have been reported (World Health Organization (WHO), 2021). After adopting a series of strict and decisive public health measures, COVID-19 prevention and control has been significantly effective in China. However, given that the virus is constantly mutating and there is a risk of infection from outside the country, scattered infection cases are inevitable. To prevent the resurgence of COVID-19, some long-term public health measures are necessary in China, including mass vaccination, the establishment of fever clinics, expansion of nucleic acid testing, and constant supervision of infection prevention and control in medical institutions (Liang et al., 2021). Healthcare systems and labor forces will certainly continue to experience a tremendous burden for a long time due to the constant struggle with the potential risk of infection (Ofei-Dodoo et al., 2021).

Compared with the general population, medical staff is more likely to be exposed to multiple risk factors related to mental health problems, such as discordant doctor-patient relationships, accumulated frustration in the face of patient death, and increased government supervision of professional activities (Paiva et al., 2018; Huo et al., 2021). Furthermore, COVID-19 exposes healthcare workers to an additional psychological burden, including fear of infection, a sense of social isolation, and urgency at work. Previous studies have suggested that healthcare workers experience significant mental burdens and psychological disorders in the COVID-19 pandemic (Lai et al., 2020; Zhang et al., 2020). Reducing damage to the mental health of medical staff caused by COVID-19 is one major challenge of the pandemic (Feng and Yin, 2021). However, research to date has primarily focused on assessing the psychological responses of the entire medical staff (Wang et al., 2020; Xu et al., 2021), with limited attention to primary healthcare workers.

As the gatekeeper of the health system, in addition to providing basic health services, the primary healthcare system is responsible for multiple COVID-19 front-line tasks (e.g., nucleic acid testing, disinfection of public environments, vaccination, and promotion of epidemic prevention knowledge). Notably, with the continuous stacking of epidemic prevention and control policies in China, primary healthcare workers have to take increasing responsibility, such as surveillance and report of patients with fever, technical training on epidemic prevention and control, and health management of discharged COVID-19 patients (e.g., isolation management, return visit and re-examination, health monitoring, rehabilitation medical treatment) (General Office of National Health Commission of the People's Republic of China, 2020; State Council of the People's Republic of China, 2020; National Health Commission of the People's Republic of China, 2021). The current containment measures will be maintained until the global COVID-19 pandemic is declared over. The sustaining work requirements of epidemic prevention and control may negatively impact

the daily life, social cognition, and psychological needs of primary healthcare workers, which consequently leads to adverse psychological symptoms. Hence, it is urgent to explore the impact of the psychosocial work environment on the psychological well-being of primary healthcare workers during the COVID-19 pandemic.

According to the effort-reward imbalance (ERI) model, the stress in the work environment involves the following three factors: work effort, work reward, and overcommitment (Siegrist et al., 2004). Specifically, work stress results from excessive work-related commitment and an imbalance between work effort and work reward (e.g., salary, respect, job security, job development prospects, etc.) (Siegrist et al., 2009). For primary healthcare workers, their working situation is associated with the development of COVID-19. In other words, in the context of COVID-19, the work stress situation of primary healthcare workers may have an unforeseen impact. Indeed, considerable evidence suggests that work stress is closely related to negative mental health outcomes (Reichenberg and MacCabe, 2007; Kopp et al., 2008), and prolonged, high levels of work stress directly contribute to anxiety and depressive disorders (Weinberg and Creed, 2000; Magnavita et al., 2021). However, the internal factors and underlying mechanisms of this relationship in the context of COVID-19 remain unclear. Therefore, given the impact of work stress and its negative effect on mental health, it is essential to explore the process and mediating factors of the transformation of COVID-19-related work stress into anxiety and depression in primary healthcare workers. Based on the above evidence, hypothesis 1 was proposed: COVID-19-related work stress positively predicts anxiety and depression among primary healthcare workers (H1).

Social support is defined as an individual's access through social ties to other individuals, groups, and the larger community, which is a social interaction process related to altruism, sense of obligation, and reciprocity (Lin et al., 1979; Hofman et al., 2021). According to coping theory, social support is one of the main coping strategies of individuals facing stress, and reduces the possible negative effects of stressful events by solving problems (i.e., problems are solved by getting information and practical help from social ties) and easing emotions (i.e., regulating negative emotional responses through social ties) (Lazarus, 1993; Mo et al., 2020). The beneficial impacts of social support on health and well-being have been widely recognized. Specifically, previous studies have confirmed that social support not only directly brings well-being, but also promotes mental health by buffering the adverse effects of stressors (Cohen and Wills, 1985; Sun et al., 2020). Several studies have found that social support is an important source of positive psychological qualities (e.g., self-efficacy) (Bhattarai et al., 2021). Moreover, social support protects against psychological problems (e.g., anxiety, depression, PTSD, suicidal ideation) (Dour et al., 2014; Arenson et al., 2021; Zalta et al., 2021). Overall, social support is a key protective factor for mental health and has the potential to improve stress coping and social adaptability (Zhang X. et al., 2021). Therefore, based on the above evidence, hypothesis 2 was proposed: social

support mediates the association between COVID-19-related work stress and symptoms of anxiety and depression in primary healthcare workers (H2).

Resilience is a personal quality that enables individuals to recover and flourish following stressful events. Resilience refers to the dynamic adaptive process of adversity, trauma, tragedy, threats, or significant stressors (Bonanno, 2004; Southwick et al., 2014). Resilience has been recognized as an internal factor that is closely related to positive emotional characteristics, which mobilize positive emotions (e.g., humor, optimism) to cope with stressful events (Tugade et al., 2004). In general, resilience can improve psychological well-being by encouraging better coping strategies (Thompson et al., 2018). Hence, resilience may mediate the process of negative mental health outcomes (e.g., anxiety, depression) triggered by stressful events (Kumpfer, 2002; Zhang D. et al., 2021). Notably, although the robust relationship between COVID-19-related stress, resilience, anxiety, and depression has been consistently shown among healthcare workers (Mosheva et al., 2020), the resilience mechanism underlying this relationship has not been elucidated. Therefore, based on the above evidence, hypothesis 3 was proposed: resilience mediates the association between COVID-19-related work stress and symptoms of anxiety and depression in primary healthcare workers (H3).

In this study, social support and resilience were considered as external and internal factors, respectively, that mediate the association between COVID-19-related work stress and the symptoms of anxiety and depression. Indeed, the relationship between COVID-19-related work stress and mental health is also likely to be influenced by the combination of social support and resilience. On the one hand, the close association between social support and resilience has been unanimously agreed upon in the existing literature. Stable and diversified social ties can provide external support resources for individuals to adapt to adversity, and subsequently produce positive results (Kumpfer, 2002; Bhattarai et al., 2021). On the other hand, extensive evidence suggests that social support is an important source of resilience for healthcare workers (Park et al., 2020; Wu C. et al., 2021), and resilience mediates the association between social support and adverse mental health outcomes (e.g., Depression) (Li et al., 2015). Therefore, based on the above evidence, hypothesis 4 was proposed: COVID-19-related work stress affected anxiety and depression of primary healthcare workers through the sequential mediating effects of social support and resilience (H4).

Therefore, to reveal the complex relationship between COVID-19-related work stress and mental health, an integrated multiple mediating model was adopted in this study (**Figure 1**). This study aimed to understand the mental health level of primary healthcare workers by measuring anxiety and depression symptoms, and to investigate the mediating roles of social support and resilience in the relationship between COVID-19-related work stress and symptoms of anxiety and depression. This study thus provides a scientific basis for preventing psychological problems and formulating relevant intervention measures for primary healthcare workers in the COVID-19 pandemic.

MATERIALS AND METHODS

Participants and Data Collection

A cross-sectional field survey on primary healthcare workers in community health centers was conducted from May to July 2021 in Guangzhou City, Guangdong Province, China. Given the differences in economic development level and street division among different districts, 17 community health centers from six districts in the central city of Guangzhou were selected by stratified random sampling. Specifically, using each district as a sample layer, a minimum of 15% of community health centers in each district was decided to be included. Overall, there are 19, 18, 18, 26, 18, and 13 community health centers in Liwan, Yuexiu, Haizhu, Tianhe, Baiyun, and Huangpu, respectively. According to our sampling method, a certain number of community health centers were selected in each district (Haizhu, 2; Huangpu, 2; Liwan, 3; Yuexiu, 3; Tianhe, 3; and Baiyun, 4). All primary healthcare workers who met the following inclusion criteria were recruited at the 17 community health centers: (1) volunteered to participate in the questionnaire survey after providing informed consent; (2) were regular employees; and (3) had been working in the center for the last 21 months.

This study was approved by the Ethics Committee of Southern Medical University, Guangzhou, Guangdong Province, China (Ethical approval number: NFYKDX002). Before the survey, each participant was informed of the purpose of the study and it was emphasized that their answers were voluntary, anonymous, and confidential. With the support of selected community health centers, we distributed questionnaires to primary medical staff. Under the guidance of researchers, participants filled out the questionnaire by themselves, which took an average of 6 min to complete. In this study, a total of 1020 primary healthcare workers were recruited to participate in the survey; 840 questionnaires were eventually included in the statistical analysis, with an effective response rate of 82.4%.

The following considerations were taken to ensure the reasonableness and rigor of the study: First, to avoid excessive collinearity among variables due to the use of similar items in different questionnaires, there were no overlapping factors measured by the assessment tools. Second, during the development process of the questionnaire of COVID-19-related work stress, several experts from the psychology, management, and statistics community were invited to make modifications to the content and structure of the questionnaire to ensure its reliability and validity. Third, all items in the questionnaire were self-reported in Chinese and conformed to Chinese cultural characteristics. Finally, researchers received unified training on the links between paper questionnaire issuance and data building to reduce the impact of researchers' subjective bias on the data authenticity.

Measures
Demographic Characteristics
Participants' basic information, such as sex, age, educational level, marital status, working years, occupation, and personal monthly income were collected.

FIGURE 1 | Multiple mediating hypothesis model between variables. HI, COVID-19-related work stress→Mental health; H2, COVID-19-related work stress→Social support→Mental health; H3, COVID-19-related work stress→Resilience→Mental health; H4, COVID-19-related work stress→Social support→Resilience→Mental health.
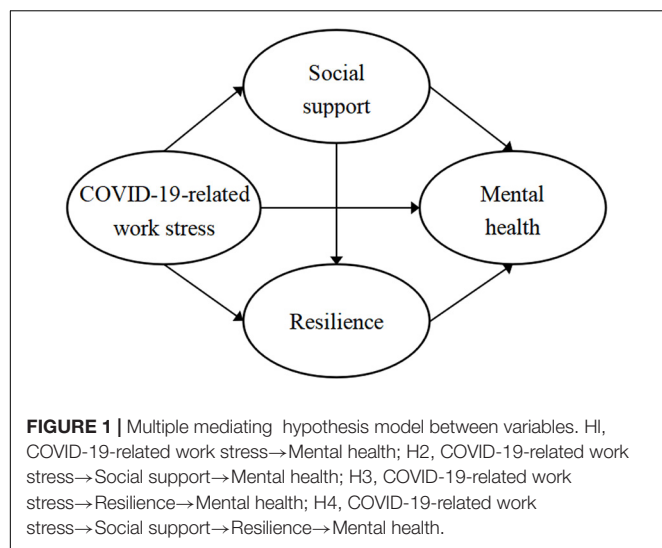
COVID-19-Related Work Stress

In this study, COVID-19-related work stress was defined as the difference in perceived levels of work stress before and after the pandemic. To assess COVID-19-related work stress, a 15-item questionnaire was constructed based on the ERI model (Siegrist et al., 2004). The questionnaire was composed of three dimensions, as follows: effort (E, 3 items); reward (R, 8 items); and overcommitment (OC, 4 items). The items were designed to examine the difference in perceived levels of work stress before and after the pandemic. An example of the questionnaire items is as follows: Compared to before the COVID-19, I get more easily overwhelmed by time pressures at work. In the ERI model, effort and overcommitment are the external environments and individual cognitive independent factors of work-related performance, respectively (Siegrist et al., 2009). Previous studies have validated the measurement structure of the ERI questionnaire in China (Li et al., 2012). All items were scored on a Likert 4-point scale ranging from 1 to 4. To eliminate the different numbers of items difference between the two dimensions, the effort-reward ratio was obtained using the $(E/3)/(R/8)$ correction formula, which reflects the imbalance between the effort and reward of COVID-19-related work. E is the total score of the effort dimension and R is the total score of the reward dimension. When the effort-reward ratio was greater than 1, participants were considered to be in a state of high effort and low reward. A higher effort-reward ratio and overcommitment score indicated a higher level of work stress. In the present study, the standardized Cronbach's Alpha of the questionnaire of COVID-19-related work stress was 0.849. In addition, the psychometric characteristics of the self-designed questionnaire of COVID-19-related work stress have been comprehensively validated (**Supplementary Table 1**).

Social Support

The Social Support Rating Scale (SSRS) was used to measure the level of social support and includes 10 self-reported items in Chinese (Xiao, 1994). It consists of the three following subscales: objective support (OS, 3 items), subjective support (SS, 4 items), and use of support (UOS, 3 items). The total Social Support Rating Scale score ranges from 12 to 66 and is obtained by calculating the sum of the three subscale scores. Higher scores indicate a higher level of social support. The Social Support Rating Scale is regarded as one of the most suitable tools for assessing social support in the Chinese population, and an excellent reliability and validity have been demonstrated in different surveys (Yu et al., 2020; Zhu et al., 2021). In the present study, the standardized Cronbach's Alpha of SSRS was 0.770.

Resilience

The Brief Resilience Scale was used to evaluate resilience. The scale was divided into two parts, as follows: a positive polarity factor, measured using 3 positively worded items (forward coding); and a negative polarity factor that was measured using 3 negatively worded items (reverse coding) (Smith et al., 2008; Fung, 2020). Each item is scored on a 5-point Likert scale ranging from 1 to 5. As a reliable tool for measuring individual elasticity, the internal consistency, convergence validity, and structural validity of the Brief Resilience Scale in the Chinese population have been verified (Windle et al., 2011; Fung, 2020). In the present study, the standardized Cronbach's Alpha of the brief resilience scale was 0.850.

Anxiety and Depression

The Hospital Anxiety and Depression Scale (HADS) was used to assess anxiety and depression levels (Zigmond and Snaith, 1983). In this scale, 7 items are assigned to measure anxiety (HADS-A, 1 item scored in reverse) and the other 7 items are used to measure depression (HADS-D, 5 items scored in reverse). Each item was scored from 0 to 3, and the total score for anxiety or depression ranged from 0 to 21. In each subscale, scores ranging from 0 to 7, 8 to 10, and 11 to 21 were interpreted as normal, borderline abnormal, and abnormal, respectively (Tasnim et al., 2021). The HADS has been widely used to assess mental health in different groups of people, including medical staff, owing to its excellent psychometric characteristics (Rahman et al., 2019; Khanal et al., 2020). In the present study, the standardized Cronbach's Alpha of the HADS-A and HADS-D was 0.882, 0.822, respectively.

Statistical Analysis

Descriptive analysis was performed on all variables, including demographic characteristics. Continuous variables and categorical variables are presented as the mean (standard deviation) and frequency (percentage), respectively. One-sample Kolmogorov–Smirnov Test was applied to confirm whether the variables conform to normal distribution. Spearman's Rank Correlation was used to assess the correlations between measures. A correlation coefficient less than 0.3 indicates a mild correlation effect. A structural equation model was used to verify the study model. Absolute fit indices (goodness of fit index, standardized root mean squared residual, and root mean square error of approximation) and incremental fit indices (comparative fit index, Tucker–Lewis index, and normed fit index) were calculated using the maximum likelihood estimation to examine the model fit. Specifically, when the goodness of fit

index, comparative fit index, Tucker–Lewis index, and normed fit index values were >0.9, and the standardized root mean squared residual and root mean square error of approximation were <0.08, the hypothetical model was broadly perceived as a good fit (Hu and Bentler, 1999; Kenny and McCoach, 2003; Groarke et al., 2021). Bootstrap tests with 5,000 random samples and 95% confidence intervals (CIs) were used to analyze the significance of the mediating role. Descriptive analysis and Cronbach's alpha test were conducted using SPSS v25.0, and confirmatory factor analysis, structural equation model, and bootstrap tests were conducted using AMOS v25.0.

RESULTS

Common Method Bias Testing

Common method bias is likely to result in systematic errors in the verification of mediation relationships. The potential impact of common method bias was measured by The Harman single-factor test before data analysis (Podsakoff et al., 2003). Eight factors with eigenvalues greater than 1 were obtained after exploratory factor analysis without rotation setup, and the first factor explains 24.6% of the total variance, which was less than 40% of the critical criterion, indicating that the influence of common method bias on the results of the statistical analysis in this study was absence of serious.

Participants' Sociodemographic Characteristics and Incidence of Anxiety and Depression

A total of 840 primary healthcare workers participated in this study. As shown in **Table 1**, 174 (20.7%) were male, and 666 (79.3%) were female. The mean age of the participants was 36.8 years (SD = 8.70). The majority of respondents had a bachelor's degree or above (75.4%) and were married (76.7%). The average number of working years of the participants was 8.85 years (SD = 7.83). The percentages of physicians, nurses, medical technicians, and management support personnel were 43.8, 37.9, 14.8, and 3.5%, respectively. More than half of the respondents had monthly incomes ranging from 3,000 to 9,000 RMB (64.2%). Of the 840 participants, 209 (24.9%) reported mild symptoms of anxiety, and 363 (43.2%) were identified as having severe anxiety symptoms. Similarly, 305 (36.3%) participants had mild depression symptoms, and 162 (19.3%) were identified as having severe depressive symptoms.

Descriptive Statistics and Correlations Between Key Variables

The mean (M) and standard deviation (SD) of, and correlation coefficients between the measures are displayed in **Table 2**. Given the results of the One-sample Kolmogorov-Smirnov Test showed the hypothesis of the normal distribution is not supported (**Supplementary Table 2**), the application of Spearman's Rank Correlation was accepted. The effort-reward ratio and overcommitment were positively correlated with anxiety and depression, and negatively correlated with social

TABLE 1 | Sociodemographic characteristics of primary healthcare workers.

Variables	Frequency (N)	Percentage(%)
Sex		
Male	174	20.7
Female	666	79.3
Age		
20–29	174	20.7
30–39	385	45.8
40–49	182	21.7
50 or above	99	11.8
Educational level		
Technical secondary school and below	34	4.0
Junior college	173	20.6
Bachelor	606	72.2
Master degree or above	27	3.2
Marital status		
Single	169	20.1
Married	644	76.7
Divorced/Widowed	27	3.2
Working years		
1–5	343	40.8
6–10	279	33.2
11 or above	218	26.0
Occupation		
Physician	368	43.8
Nurse	318	37.9
Medical technician	125	14.8
Management support personnel	29	3.5
Personal monthly income (RMB)		
3000 or below	45	5.4
3000–6000	299	35.6
6000–9000	240	28.6
9000–12000	156	18.5
12000–15000	58	6.9
15000 or above	42	5.0
Anxiety		
Normal (HADS-A$\leq$7)	268	31.9
Borderline abnormal (8$\leq$HADS-A$\leq$10)	209	24.9
Abnormal (11$\leq$HADS-A$\leq$21)	363	43.2
Depression		
Normal (HADS-D$\leq$7)	373	44.4
Borderline abnormal (8$\leq$HADS-D$\leq$10)	305	36.3
Abnormal (11$\leq$HADS-D$\leq$21)	162	19.3

An average exchange rate of RMB against USD was 6.4439.

support and resilience ($P < 0.05$). Furthermore, social support, objective support, subjective support, use of support, positive polarity factor, negative polarity factor, and resilience were negatively correlated with anxiety and depression ($P < 0.01$).

Measurement Model

The measurement model consisted of four constructs – COVID-19-related Work Stress, social support, resilience, and mental health. The analysis results for the measurement model are presented in **Table 3**. All factor loadings of the measurement

TABLE 2 | Descriptive statistics and bivariate Spearman's rank correlation among study variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	M (SD)
(1) E-R ratio	1											1.27 (0.44)
(2) OC	0.457**	1										11.34 (2.49)
(3) Social support	−0.210**	−0.075*	1									40.80 (8.48)
(4) OS	−0.149**	−0.075*	0.808**	1								10.41 (3.68)
(5) SS	−0.212**	−0.066	0.882**	0.504**	1							22.51 (4.99)
(6) UOS	−0.135**	−0.055	0.548**	0.372**	0.335**	1						7.88 (1.70)
(7) Resilience	−0.346**	−0.343**	0.359**	0.290**	0.319**	0.218**	1					3.19(0.61)
(8) PPF	−0.312**	−0.233**	0.322**	0.255**	0.286**	0.204**	0.845**	1				3.27 (0.62)
(9) NPF	−0.310**	−0.361**	0.314**	0.255**	0.279**	0.200**	0.893**	0.542**	1			3.11 (0.73)
(10) Anxiety	0.310**	0.458**	−0.305**	−0.232**	−0.286**	−0.185**	−0.594**	−0.498**	−0.539**	1		9.68 (4.31)
(11) Depression	0.314**	0.367**	−0.392**	−0.327**	−0.329**	−0.263**	−0.559**	−0.473**	−0.507**	0.705**	1	7.64 (3.78)

*$P < 0.05$; **$P < 0.01$; M, mean; SD, standard deviation; E-R ratio, Effort-Reward ratio; OC, overcommitment; OS, objective support; SS, subjective support; UOS, use of support; PPF, positive polarity factor; NPF, negative polarity factor.*

model were significant ($P < 0.001$), and the standardized factor loading ranged from 0.534 to 0.863. Moreover, the measurement model revealed a good fit with the data ($\chi 2/df = 3.740$, $P < 0.001$, goodness of fit index = 0.980, comparative fit index = 0.979, Tucker–Lewis index = 0.962, normed fit index = 0.971, standardized root mean squared residual = 0.034, root mean square error of approximation = 0.057).

Structural Model and Bootstrap Test

As predicted, all paths in the study model were significant (**Figure 2**). COVID-19-related work stress ($\beta = 0.300$, $P < 0.001$, 95% CI = 0.149 to 0.438) had a significant positive effect on anxiety and depression, while social support ($\beta = −0.177$, $P = 0.001$, 95% CI = −0.263 to −0.089) and resilience ($\beta = −0.498$, $P = 0.001$, 95% CI = −0.653 to −0.334) had a significant negative association with anxiety and depression. COVID-19-related work stress had a significant negative influence on social support ($\beta = −0.261$, $P < 0.001$, 95% CI = −0.378 to −0.144) and resilience ($\beta = −0.569$, $P < 0.001$, 95% CI = −0.675 to −0.463). Social support played a significant positive predictive role on resilience ($\beta = 0.380$, $P = 0.001$, 95% CI = 0.276 to 0.473).

The 95% CI of the model path was obtained using the bootstrap method. In this process, repeated sampling was performed 5000 times. As outlined in **Table 4**, the CI of each path coefficient did not contain 0, indicating that the indirect and direct effects were statistically significant. Among the three mediating paths, COVID-19-related work stress → resilience → mental health had the greatest value of indirect effect ($\beta = 0.283$, $P < 0.001$, 95% CI = 0.190 to 0.414), followed by COVID-19-related work stress → social support → resilience → mental health ($\beta = 0.049$, $P < 0.001$, 95% CI = 0.028 to 0.081) and COVID-19-related work stress→ social support → mental health ($\beta = 0.046$, $P < 0.001$, 95% CI = 0.022 to 0.083). Overall, indirect and direct effects accounted for 55.8% and 44.2% of the total effect, respectively, and this model explained 68.9% of the total variance of anxiety and depression.

DISCUSSION

Currently, there are limited reports on the prevalence of anxiety and depression in primary healthcare workers during the COVID-19 pandemic. The present study revealed the prevalence of anxiety (68.1%) and depression (55.6%) among the participants, which were much higher than the pooled prevalence in overall healthcare workers reported in several meta-analyses in the COVID-19 pandemic (Hao et al., 2021; Pappa et al., 2021; Saragih et al., 2021; Wu T. et al., 2021). Furthermore, we examined the direct and indirect effects of COVID-19-related work stress on anxiety and depression in primary healthcare workers. Social support and resilience were found to independently and continuously mediate the effects of COVID-19-related work stress on anxiety and depression, with a total indirect effect of 55.8%.

Our findings suggested that COVID-19-related work stress is an important predictor of anxiety and depression symptoms among primary healthcare workers, which is consistent with

TABLE 3 | Maximum likelihood parameter estimates for measurement model.

Path	Factor loadings	S.E.	Standardized factor loadings	P
E-R ratio<—COVID-19-related work stress	1		0.611	
OC<—COVID-19-related work stress	6.923	0.568	0.739	<0.001
OS<—Social support	1		0.703	
SS<—Social support	1.422	0.102	0.737	<0.001
UOS<—Social support	0.351	0.029	0.534	<0.001
PPF<—Resilience	1		0.761	
NPF<—Resilience	1.218	0.064	0.788	<0.001
Anxitey<–Mental health	1		0.863	
Depression<—Mental health	0.856	0.033	0.843	<0.001

E-R ratio, Effort-Reward ratio; OC, overcommitment; OS, objective support; SS, subjective support; UOS, use of support; SE, standard error; PPF, positive polarity factor; NPF, negative polarity factor.
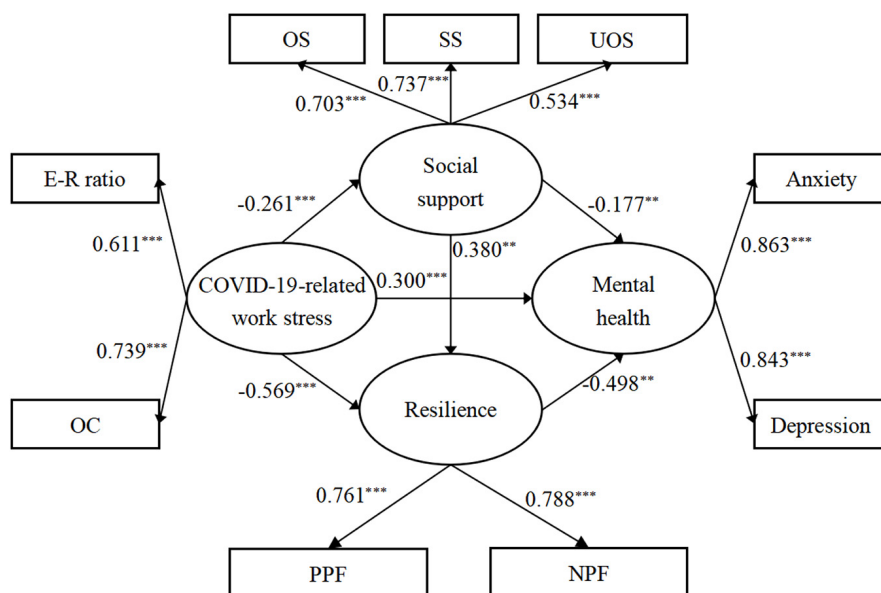
FIGURE 2 | Multiplemediation models with significantly standardized estimates. **$P < 0.05$; ***$P < 0.001$, E-R ratio, Effort-Reward ratio; OC, overcommitment; OS, objective support; SS, subjective support; UOS, use of support; PPF, positive polarity factor; NPF, negative polarity factor.

TABLE 4 | Standardization direct effects and indirect effects in the model.

	Standardized estimate	P	95% confidence interval		Ratio of effect
			Lower	Upper	
Indirect effects	0.378	<0.001	0.275	0.523	55.8%
COVID-19-related work stress→Social support→Resilience→Mental health	0.049	<0.001	0.028	0.081	7.2%
COVID-19-related work stress→Social support→Mental health	0.046	<0.001	0.022	0.083	6.9%
COVID-19-related work stress→Resilience→Mental health	0.283	<0.001	0.190	0.414	41.7%
Direct effects	0.300	<0.001	0.149	0.438	44.2%
Total effects	0.678	<0.001	0.604	0.753	

previous studies on occupational health among medical staff. For example, Gao et al. showed that work content, ERI, and overcommitment were significantly associated with anxiety symptoms in nurses (Gao et al., 2012). Bernburg et al. (2016) reported significant associations between working conditions and depressive symptoms among physicians. Indeed, since

the COVID-19 outbreak, primary healthcare workers have been exposed to oppressive work environments that create stable stressors (e.g., COVID-19-related work insecurity, overload, responsibility, programmatic work content, and rigor requirements). The long-term accumulation of these stressors may trigger a range of COVID-19-related psychosocial

responses, further amplifying the psychiatric hazards of COVID-19 outbreaks for primary health care workers. Therefore, future interventions should focus on the impact of working conditions on primary healthcare workers and provide them with adequate work benefits, solid work security, and ongoing mental health services to support their coping strategies (Ashley et al., 2021).

Our study confirmed the mediating role of social support in the association between COVID-19-related work stress and symptoms of anxiety and depression among primary healthcare workers. This finding is consistent with that of some previous studies conducted with nurses (Wu et al., 2011; Chen et al., 2020). Healthcare workers with high levels of social support may have more chances to adopt a positive coping style, which can reduce anxiety and depression symptoms during the COVID-19 pandemic (Zhu et al., 2020). However, unlike previous studies, we found that social support mediated only 6.9% of the effect of COVID-19-related work stress on anxiety and depression. A possible explanation is that the work restrictions of social distancing, lockdown, and quarantine prevent primary healthcare workers from effectively utilizing their support systems as they did previously, thus weakening the stress-buffering effect of social support (Szkody et al., 2020). Therefore, the beneficial effects of social support cannot be ignored. The primary healthcare institutions must provide a supportive work environment (e.g., using online social networking platforms, limiting the shift time, setting up special rest areas, and providing accurate information about the virus) on the premise of the virus protection requirements, strengthening the social and emotional connection and active coping strategies of primary healthcare workers in the workplace (Labrague, 2021).

We also found that resilience played a significant mediating role in the association between COVID-19-related work stress and symptoms of anxiety as well as depression among primary healthcare workers, which is in line with previous research (Labrague, 2021). Interestingly, The pathway in which COVID-19-related work stress impacted anxiety and depression through resilience had the greatest impact (41.7%) on all indirect pathways. Highly resilient healthcare workers may have adequate coping resources and positive emotions, can effectively address COVID-19-related stressors and withstand the pandemic-related psychological burden, thus reducing the occurrence of psychological distress (e.g., anxiety, depression, insomnia, and fatigue) (Huffman et al., 2021; Yoruk and Guler, 2021). Given the important role of resilience in mitigating the mental health hazards associated with COVID-19-related work stress, there is a need to deliver interventions that focus on enhancing resilience. For example, interventions such as stress management and resilience training programs (Magtibay et al., 2017), mindfulness-based stress reduction, and cognitive restructuring strategies (Huffman et al., 2021) have been recommended to improve the resilience of primary healthcare workers.

Our study indicated that COVID-19-related work stress affected anxiety and depression in primary healthcare workers through the sequential mediating effect of social support and resilience, which is consistent with Kumpfer's resilience framework. Successful adaptation in adversity comes from the interaction between an individual's internal characteristics (e.g.,

resilience) and the external environment (e.g., social support) (Kumpfer, 2002; Bhattarai et al., 2021). Our findings highlight the unique role of social support and resilience in the processes of mitigating mental health damage from COVID-19-related work stress. Specifically, higher levels of social support can provide more external resources to help change stress perceptions and reassess COVID-19-related work stress as manageable, thus improving individuals' resilience and reducing the occurrence of adverse mental health symptoms (Tam et al., 2021). Therefore, interventions that focus on both social support and resilience may be more effective in improving coping strategies and reducing the risk of anxiety and depression.

The present study has the following limitations. First, the conclusions obtained are based on cross-sectional data, and causal relationships between variables cannot be determined. Future studies should collect follow-up data at multiple time points to assess the longitudinal variation of the association between these factors at different stages of the COVID-19 pandemic. Second, given the self-report questionnaire-centered assessment method adopted in this study, the data obtained may have recall bias. Third, although a rigorous random sampling method was employed to recruit participants from 17 community health centers, the repeatability needs to be noted, as the sample was only from one city in China. Future studies need to perform random sampling in multiple cities to improve the generalizability of our findings.

Despite these limitations, our study has some novel strengths. First, to our knowledge, our study reports a high prevalence of anxiety and depression symptoms among primary healthcare workers for the first time, which emphasizes the urgency for greater attention to the psychological responses of primary healthcare workers during the COVID-19 pandemic. Second, the current study developed a questionnaire of COVID-19-related work stress based on the ERI model, which provides a new perspective for measuring the impact of work stress caused by the pandemic. Third, we verified that social support and resilience mediate the relationship between COVID-19-related work stress and symptoms of anxiety and depression, which provides evidence for the establishment of mental health-protective mechanisms of social support and resilience in the COVID-19 pandemic.

CONCLUSION

Overall, more than half of primary healthcare workers suffered from mild or more severe (at least borderline abnormal) symptoms of anxiety (68.1%) and depression (55.6%). More importantly, this study found that COVID-19-related work stress significantly predicted anxiety and depression. The independent and cumulative mediating effects of social support and resilience on the association between COVID-19-related work stress and symptoms of anxiety and depression were verified by applying a structural equation model. Specifically, COVID-19-related work stress not only affected anxiety and depression independently *via* social support and resilience, but also affected anxiety and depression through the sequential mediating role of social

support and resilience. Notably, the indirect effect of COVID-19-related work stress on anxiety and depression through resilience was much higher than that of the other indirect effects in our study. These findings have positive implications for the intervention of mental problems among primary healthcare workers, as well as for the improvement of mental health well-being during COVID-19.

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 Southern Medical University, Guangzhou, Guangdong Province, China (Ethical approval number: NFYKDX002). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

L-S-BS, RX, and DW contributed to the design of this study. L-S-BS, D-XC, YX, and DW collected the data. L-S-BS, RX, and YX conducted the data analysis. L-S-BS wrote the manuscript. All authors edited, approved, and submitted the final manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.800183/full#supplementary-material

REFERENCES

Arenson, M., Bernat, E., De Los, R. A., Neylan, T. C., and Cohen, B. E. (2021). Social support, social network size, and suicidal ideation: a nine-year longitudinal analysis from the Mind Your Heart Study. *J. Psychiatr. Res.* 135, 318–324. doi: 10.1016/j.jpsychires.2021.01.017

Ashley, C., James, S., Williams, A., Calma, K., Mcinnes, S., Mursa, R., et al. (2021). The psychological well-being of primary healthcare nurses during COVID-19: a qualitative study. *J. Adv. Nurs.* 77, 3820–3828. doi: 10.1111/jan.14937

Bernburg, M., Vitzthum, K., Groneberg, D. A., and Mache, S. (2016). Physicians' occupational stress, depressive symptoms and work ability in relation to their working environment: a cross-sectional study of differences among medical residents with various specialties working in German hospitals. *BMJ Open* 6:e11369. doi: 10.1136/bmjopen-2016-011369

Bhattarai, M., Jin, Y., Smedema, S. M., Cadel, K. R., and Baniya, M. (2021). The relationships among self-efficacy, social support, resilience, and subjective well-being in persons with spinal cord injuries. *J. Adv. Nurs.* 77, 221–230. doi: 10.1111/jan.14573

Bonanno, G. A. (2004). Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *Am. Psychol.* 59, 20–28. doi: 10.1037/0003-066X.59.1.20

Chen, J., Li, J., Cao, B., Wang, F., Luo, L., and Xu, J. (2020). Mediating effects of self-efficacy, coping, burnout, and social support between job stress and mental health among young Chinese nurses. *J. Adv. Nurs.* 76, 163–173. doi: 10.1111/jan.14208

Cohen, S., and Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychol. Bull.* 98, 310–357.

Dour, H. J., Wiley, J. F., Roy-Byrne, P., Stein, M. B., Sullivan, G., Sherbourne, C. D., et al. (2014). Perceived social support mediates anxiety and depressive symptom changes following primary care intervention. *Depress Anxiety*. 31, 436–442. doi: 10.1002/da.22216

Feng, L., and Yin, R. (2021). Social support and hope mediate the relationship between gratitude and depression among front-line medical staff during the pandemic of COVID-19. *Front. Psychol.* 12:623873. doi: 10.3389/fpsyg.2021.623873

Fung, S. (2020). Validity of the Brief resilience scale and brief resilient coping scale in a chinese sample. *Int. J. Env. Res. Pub. He.* 17:1265. doi: 10.3390/ijerph17041265

Gao, Y. Q., Pan, B. C., Sun, W., Wu, H., Wang, J. N., and Wang, L. (2012). Anxiety symptoms among Chinese nurses and the associated factors: a cross sectional study. *BMC Psychiatry* 12:141. doi: 10.1186/1471-244X-12-141

General Office of National Health Commission of the People's Republic of China (2020). *Notice on the Issuance of Health Management Plan for Discharged COVID-19 Patients (trial)*. Available online at: http://www.nhc.gov.cn/cms-search/xxgk/getManuscriptXxgk.htm?id=056b2ce9e13142e6a70ec08ef970f1e8 (accessed December 16, 2021).

Groarke, J. M., McGlinchey, E., McKenna-Plumley, P. E., Berry, E., Graham-Wisener, L., and Armour, C. (2021). Examining temporal interactions between loneliness and depressive symptoms and the mediating role of emotion regulation difficulties among UK residents during the COVID-19 lockdown: Longitudinal results from the COVID-19 psychological wellbeing study. *J. Affect. Disord.* 285, 1–9. doi: 10.1016/j.jad.2021.02.033

Hao, Q., Wang, D., Xie, M., Tang, Y., Dou, Y., Zhu, L., et al. (2021). Prevalence and risk factors of mental health problems among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Front. Psychiatry* 12:567381. doi: 10.3389/fpsyt.2021.567381

Hofman, A., Zajdel, N., Klekowski, J., and Chabowski, M. (2021). Improving social support to increase QoL in lung cancer patients. *Cancer Manag. Res.* 13, 2319–2327. doi: 10.2147/CMAR.S278087

Hu, L., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equat. Model.* 6, 1–55. doi: 10.1080/10705519909540118

Huffman, E. M., Athanasiadis, D. I., Anton, N. E., Haskett, L. A., Doster, D. L., Stefanidis, D., et al. (2021). How resilient is your team? Exploring healthcare providers' well-being during the COVID-19 pandemic. *Am. J. Surg.* 221, 277–284. doi: 10.1016/j.amjsurg.2020.09.005

Huo, L., Zhou, Y., Li, S., Ning, Y., Zeng, L., Liu, Z., et al. (2021). Burnout and Its relationship with depressive symptoms in medical staff during the COVID-19 epidemic in China. *Front. Psychol.* 12:616369. doi: 10.3389/fpsyg.2021.616369

Kenny, D. A., and McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Struct. Equat.Model.* 10, 333–351. doi: 10.1207/S15328007SEM1003_1

Khanal, P., Devkota, N., Dahal, M., Paudel, K., and Joshi, D. (2020). Mental health impacts among health workers during COVID-19 in a low resource setting: a cross-sectional survey from Nepal. *Globaliz. Health* 16:89. doi: 10.1186/s12992-020-00621-z

Kopp, M. S., Stauder, A., Purebl, G., Janszky, I., and Skrabski, A. (2008). Work stress and mental health in a changing society. *Eur. J. Public Health* 18, 238–244. doi: 10.1093/eurpub/ckm077

Kumpfer, K. L. (2002). "Factors and processes contributing to resilience," in *Resilience and Development: Positive Life Adaptations*, eds M. D. Glantz and J. L. Johnson (Boston, MA: Springer US), 179–224, Reprinted. doi: 10.1007/s10995-014-1479-y

Labrague, L. J. (2021). Psychological resilience, coping behaviours and social support among health care workers during the COVID-19 pandemic: a systematic review of quantitative studies. *J. Nurs. Manag.* 1893–1905. doi: 10.1111/jonm.13336

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., et al. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open* 3:e203976. doi: 10.1001/jamanetworkopen.2020.3976

Lazarus, R. S. (1993). Coping theory and research: past, present, and future. *Psychosom. Med.* 55, 234–247. doi: 10.1097/00006842-199305000-00002

Li, J., Loerbroks, A., Shang, L., Wege, N., Wahrendorf, M., and Siegrist, J. (2012). Validation of a short measure of effort-reward imbalance in the workplace: evidence from China. *J. Occup. Health.* 54, 427–433. doi: 10.1539/joh.12-0106-BR

Li, J., Theng, Y. L., and Foo, S. (2015). Does psychological resilience mediate the impact of social support on geriatric depression? An exploratory study among Chinese older adults in Singapore. *Asian J. Psychiatr.* 14, 22–27. doi: 10.1016/j.ajp.2015.01.011

Liang, W. N., Yao, J. H., Wu, J., Liu, X., Liu, J., Zhou, L., et al. (2021). Experience and thinking on the normalization stage of prevention and control of COVID-19 in China. *Zhonghua Yi Xue Za Zhi* 101, 695–699. doi: 10.3760/cma.j.cn112137-20210104-00008

Lin, N., Simeone, R. S., Ensel, W. M., and Kuo, W. (1979). Social support, stressful life events, and illness: a model and an empirical test. *J. Health Soc. Behav.* 20, 108–119. doi: 10.2307/2136433

Magnavita, N., Soave, P. M., and Antonelli, M. (2021). Prolonged stress causes depression in frontline workers facing the COVID-19 pandemic-a repeated cross-sectional study in a COVID-19 Hub-Hospital in Central Italy. *Int. J. Environ. Res. Public Health* 18:7316. doi: 10.3390/ijerph18147316

Magtibay, D. L., Chesak, S. S., Coughlin, K., and Sood, A. (2017). Decreasing stress and burnout in nurses: efficacy of blended learning with stress management and resilience training program. *J. Nurs. Adm.* 47, 391–395. doi: 10.1097/NNA.0000000000000501

Mo, P., Chen, X., Lam, E., Li, J., Kahler, C. W., and Lau, J. (2020). The moderating role of social support on the relationship between anxiety, stigma, and intention to use illicit drugs among HIV-positive men who have sex with men. *Aids Behav.* 24, 55–64. doi: 10.1007/s10461-019-02719-x

Mosheva, M., Hertz-Palmor, N., Dorman, I. S., Matalon, N., Pessach, I. M., Afek, A., et al. (2020). Anxiety, pandemic-related stress and resilience among physicians during the COVID-19 pandemic. *Depress Anxiety* 37, 965–971. doi: 10.1002/da.23085

National Health Commission of the People's Republic of China (2021). *Ministry of Finance of the People's Republic of China, National Administration of Traditional Chinese Medicine of the People's Republic of China. A Circular on Completing Work on the Basic Public Health Service Project in 2021.* Available online at: http://www.gov.cn/zhengce/zhengceku/2021-07/14/content_5624819.htm (accessed December 16, 2021).

Ofei-Dodoo, S., Loo-Gross, C., and Kellerman, R. (2021). Burnout, depression, anxiety, and stress among family physicians in kansas responding to the COVID-19 pandemic. *J. Am. Board Fam. Med.* 34, 522–530. doi: 10.3122/jabfm.2021.03.200523

Paiva, C. E., Martins, B. P., and Ribeiro Paiva, B. S. (2018). Doctor, are you healthy? A cross-sectional investigation of oncologist burnout, depression, and anxiety and an investigation of their associated factors. *BMC Cancer* 18:4964. doi: 10.1186/s12885-018-4964-7

Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V. G., Papoutsi, E., and Katsaounou, P. (2021). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav. Immun. Brain Behav. Immun.* 88, 901–907. doi: 10.1016/j.bbi.2020.05.026

Park, N. S., Song, S. M., and Kim, J. E. (2020). The mediating effect of childcare teachers' resilience on the relationship between social support in the workplace and their self-care. *Int. J. Environ. Res. Public Health* 17:8513. doi: 10.3390/ijerph17228513

Pfefferbaum, B., and North, C. S. (2020). Mental health and the Covid-19 pandemic. *N. Engl. J. Med.* 383, 510–512. doi: 10.1056/NEJMp2008017

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879–903. doi: 10.1037/0021-9010.88.5.879

Rahman, A., Khan, M. N., Hamdani, S. U., Chiumento, A., Akhtar, P., Nazir, H., et al. (2019). Effectiveness of a brief group psychological intervention for women in a post-conflict setting in Pakistan: a single-blind, cluster, randomised controlled trial. *Lancet* 393, 1733–1744. doi: 10.1016/S0140-6736(18)32343-2

Reichenberg, A., and MacCabe, J. H. (2007). Feeling the pressure: work stress and mental health. *Psychol. Med.* 37, 1073–1074. doi: 10.1017/S0033291707000888

Robbins, R., Weaver, M. D., Czeisler, M. E., Barger, L. K., Quan, S. F., and Czeisler, C. A. (2021). Associations between changes in daily behaviors and self-reported feelings of depression and anxiety about the COVID-19 pandemic among older adults. *J. Gerontol. B Psychol. Sci. Soc. Sci.* 2:gbab110. doi: 10.1093/geronb/gbab110

Saragih, I. D., Tonapa, S. I., Saragih, I. S., Advani, S., Batubara, S. O., Suarilah, I., et al. (2021). Global prevalence of mental health problems among healthcare workers during the Covid-19 pandemic: A systematic review and meta-analysis. *Int. J. Nurs. Stud.* 121:104002. doi: 10.1016/j.ijnurstu.2021.104002

Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I., et al. (2004). The measurement of effort-reward imbalance at work: European comparisons. *Soc. Sci. Med.* 58, 1483–1499. doi: 10.1016/S0277-9536(03)00351-4

Siegrist, J., Wege, N., Puehlhofer, F., and Wahrendorf, M. (2009). A short generic measure of work stress in the era of globalization: effort-reward imbalance. *Int. Arch. Occ. Env. Hea.* 82, 1005–1013. doi: 10.1007/s00420-008-0384-3

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., and Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *Int. J. Behav. Med.* 15, 194–200. doi: 10.1080/10705500802222972

Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., and Yehuda, R. (2014). Resilience definitions, theory, and challenges: interdisciplinary perspectives. *Eur. J. Psychotraumatol.* 5:25338. doi: 10.3402/ejpt.v5.25338

State Council of the People's Republic of China (2020). *Notice on Giving Full Play to the Sentinel role of Medical Institutions to Carry Out Regular Epidemic Prevention and Control Work.* Available online at: http://www.gov.cn/fuwu/2020-06/11/content_5518727.htm (Accessed December 16, 2021).

Sun, J., Harris, K., and Vazire, S. (2020). Is well-being associated with the quantity and quality of social interactions? *J. Pers. Soc. Psychol.* 119, 1478–1496. doi: 10.1037/pspp0000272

Szkody, E., Stearns, M., Stanhope, L., and McKinney, C. (2020). Stress-Buffering Role of Social Support during COVID-19. *Fam. Process* 60, 1002–1015. doi: 10.1111/famp.12618

Tam, C. C., Sun, S., Yang, X., Li, X., Zhou, Y., and Shen, Z. (2021). Psychological distress among HIV healthcare providers during the COVID-19 pandemic in china: mediating roles of institutional support and resilience. *Aids Behav.* 25, 9–17. doi: 10.1007/s10461-020-03068-w

Tasnim, R., Sujan, M., Islam, M. S., Ritu, A. H., Siddique, M., Toma, T. Y., et al. (2021). Prevalence and correlates of anxiety and depression in frontline

healthcare workers treating people with COVID-19 in Bangladesh. *BMC Psychiatry* 21:271. doi: 10.1186/s12888-021-03243-w

Thompson, N. J., Fiorillo, D., Rothbaum, B. O., Ressler, K. J., and Michopoulos, V. (2018). Coping strategies as mediators in relation to resilience and posttraumatic stress disorder. *J. Affect. Disord.* 225, 153–159. doi: 10.1016/j.jad.2017.08.049

Tugade, M. M., Fredrickson, B. L., and Barrett, L. F. (2004). Psychological resilience and positive emotional granularity: examining the benefits of positive emotions on coping and health. *J. Pers.* 72, 1161–1190. doi: 10.1111/j.1467-6494.2004.00294.x

Wang, L. Q., Zhang, M., Liu, G. M., Nan, S. Y., Li, T., Xu, L., et al. (2020). Psychological impact of coronavirus disease (2019) (COVID-19) epidemic on medical staff in different posts in China: a multicenter study. *J. Psychiatr. Res.* 129, 198–205. doi: 10.1016/j.jpsychires.2020.07.008

Weinberg, A., and Creed, F. (2000). Stress and psychiatric disorder in healthcare professionals and hospital staff. *Lancet* 355, 533–537. doi: 10.1016/S0140-6736(99)07366-3

Windle, G., Bennett, K. M., and Noyes, J. (2011). A methodological review of resilience measurement scales. *Health Qual. Life Outcomes* 9:8. doi: 10.1186/1477-7525-9-8

World Health Organization (WHO) (2021). *Coronavirus Disease (COVID-19) Situation Dashboard (2021)*. Available online at: https://covid19.who.int/ (accessed December 13, 2021).

Wu, C., Liu, Y., Ma, S., Jing, G., Zhou, W., Qu, L., et al. (2021). The mediating roles of coping styles and resilience in the relationship between perceived social support and posttraumatic growth among primary caregivers of schizophrenic patients: a cross-sectional study. *BMC Psychiatry* 21:58. doi: 10.1186/s12888-021-03058-9

Wu, H., Ge, C. X., Sun, W., Wang, J. N., and Wang, L. (2011). Depressive symptoms and occupational stress among Chinese female nurses: the mediating effects of social support and rational coping. *Res. Nurs. Health* 34, 401–407. doi: 10.1002/nur.20449

Wu, T., Jia, X., Shi, H., Niu, J., Yin, X., Xie, J., et al. (2021). Prevalence of mental health problems during the COVID-19 pandemic: a systematic review and meta-analysis. *J. Affect. Disord.* 281, 91–98. doi: 10.1016/j.jad.2020.11.117

Xiao, S. Y. (1994). Theoretical basis and application of the social support rating scale. *J. Clin. Psychiat.* 2, 98–100.

Xu, L., You, D., Li, C., Zhang, X., Yang, R., Kang, C., et al. (2021). Two-stage mental health survey of first-line medical staff after ending COVID-19 epidemic assistance and isolation. *Eur. Arch. Psychiatry Clin. Neurosci.* 2, 1–13. doi: 10.1007/s00406-021-01239-x

Yoruk, S., and Guler, D. (2021). The relationship between psychological resilience, burnout, stress, and sociodemographic factors with depression in nurses and midwives during the COVID-19 pandemic: a cross-sectional study in Turkey. *Perspect. Psychiatr. Care* 57, 390–398. doi: 10.1111/ppc.12659

Yu, H., Li, M., Li, Z., Xiang, W., Yuan, Y., Liu, Y., et al. (2020). Coping style, social support and psychological distress in the general Chinese population in the early stages of the COVID-19 epidemic. *BMC Psychiatry* 20:426. doi: 10.1186/s12888-020-02826-3

Zalta, A. K., Tirone, V., Orlowska, D., Blais, R. K., Lofgreen, A., Klassen, B., et al. (2021). Examining moderators of the relationship between social support and self-reported PTSD symptoms: a meta-analysis. *Psychol. Bull* 147, 33–54. doi: 10.1037/bul0000316

Zhang, D., Wang, R., Zhao, X., Zhang, J., Jia, J., Su, Y., et al. (2021). Role of resilience and social support in the relationship between loneliness and suicidal ideation among Chinese nursing home residents. *Aging Ment. Health* 25, 1262–1272. doi: 10.1080/13607863.2020.1786798

Zhang, W. R., Wang, K., Yin, L., Zhao, W. F., Xue, Q., Peng, M., et al. (2020). Mental Health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. *Psychother. Psychosom.* 89, 242–250. doi: 10.1159/000507639

Zhang, X., Huang, P. F., Li, B. Q., Xu, W. J., Li, W., and Zhou, B. (2021). The influence of interpersonal relationships on school adaptation among Chinese university students during COVID-19 control period: multiple mediating roles of social support and resilience. *J. Affect. Disord.* 285, 97–104. doi: 10.1016/j.jad.2021.02.040

Zhu, W., Wei, Y., Meng, X., and Li, J. (2020). The mediation effects of coping style on the relationship between social support and anxiety in Chinese medical staff during COVID-19. *BMC Health Serv. Res.* 20:1007. doi: 10.1186/s12913-020-05871-6

Zhu, Z., Zhu, D., Jiang, Y., Lin, Y., Yang, Y., and Luan, W. (2021). Cross-sectional study on the SF-36, the general self-efficacy, the social support, and the health promoting lifestyle of the young elderly in a community in Shanghai, China. *Ann. Palliat. Med.* 10, 518–529. doi: 10.21037/apm-20-2462

Zigmond, A. S., and Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatr. Scand.* 67, 361–370. doi: 10.1111/j.1600-0447.1983.tb09716.x

Check for updates

Psychological Support in a COVID-19 Hospital: A Community Case Study

Damiano Rizzi[1,2*†], Erika Asperges[3†], Anna Rovati[1,2], Francesca Bigoni[1,2], Elena Pistillo[1], Angelo Corsico[4], Francesco Mojoli[5], Stefano Perlini[2] and Raffaele Bruno[3]

[1] Fondazione Soleterre Strategie di Pace ONLUS, Milan, Italy, [2] Unit of Emergency Medicine, Department of Internal Medicine, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy, [3] Unit of Infectious Disease, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy, [4] Unit of Respiratory Diseases, Department of Medical Sciences and Infective Diseases, IRCCS Policlinico San Matteo Foundation, University of Pavia, Milan, Italy, [5] Unit of Anaesthesia and Intensive Care, Department of Clinical-Surgical, Diagnostic, and Pediatric Sciences, IRCCS Policlinico San Matteo Foundation, University of Pavia, Pavia, Italy

Burnout is a well-documented entity in Care Workers population, affecting up to 50% of physicians, just as it is equally well established that managing an infectious disease outbreaks, such as confirmed in the COVID-19 pandemic, increases Post-Traumatic Stress Disorder (PTSD) and the psychological burden. Mental health support, in the form of formal or remote sessions, has been shown to be helpful to health care staff, despite the organizational difficulties in an emergency. During the first emergence of COVID-19 in Italy, the Scientific Institute for Research, Hospitalization and Health Care *Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) Policlinico San Matteo Foundation* (Pavia, Lombardy), the Italian hospital that treated "patient 1," has activated an agreement with the *Soleterre Foundation*, an international Non-Governmental Organization (NGO) that manages health emergency projects, to provide psychological support. A task force of psychologists was created with the aim of designing and administering a *Therapeutic Mental Health Assessment for COVID-19 Care Workers* (TMHA COVID-19 CWs) to evaluate and support health care workers' mental health. The assessment battery was developed to evaluate symptoms and behaviors associated with trauma and the corresponding maladaptive behaviors (the National Stressful Events Survey for PTSD-Short Scale "NSESSS" and the Diagnostic and Statistical Manual of Mental Disorders "DSM-5" Self-Rated Level 1 transversal Symptom Measure—Adult). Once the TMHA COVID-19 CWs had been developed, the team of psychologists regularly visited healthcare staff in the ward to administer it. One hundred seven care workers (44 males, mean age 40 ± 15) across Intensive Care Units (ICUs), the emergency room and medical ward were administered the TMHA COVID-19 CWs. PTSD symptoms were reported as severe by 13% of the population. Depressive symptoms as severe for 7% and Anxiety symptoms as severe for 14%. Severe psychotic symptoms were experienced by 2% and severe suicidal thoughts by 1% of the population. The possibility of acting upon the results of the TMHA COVID-19 CWs allowed an early intervention through individual session beyond the cut-off level (moderate and severe symptoms) for PTSD in NSESSS. In fact, 280 individual support

sessions were offered. Therefore, we considered our project a protective and support factor for healthcare workers' mental well-being and we recommend implementing a mental health screening program in ward involved in COVID-19 patients' care.

INTRODUCTION

The COVID-19 pandemic put medical personnel under unprecedented levels of stress. Burnout is already a well-documented entity in this population, affecting as many as 50% of physicians (West et al., 2018), and infectious disease outbreaks are known to increase the psychological burden because of overwork and fear of contagion and dealing with unknown diseases, new or unusual protocols and decreased resources (Walton et al., 2020). A review on risk factors for post-traumatic stress disorder (PTSD) symptoms after Coronavirus outbreaks, including COVID-19, demonstrated a high risk for PTSD among emergency health care staff, and an English study confirmed worrying rates of probable mental health disorders in ICU staff during the current pandemic (Carmassi et al., 2020; Greenberg et al., 2021).

Response to stress can be varied: from acute stress reaction to PTSD. Psychological support in the form of formal or remote (*via* telephone or computer) sessions have been shown to be helpful to staff, but they can be difficult to organize because of time constraints and contagion concerns (Maunder et al., 2003).

Italy was the second country, after China, to deal with a relevant number of COVID-19 cases, and since the very first days of the pandemic it became apparent that the evidence on worsening mental health of medical personnel during a pandemic was going to be confirmed. For this reason, in the first Italian hospital that received COVID-19 patients, the Scientific Institute for Research, Hospitalization and Health Care *Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) Policlinico San Matteo Foundation* (Pavia, Italy), the *Soleterre Foundation* decided to implement a program of psychological support for healthcare personnel.

Since 2015, *Soleterre Foundation* has an agreement protocol with the *IRCCS Policlinico San Matteo Foundation* and actively collaborates offering psychological support to pediatric patients, their families, doctors and health workers. *Soleterre* also has considerable experience as an international NGO in the management of health emergency in Europe and Africa[1] including projects on psychological support and PTSD prevention in 22 middle and low income countries.[2]

---

[1]National Cancer Institute, Kyiv, Pediatric Department of the Romodanov Neurosurgery Institute, Kyiv, Western Ukrainian Specialized Children's Medical Centre, Lviv, Hospital di Treichville, Abidjan, SS. Annunziata Hospital, Taranto, *IRCCS Policlinico San Matteo Foundation*, Pavia, Ibn Sina Centre of Paediatric Hematology and Oncology, Rabat, Centre of Paediatric Hematology and Oncology, Marrakesh, St Mary's Lacor Hospital, Gulu Regional Referral Hospital (GRRH).

[2]Morocco, Ukraine, Philippines, India, Ivory Coast Italy, El Salvador, Panama, Costa Rica, Nicaragua, Honduras, Guatemala, Belize, Mexico, Dominican Republic, Uganda, Senegal, Central African Republic, Sierra Leone, Democratic Republic of Congo, Syria, Burkina Faso.

As the health situation worsened, *Soleterre Foundation* offered to expand their collaboration within the hospital, making their psychologists available and adding external professionals, for both in presence and remote interventions.

In this regard, it should be noted that, although telepsychiatry has proven effective in various contexts (for example, psychiatric assessment, monitoring of interventions (Shore et al., 2007; Santesteban-Echarri et al., 2020), individual and group support for PTSD, anxiety or depression (Andersson et al., 2014; Berryhill et al., 2019a,b; Gentry et al., 2019; Liu et al., 2020), its effectiveness in emergency pandemic situations is still poorly understood. In fact, while the majority of hospitals in Italy activated their few clinical psychologists for remote sessions *via* telephone or video calls, *Soleterre Foundation* specifically aimed at working at least partially in the frontlines.

Thus, on the 16th March 2020, *Soleterre Foundation* and the hospital implemented an emergency psychological support project. The main aim was implementation of a task force of psychologists required to create and administer a tool to evaluate health care workers' mental health. The objective of the intervention was to provide adequate psychological support where needed.

CONTEXT

Since the outbreak of the COVID-19 emergency in Italy, in February 2020, *IRCCS Policlinico San Matteo Foundation*, a university hospital managing more than 1,000 beds, has been on the front line for COVID-19 patients from four different provinces. It has been declared by the Lombardy Region a COVID-19 hub hospital for the provinces of Pavia, Lodi, Cremona, and Milan's southern metropolitan area, catering to a basin of 1.6 million inhabitants, with about 28,000 infections recorded in the first wave. During the first peak, 2,770 COVID-19 patients were admitted to the Emergency Room, 1,162 were admitted to the ward (including the Italian "patient 1"), and 397 patients died in-hospital over the course of 2 months. Actions had to be taken to accommodate the increased number of patients, many of them severely ill, including more than doubling the beds in the Infectious Diseases ward, creating an extra Emergency Room and ICU, converting or at least dedicating some beds of many other ward to COVID-19 (Asperges et al., 2020; Lenti et al., 2020; Perlini et al., 2020). The healthcare personnel was heavily involved in the emergency, and directly or indirectly exposed to the experience of death or the threat of death.

Setting

Since the first days of the emergency, two Soleterre psychologists monitored the departments in order to understand the level

of need in terms of psychological support and to estimate the number of psychologists to be activated.

From this work, an emergency project lasting 6 months (March–September 2020) was activated.

A task force of eleven clinical psychologists from the *Soleterre Foundation* active at *IRCCS Policlinico San Matteo Foundation* was set up to develop a mental health monitoring test for Care Workers *Therapeutic Mental Health Assessment for COVID-19 Care Workers* (TMHA COVID-19 CWs) and a psychological support intervention (in case of need) in continuity with local and national guidelines.

Targeted Sites

The target of the intervention were any healthcare personnel (physicians, nurses, nurse administrators, bed managers, and auxiliary nurses) working in the Emergency Room, the ICU and the ward of Infectious Diseases and Internal Medicine between the 16th of March and the 31st of May. Any staff that requested additional intervention was catered to. We excluded subjects who, while operating at *IRCCS Policlinico San Matteo Foundation*, were not in the job roles listed above or did not work in one of the departments listed above involved in the first line of the emergency at the time of filling in the questionnaires.

PROGRAMMATIC ELEMENTS

The first step was creating a task force: several meetings with the general management, the health management and the directors of the different departments involved within the *IRCCS Policlinico San Matteo Foundation* were necessary to recruit the members.

The TMHA COVID-19 CWs was then developed by borrowing the medical strategy for COVID-19 adopted and described by clinicians during clinical summits, starting from the following assumptions:

- A new disease needs a new approach, thus we need new clinical criteria; Like COVID-19's natural history can be divided in two main phases (Siddiqi and Mehra, 2020) (a viral and a hyper inflammation phase), with some overlapping in the middle, we likewise represent two phases in mental symptomatology. The first is concurrent to the potential trauma ("viral" element) and characterized by specific symptoms. It is then followed by a potential readjustment ("immune response" element), but if no re-adaptation occurs, the onset of pathological symptoms linked to the specific life experience is very likely.
- The whole population, during a pandemic, is potentially affected by disorders related to life events and stressful conditions, including dissociative disorders (also following the historical relation between dissociation and conversion) maintained in the ICD-10.
- The intensity and quality of negative outcomes of a potentially traumatic situation are the result of the balance between the event's characteristics and protection's factors. Typical protection factors include:

(1) **Hyperactivation**, a permanent state of alert that aims at keeping things under control while the whole world loses elements of daily certainty. In such state the psychophysical system increases the level of excitement, amplifies the emotional instability, exaggerates fear or aggressiveness and manifests symptoms of hyperarousal.

(2) **Turning off**, a state of demotivation, withdrawal, loss of energy.

(3) **Dissociation**, a kind of interruption between us and the threatening event. In this dissociative behavior the psychophysical system acts a sort of interruption of the generally integrated functions of consciousness, memory, identity or awareness of the body, the self or the environment. In such a hypoactivity (hypoarousal) the psychophysical system lowers the level of excitement and attenuates the alarm reaction, which could cause hypersomnia and insensitivity to stress.

While these defensive behaviors are natural in a moment of alarm, it is necessary that they do not become chronic (to get chronic in a noradrenergic dysfunction), beyond the threat because they could turn from defenses into pathogenic behaviors outside the emergency. There will be, therefore, a passage from the potentially traumatic phase to the adaption phase, that will occur at a different time point for each individual or group.

On the basis of these assumptions and the aforementioned knowledge in the field, tools appropriate to evaluate symptoms and behaviors associated with the protective factors described above and the corresponding maladaptive behaviors were chosen to be used in the TMHA COVID-19 CWs. This tools are the National Stressful Events Survey PTSD Short Scale (NSESSS) and the DSM-5 Self-Rated Level 1 transversal Symptom Measure—Adult, which are part of the Italian DMS-5 and are widely used in the Italian context. They were chosen also to allow comparison of data at European and international level. The scales are designed for administration during the initial interview and to monitor the progress of psychological interviews. The scales can be used in stand-alone mode, i.e., the total score does not refer to a normative distribution for the definition of cut-offs, which are defined *a priori*. In the DSM-5 further information that clarifies their use in the Italian context is available.

Once the TMHA COVID-19 CWs had been developed, the team of psychologists regularly visited healthcare staff in the ward to administer it and to determine who should be prioritized when offering support.

In each of the departments two psychologists were deployed at the same time 7 days a week, for a total of six psychologists always present. The team had its operational base in a space isolated from the other ward and used also for in presence sessions. Each ward had a room for individual and group support session. During the first emergency phase, each psychologist present in the ward directly organized individual sessions of 45 min and group sessions of 1 h (3–15 people involved) that were guided by the questions present in the TMHA COVID-19 CWs. At the same time, to reach a greater number of operators and to provide additional psychological support space, Soleterre activated a psychological support telephone line which received

TABLE 1 | Number of health care staff involved in the intervention according to role and place of work—number of males are in parentheses.

			Place of work					
			ICU	Infectious disease	Internal medicine	Emergency room	Non-specified	Total
Role	Physicians	Senior	14 (7)	11 (4)		2 (1)	2	39 (18)
		Junior	3 (2)	5 (2)	1 (1)	1 (1)		
		Non-specified						
	Nurses	Regular	21 (10)	3	2	9 (4)		40 (15)
		Head nurses	2					
		Bed Managers					1 (1)	
		Non-specified					2	
	Auxiliary nurses		1	4 (1)	2 (1)	2		9 (2)
	Unknown		3 (2)	1	1	3 (1)	11 (6)	19 (9)
	Total		44 (21)	24 (7)	6 (2)	17 (7)	16 (7)	107 (44)

reports and calls. According to the request, the healthcare personnel were supported directly over the phone or *via* video call (individual 45-min session) or oriented toward face-to-face session. All the sessions were based on the TMHA COVID-19 CWs and therefore had a fixed pattern. However, given the emergency conditions, psychoeducation techniques were also used (relaxation, listening, and restitution of coping techniques) which cannot be systematized in duration (from 20 min to 1 h) because of their different nature. Support sessions took place mostly during debriefing sessions and shift changes, in order to avoid interrupting work on the ward.

Data were the verified and transcribed into an electronic database to analyze them in approximately 175 h. The number of individual psychological support sessions were 207 (25 in video call), while group session were 27 (for a total of 280).

Process Evaluation

During the implementation, a methodological review based on the data collected was carried on with the support of the Department of Brain and Behavioral Sciences of University of Pavia. The aim was to evaluate *in interim* the efficacy of the evaluation and intervention model, investigating further psychological dimensions that could be affected by the emergency (i.e., Caregiving) or protection factors (i.e., social support).

While no changes to the implementation and intervention protocol was carried on at the time, this led to the addition of other tests and the development of a protocol for randomized controlled study on various modes of psychological intervention (remote vs. in person vs. no intervention) on healthcare staff for COVID19-related trauma (study in progress since February 2021).

Fidelity to the project was maintained throughout the study period.

Economic Evaluation

The project in the emergency phase had a total cost of 78.311,00 €:

- € 19.000,00: Soleterre project management—coordination of actions and operations center,
- € 42.966,00: Psychological support—psychologists team for face-to-face and remote meetings,
- € 16.346,00: Personal protective equipment and materials for the project (printer, flyers, badges, stationery, telephony).

Sample Size

Sample size was not considered in advance, as the service was provided during an emergency situation. Moreover, our objective was not to generalize our findings to the population but to provide support when requested; in fact the size and flexibility of the psychologists' team allowed the service to be available whenever needed in accord with the health care staff's schedule. However, a post-hoc analysis based on the prevalence of PTSD from the literature (Greenberg et al., 2021) reveals a power higher than 80%.

A target number of individual sessions to be administered when required was not pre-specified, as the aim was to provide support as needed.

Analysis

Analysis was conducted retrospectively. Descriptive statistics was employed to summarize the findings.

TABLE 2 | Number of health care staff involved in the study compared to the total number of staff normally employed.

	Total staff employed for COVID-19 emergency	Staff included in the study	% Staff included in the study compared to total staff employed for COVID-19 emergency
ICU	223	44	19.7
Infectious disease	62	24	38.7
Internal medicine	100	6	6.0
Emergency room	66	17	25.8
NN*		16	
Total	**451**	**107**	**23.7**

Participants not assigned to a specific department because they worked in more than one department.

FIGURE 1 | National stressful events survey PTSD short scale (NSESSS) results according to severity of symptoms and place of work.
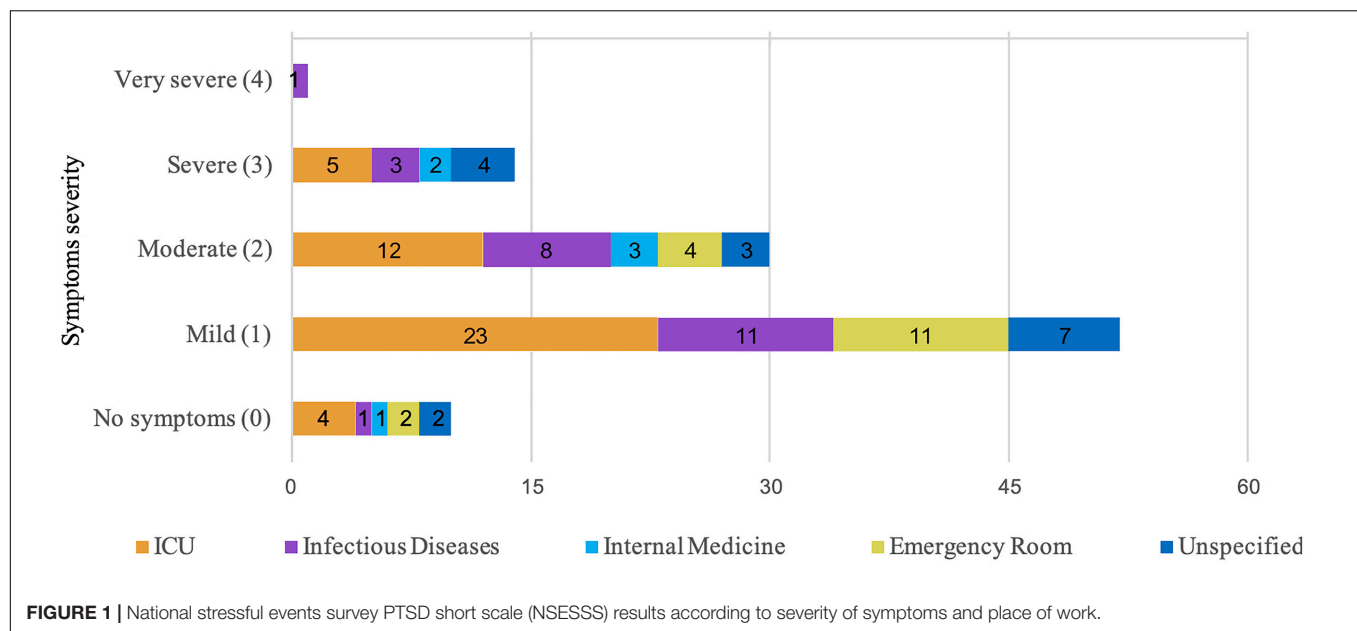
Ethical Approval

IRCCS Policlinico San Matteo Foundation's ethical board committee gave its approval of the project (protocol number 20210057600). The approval was requested and obtained for the publication of the data after the implementation was carried out.

Consent

All healthcare staff involved in the study provided their written consent or oral consent when the emergency situation prevented the acquisition of a written one, since the reorganization of the healthcare facilities had substantial repercussions on the standard procedures for collecting informed consent. During the administration of the tests we tried to respect standards of administration in quiet and controlled circumstances, but this was not always possible.

RESULTS

Task Force Creation

Fourteen professionals were hired by Soleterre. Three worked remotely at the hotline, 11 worked in the ward. They totaled 1.912 h on the project (on average 32 per day).

Population

One hundred and seven health care workers (44 males, mean age 40 ± 15) were recruited for the project. Their role, place of work and gender are summarized in **Table 1**. Sixteen missing or unspecified data are due either to mobilization of some staff across several ward, or to communication difficulties during extreme emergency conditions. Compared to the total number of health care workers involved in the first wave of the COVID-19 emergency, the study included 19.7% of ICU staff, 38.7% of Infectious Disease staff, 6.0% of Internal Medicine staff and

25.8% of Emergency Room staff. In total, 23.7% of the personnel involved in the emergency participated in the study. Participation was dictated by the self-perception of need combined with the help proposal of psychologists in a context of emergency debriefing and defusing. Those who denied participation did so mainly because they did not have time to spare or were not willing to share psychic pain (**Table 2**).

Mental Health Assessment

One hundred and seven questionnaires were administered to 107 health care staff. In addition to the official surveys, it is possible to estimate about 280 monthly activations of psychologists for the benefit of health operators. This number, given the peculiarity of the context, includes both formal meetings and contacts in informal situations on the premises of the ward (during breaks or shift changes).

Results of NSESSS according to severity of symptoms and place of work are represented in **Figure 1**. PTSD symptoms were reported as severe for 13% of the population. Most staff presented with mild (49%) and moderate (28%) symptoms of PTSD.

Results of DSM-5 Self-Rated Level 1 transversal Symptom Measure—Adult are represented in **Table 3**. Depressive symptoms were reported as severe for 7% of the population. Most staff presented with mild (35%), very mild (19%), and moderate (17%) symptoms of Depression.

Anger symptoms were reported as severe for 11% of the population. Most staff presented with mild (30%), moderate (21%), and very mild (12%) symptoms of Anger.

Mania symptoms were reported as severe for 22% of the population. Most staff presented with moderate (25%), mild (19%), and very mild (15%) symptoms of Mania.

Anxiety symptoms were reported as severe for 14% of the population. Most staff presented with moderate (29%), mild (21%), and very mild (21%) symptoms of Anxiety.

TABLE 3 | Severity of transversal symptoms in percentages.

Depression	Absent	22%
	Very mild	19%
	Mild	35%
	Moderate	17%
	Severe	7%
Anger	Absent	26%
	Very mild	12%
	Mild	30%
	Moderate	21%
	Severe	11%
Mania	Absent	19%
	Very mild	15%
	Mild	19%
	Moderate	25%
	Severe	22%
Anxiety	Absent	15%
	Very mild	21%
	Mild	21%
	Moderate	29%
	Severe	14%
Somatic symptoms	Absent	43%
	Very mild	19%
	Mild	13%
	Moderate	18%
	Severe	7%
Suicidal ideation	Absent	93%
	Very mild	4%
	Mild	0%
	Moderate	2%
	Severe	1%
Psychosis	Absent	90%
	Very mild	4%
	Mild	4%
	Moderate	1%
	Severe	2%
Sleep problems	Absent	32%
	Very mild	12%
	Mild	17%
	Moderate	20%
	Severe	20%
Memory	Absent	71%
	Very mild	13%
	Mild	11%
	Moderate	4%
	Severe	1%
Repetitive thoughts and behaviors	Absent	51%
	Very mild	20%
	Mild	15%
	Moderate	5%
	Severe	9%
Dissociation	Absent	76%
	Very mild	9%
	Mild	8%
	Moderate	6%

(Continued)

TABLE 3 | (Continued)

	Severe	1%
Personality functioning	Absent	49%
	Very mild	19%
	Mild	18%
	Moderate	10%
	Severe	4%

Frequency of severity of transversal symptoms as assessed by the DSM-5 Self-Rated Level 1 transversal Symptom Measure—Adult. In accordance with the recommendations of DSM-5 Substance-Related Disorders Work Group, we did not consider the data relating to substances abuse due to the impossibility of providing a subdivision between the different types of substances.

Somatic symptoms were reported as severe for 7% of the population and absent for 43%, severe Suicidal Thoughts were experienced by 1% of the population and absent for 93%. Severe Psychotic symptoms were experienced by 2% of the population and absent for 90%.

Sleep Disorders were reported as severe for 20% of the population, most staff presented with moderate (20%), mild (17%), and very mild (12%) Sleep Disorders.

Memory Disorders were reported as absent for 71% and very mild for 13%.

Repetitive Thoughts and Behavior were reported as absent for 51% and very mild for 20%.

Dissociative Disorders were reported as absent for 76% and Personality Disorders were reported as absent for 49%, very mild for 19%, and mild for 18% of the population.

Therapeutic Procedure

After the test administration, the results were assessed and those who had moderate and severe symptoms of PTSD were offered support (a maximum number of five individual session carried out by psychologists and psychotherapists who adopted a psychoanalytic orientation). Two hundred and seven individual sessions were offered (91 in the ICU, 55 in Infectious Diseases, 24 in Internal Medicine, 34 in the Emergency Room, and 3 non-specified).

CONCLUSION

During the emergence of the COVID-19 pandemic, psychological intervention brought to light in health care workers feelings of grief, loss, uncertainty about the present and future, constant alarm with emotional and physical tension, helplessness and vulnerability.

As demonstrated by the literature from previous pandemic situations (e.g., SARS in 2003), we expect long-term adverse effects on the mental health of medical staff engaged in front-line care of COVID-19 patients (Lu et al., 2020; Xu et al., 2020).

While it is impossible to predict who will suffer from PTSD in a given situation, it is known that certain factors occurring before, in conjunction with, or after the event may contribute to the onset of this disorder (e.g., chronic exposure to traumatic events). Similarly, psychological intervention often turns out to be a protective factor for the onset of the disorder.

Acute stress reactions can be normal for frontline staff and with protective actions (e.g., psychological support) they usually resolve relatively quickly in the following months (Cole et al., 2020; Walton et al., 2020) when workers feel supported and understood by the organization that offers psychological support and coping and resilience strategies. In the literature, the interviews with American health workers held during the first week of the COVID-19 pandemic showed that the main concerns of the staff were to feel understood and supported on a psychological level ("a mental health professional takes care of me") (Shanafelt et al., 2020). The British Psychological Society (2020) has highlighted formal counseling as a key way to support front-line staff. The data show that early psychological intervention is an important protective factor especially for grieving and PTSD (ITV News, 2020).

The possibility of acting upon the results of the TMHA COVID-19 CWs allowed an early intervention through individual session at least for moderate and severe PTSD as assessed by the NSESSS and symptom detection with the DSM-5 Self-Rated Level 1 transversal Symptom Measure—Adult. Therefore, although the data was collected at the time of maximum stress exposure we believe that our intervention represented a protective and support factor for mental well-being. At the end of the project, we registered increasing requests for the presence of the psychologists from the ward involved: the role of psychological support as a protective factor during the emergency period had been recognized and applied also during times of regular activity of the units.

The main difficulties we faced were the lack of a stable setting due to the emergency and the continuous "need of meaning" for the therapists. Seven hours of intervision were needed, conducted by a SPI (Italian Society of Psychoanalysis) and IPA (International Psychoanalytic Association) psychoanalyst trainer.

Since the project took place during the first phase of the emergency, there was also a high risk for the psychologists involved to contract COVID-19, however, thanks to prevention measures and the avail ability of PPE none of the equipe got infected.

The data collected during the first wave are in line with an Italian study conducted by Di Tella et al. (2020) with 145 health care workers (72 physicians and 73 nurses) that found higher levels of depressive and post-traumatic symptoms in physicians and nurses employed in front-line ward treating COVID-19 cases than in physicians and nurses working in non-COVID-19 ward.

The variety of roles and ward involved in this study is both a strength and a limitation, as the results represent all the staff majorly involved in the emergency but are consequently of little homogeneity. However, the study was activated during a time when the priority was catering to all the staff in a timely manner, and reaching all first-line worker was considered more ethical than differentiating the intervention on the basis of roles or workplace. Moreover, it worked as a starting point for the RCT on telematic/in person psychological sessions previously described.

Given our findings, we recommend implementing a mental health screening program in ward involved in COVID-19 patients' care.

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 Comitato Etico di Pavia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

EA designed the project and wrote the manuscript. DR managed and supervised the project. AR was the project coordinator. FB was the research assistant. EP collected and analyzed the data and wrote the manuscript. AC, FM, and SP collected the data. RB supervised the project. All authors contributed to the article and approved the submitted version.

FUNDING

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.820074/full#supplementary-material

REFERENCES

Andersson, G., Cuijpers, P., Carlbring, P., Riper, H., and Hedman, E. (2014). Guided Internet-based vs. face-to- face cognitive behavior therapy for psychiatric and somatic disorders: a systematic review and meta- analysis. *World Psychiatry* 13, 288–295. doi: 10.1002/wps.20151

Asperges, E., Novati, S., Muzzi, A., Biscarini, S., Sciarra, M., Lupi, M., et al. (2020). COVID-19 IRCCS policlinico san matteo foundation task force. Rapid response to COVID-19 outbreak in Northern Italy: how to convert a classic infectious disease ward into a COVID-19 response centre. *J. Hosp. Infect.* 105, 477–479. doi: 10.1016/j.jhin.2020.03.020

Berryhill, M. B., Culmer, N., Williams, N., Halli-Tierney, A., Betancourt, A., Roberts, H., et al. (2019a). Vid- eoconferencing psychotherapy and depression: a systematic review. *Telemed. J. E Health* 25, 435–446. doi: 10.1089/tmj.2018.0058

Berryhill, M. B., Halli-Tierney, A., Culmer, N., Williams, N., Betancourt, A., King, M., et al. (2019b). Vid- eoconferencing psychological therapy and anxiety: a systematic review. *Family Pract.* 36, 53–63. doi: 10.1093/fampra/cmy072

Carmassi, C., Foghi, C., Dell'Oste, V., Cordone, A., Bertelloni, C. A., Bui, E., et al. (2020). PTSD symp- toms in healthcare workers facing the three coronavirus outbreaks: what can we expect after the COVID-19 pandemic. *Psychiatry Res.* 292:113312.

Cole, C. L., Waterman, S., Stott, J., Saunders, R., Buckman, J. E. J., Pilling, S., et al. (2020). Adapting IAPT services to support frontline NHS staff during the Covid-19 pandemic: the Homerton covid psycho- logical support (HCPS) pathway. *Cogn. Behav. Ther.* 13:e12. doi: 10.1017/S1754470X20000148

Di Tella, M., Romeo, A., Benfante, A., and Castelli, L. (2020). Mental health of healthcare workers during the COVID-19 pandemic in Italy. *J. Eval. Clin. Pract.* 26, 1583–1587. doi: 10.1111/jep.13444

Gentry, M. T., Lapid, M. I., Clark, M. M., and Rummans, T. A. (2019). Evidence for telehealth group-based treatment: a systematic review. *J. Telemed. Telecare* 25, 327–342. doi: 10.1177/1357633X18775855

Greenberg, N., Weston, D., Hall, C., Caulfield, T., Williamson, V., and Fong, K. (2021). Mental health of staff working in intensive care during COVID-19. *Occup. Med.* 71, 62–67. doi: 10.1093/occmed/kqaa220

ITV News (2020). *Mental Health 'Damaged' in Majority of Scottish Coronavirus Carers.* London: ITV News.

Lenti, M. V., Corazza, G. R., and Di Sabatino, A. (2020). Carving out a place for internal medicine during COVID-19 epidemic in Italy. *J. Internal Med.* 288, 263–265. doi: 10.1111/joim.13079

Liu, S., Yang, L., Zhang, C., Xiang, Y. T., Liu, Z., Hu, S., et al. (2020). Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatry* 7, e17–e18.

Lu, W., Wang, H., Lin, Y., and Li, L. (2020). Psychological status of medical workforce during the COVID-19 pandemic: a cross-sectional study. *Psychiatr. Res.* 288:112936.

Maunder, R., Hunter, J., Vincent, L., Bennett, J., Peladeau, N., Leszcz, M., et al. (2003). The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *Can. Med. Assoc. J.* 168, 1245–1251.

Perlini, S., Canevari, F., Cortesi, S., Sgromo, V., Brancaglione, A., Contri, E., et al. (2020). COVID19 IRCCS policlinico san matteo foundation task force. Emergency Department and Out-of-Hospital Emergency Sys- tem (112-AREU 118) integrated response to Coronavirus Disease 2019 in a Northern Italy centre. *Internal Emerg. Med.* 15, 825–833. doi: 10.1007/s11739-020-02390-4

Santesteban-Echarri, O., Piskulic, D., Nyman, R. K., and Addington, J. (2020). Telehealth interventions for schiz- ophrenia-spectrum disorders and clinical high-risk for psychosis individuals: a scoping review. *J. Telemed. Telecare* 26, 14–20. doi: 10.1177/1357633X18794100

Shanafelt, T., Ripp, J., and Trockel, M. (2020). Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *J. Am. Med. Assoc.* 323, 2133–2134. doi: 10.1001/jama.2020.5893

Shore, J. H., Hilty, D. M., and Yellowlees, P. (2007). Emergency management guidelines for telepsychiatry. *Gen. Hosp. Psychiatry* 29, 199–206. doi: 10.1016/j.genhosppsych.2007.01.013

Siddiqi, H. K., and Mehra, M. R. (2020). COVID-19 illness in native and immunosuppressed states: a clinical- therapeutic staging proposal. *J. Heart Lung Transplant.* 39, 405–407. doi: 10.1016/j.healun.2020.03.012

The British Psychological Society (2020). *The Psychological Needs of Healthcare Staff as a result of the Coronavirus Pandemic.* Leicester: The British Psychological Society.

Walton, M., Murray, E., and Christian, M. D. (2020). Mental health care for medical staff and affiliated healthcare workers during the COVID-19 pandemic. *Eur. Heart J. Acute Cardiovasc. Care* 9, 241–247. doi: 10.1177/2048872620922795

West, C. P., Dyrbye, L. N., and Shanafelt, T. D. (2018). Physician burnout: contributors, consequences and solutions. *J. Intern. Med.* 283, 516–529. doi: 10.1111/joim.12752

Xu, J., Xu, Q., Wang, C., and Wang, J. (2020). Psychological status of surgical staff during the COVID- 19 outbreak. *Psychiatr. Res.* 288:112955. doi: 10.1016/j.psychres.2020.112955

Self-Care as a Method to Cope With Suffering and Death: A Participatory Action-Research Aimed at Quality Improvement

Loredana Buonaccorso[1]*, Silvia Tanzi[2], Simona Sacchi[2], Sara Alquati[2], Elisabetta Bertocchi[2], Cristina Autelitano[2], Eleonora Taberna[3] and Gianfranco Martucci[4]

[1] Psycho-Oncology Unit, Azienda USL – IRCCS di Reggio Emilia, Reggio Emilia, Italy, [2] Palliative Care Unit, Azienda USL – IRCCS di Reggio Emilia, Reggio Emilia, Italy, [3] Azienda Sanitaria dell'Alto Adige, Comprensorio Sanitario di Merano, Merano, Italy, [4] Local Network of Palliative Care, Azienda USL Modena, Modena, Italy

Introduction: Palliative care is an emotionally and spiritually high-demanding setting of care. The literature reports on the main issues in order to implement self-care, but there are no models for the organization of the training course. We described the structure of training on self-care and its effects for a Hospital Palliative Care Unit.

Method: We used action-research training experience based mostly on qualitative data. Thematic analysis of data on open-ended questions, researcher's field notes, oral and written feedback from the trainer and the participants on training outcomes and satisfaction questionnaires were used.

Results: Four major themes emerged: (1) "Professional role and personal feelings"; (2) "Inside and outside the team"; (3) "Do I listen to my emotions in the care relationship?"; (4) "Death: theirs vs. mine." According to participants' point of view and researchers' observations, the training course resulted in ameliorative adjustments of the program; improved skills in self-awareness of own's emotions and sharing of perceived emotional burden; practicing "compassionate presence" with patients; shared language to address previously uncharted aspects of coping; allowing for continuity of the skills learned; translation of the language learned into daily clinical practices through specific facilitation; a structured staff's support system for emotional experiences.

Discussion: Self-care is an important enabler for the care of others. The core of our intervention was to encourage a meta-perspective in which the trainees developed greater perspicacity pertaining to their professional role in the working alliance and also recognizing the contribution of their personal emotions to impasse experienced with patients.

Keywords: self-care, self-awareness, compassionate presence, palliative care (MeSH), continuous education, action-research

INTRODUCTION

Palliative care (PC) is an emotionally and spiritually high-demanding setting of care. Professionals working in the landscape of death are frequently exposed to existential issues, psychological challenges, and emotional distress associated with care at the end of life (Cole and Carlin, 2009; Sinclair, 2011). The risks of working in this context are well documented, e.g., burnout, compassion fatigue, and poor quality of care (Cole and Carlin, 2009; Sinclair, 2011; Peters et al., 2012). Self-care is an important enabler for the care of others (Kearney et al., 2009). The healthcare professionals (HCPs) must take care of their own health and well-being to support their competence in caring for patients (Mount et al., 2007; Kearney et al., 2009; Zulman et al., 2020).

The training in self-reflection of one's emotional experience and its meanings associated with suffering, death and dying asks the HCPs to focus on their own resources and coping mechanisms (Meier et al., 2001; Kearney et al., 2009). It might result in better outcomes for both HCPs and the patients and their families (Meier et al., 2001; Kearney et al., 2009; Childers and Arnold, 2019). Research on the training of self-care, self-awareness of one's emotions, spirituality and inner life of the HCPs, according to available resources and local context on these topics, is still needed.

Many international documents reported that the PC training in self-care skills might be relevant for the HCPs' well-being and for the patients (Jünger et al., 2010; Jünger and Payne, 2011; Società Italiana di Cure Palliative, 2016; Brighton et al., 2019; Joint Royal Colleges of Physicians Training Board, 2020).

The Italian core curricula was developed from Italian Association of PC containing indications on "self-care and awareness" (Società Italiana di Cure Palliative, 2016). It suggests that the HCPs should have access to a space in which to reflect on one's emotional experiences that are associated with the assistance of suffering and dying patients. It emphasized the relevance of having a high level of awareness of one own's emotions, prejudices, projections, beliefs, and level of stress. It also suggests developing these skills with active educational strategies as role playing, and creating occasions of team discussions and opportunities for personal spiritual reflection during work time.

The European Association of PC white paper on spiritual care education (Best et al., 2020) suggests developing reflective capacity of staff: "Self-awareness can help the healthcare practitioner to avoid being distracted by their own fears, prejudices and restraints and attend to the patient." Furthermore, Puchalski et al. (2019) suggested that learners should reflect on their own spirituality in practicing compassionate presence, on their professional call to serve, and on their spiritual beliefs and self-care practices. Clinicians can apply a compassionate presence, reflective listening, referral to dignity therapy, forgiveness therapy, and self-care spiritual practice (e.g., meditation and yoga) through case-based presentation.

Nonetheless, there is no one-size-fits-all solution as indicated by the scientific literature. All the previously referenced literature report on the main issues to be addressed in order to implement self-care and self-awareness of emotions, but the organization

of the training courses (e.g., How many hours and days? What themes? What professional figures should be involved? Which setting: indoor or outdoor?) is an aspect in which there are no univocal models. Considering that inner life is a highly cultural-sensitive topic, it might be important in every context to coherently develop its own answer.

Therefore, we considered it imperative to describe a training experience on self-care to identify the specific characteristics of the topics covered, the number of hours identified, and the professionals involved.

AIM

We described the structure of a training on self-care and its effects for a Hospital Palliative Care Unit.

METHODS

Setting

This study was conducted with a Specialized Palliative Care Service (SPCS) at an Italian hospital, in the context of continuous medical education, from September 2018 to April 2019. The SPCS is a specialized unit with no designated hospital beds. It was established in April 2013 with a remit of specialist in-hospital consultations and in a clinic for oncological and non-oncological outpatients and their family members. It is continuously involved in its own medical education and training courses to improve spiritual and psycho-social care, as well as courses to solve ethical dilemma (De Panfilis et al., 2020).

The SPCS includes three senior PC physicians and two advanced practice nurses. A psychologist psychotherapist expert in palliative care is also available for the care of patients and family members with severe psychological distress.

Subjects and Recruitment

We used a purposive sample by enrolling the entire staff of the SPCS in the training that consisted of three PC physicians (ST, SS, and SA), one resident doctor (ET), and two nurses (CA and EB).

Research Design

The research design was a participatory action-research of a training experience (Smith et al., 2010). An action-research approach in PC has been suggested as a possible way to both address an existing problem in a specific context and produce useful scientific knowledge by different authors (Hockley and Froggatt, 2006; Froggatt and Hockley, 2011; Hockley and Stacpoole, 2014). Our research was a "professionalizing type" action research, according to Hockley and Froggatt (2006), and the educational purpose was to "enhance professional control and individual ability to control work situation" (Smith et al., 2010; Hockley and Stacpoole, 2014). In this specific type of study design, the research was meant to be the response to a problem "defined by professional group" and "related to a behavior of practitioners," as it was considered "successful" relatively to a contested definition of success

(Smith et al., 2010; Hockley and Stacpoole, 2014). "Observation" as a research methodology can be "participative" or "non-participative," depending on the choice and the possibilities of the researcher of taking part in the actions that he/she is also observing, which usually results in the production of field notes. Field notes were taken at a short distance from the events and iteratively enriched with additional reflections and insights of the researcher, so that he/she can get to a "thick description" of the observed phenomena. A participatory project usually allows for the elaboration of *ad hoc* instruments used to investigate preferences and choices of the participants.

In our study, field notes have been taken in different moments during both participative and non-participative observation by one researcher (LB). A second researcher (GM) facilitated the participative evaluation of the events with trainer and trainees (see **Figure 1**).

During the usual assessment of educational needs, aimed at the programming of the continuous education plan for the following months, the need to develop a training program on the topic of personal perspective and relation of the professionals with death, and the impact of this on their work life, emerged. LB who works as a psychologist psychotherapist with the SPCS, identified the trainer based on the routine educational needs assessment, which takes place during dedicated meetings where every participant can propose topics for the future training. The researcher (LB) maintained the role of note-taking and documentation during and after the training (see **Figure 1**).

Self-care and self-awareness of one's own emotions were selected as the main focuses of the training. Consequently, the principal study question of the action-research was as follows:

"*How can we develop an educational answer to our need of better coping with the strong emotional distress due to our constant relation with death in the professional environment of a palliative care unit?*"

A secondary study question, according to the action-research methodology was as follows:

"*Which useful lessons can we draw from our educational experience in the development of similar initiatives?*"

Intervention

In accordance with internal procedures, the intervention was endorsed by the competent body of the Hospital (CME Scientific Committee): 30.4 CME were recognized. A trainer with a background in the field of non-technical skills related to the self-awareness of one's own emotions was chosen. She is a meditation teacher with specific expertise in stress management and relaxation. The training was provided in three sessions for a total of 16 h (September 2018–December 2018). After three meetings, the trainees expressed a need to extend the training by an additional two meetings for a total of 6 h (February 2019–April 2019). They expressed the difficulties of understanding a language more focused on self-awareness of personal emotions.

FIGURE 1 | The different phases of action research adapted to our study.
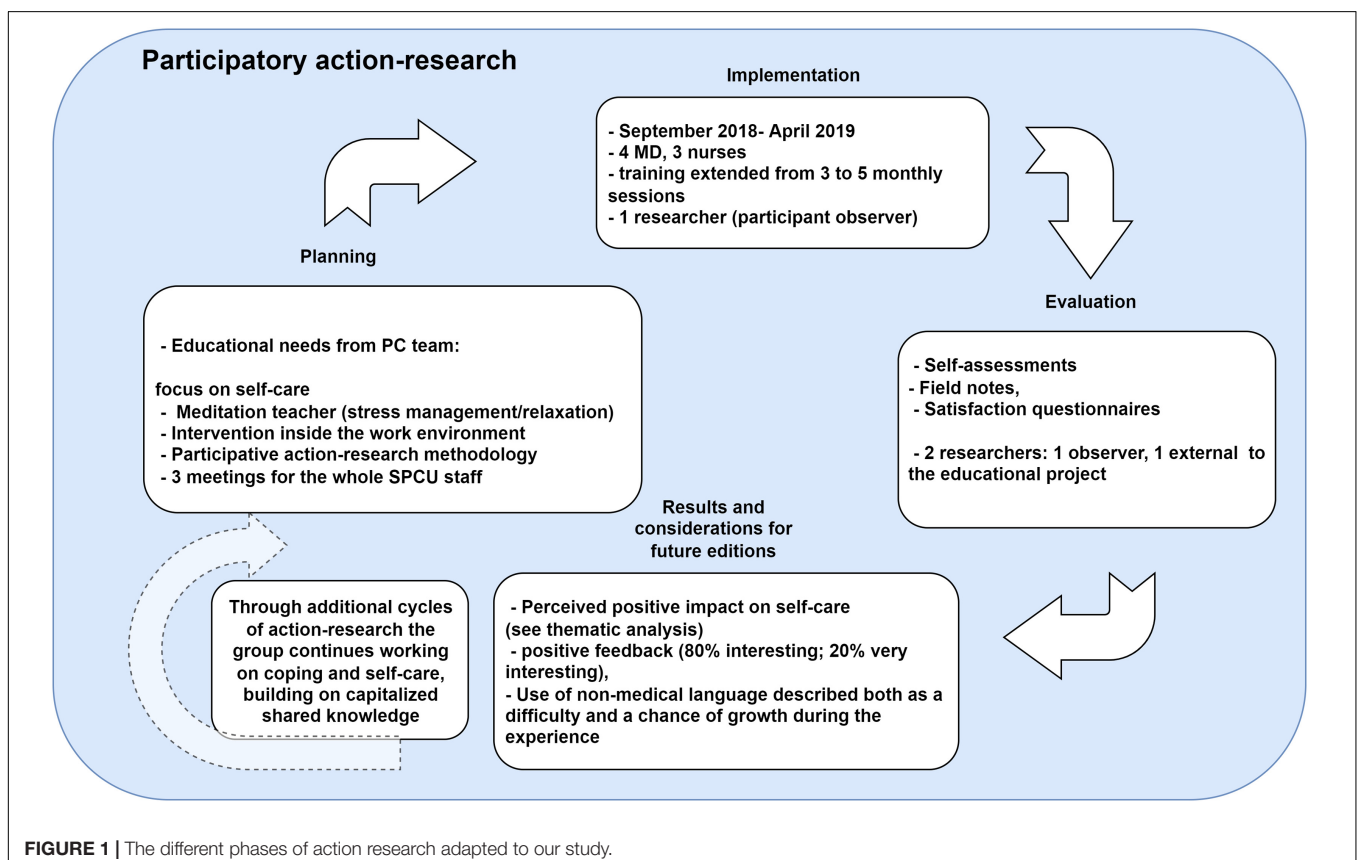
The meetings started from significant clinical cases brought in by the participants with the focus on diseases, suffering, listening to one's emotions starting from psycho-physical relaxation, and self-reflection on one's response mechanism to suffering (see **Table 1** for curricular details for each session). A training particularly based on a constructivist approach that "values the cultivation of trainee self-reflection, relational awareness, and creativity in envisioning alternative therapeutic strategies," was used (Novack et al., 1997; Neimeyer et al., 2016). It supported the trainees to take the lead in analyzing and deconstructing their own in-session behaviors from a stance of self-awareness rather than self-criticism. Albeit demanding, the recursive and reflexive nature of the questions that scaffolded the training seemed to consistently help trainees shift to a meta-perspective in which they developed greater perspicacity for their role in the working alliance without seldom recognition of the contribution of their personal preoccupations or insecurities to impasse experienced in the care relationship (Neimeyer et al., 2016).

During the intervention and after its conclusion, the researchers (LB and GM) conducted sessions of training analysis and reflection on the impact, starting from the collected materials (answers to evaluation questions and field notes) to the subsequent participative meetings aimed at evaluating and reflecting on the results with trainers and participants (see **Figure 1**). In particular, as specified in **Figure 1**, LB supervised the self-assessment of the perceived educational needs of the group, and all the training was based on an inductive approach, where the participants were invited to share their experiences and personal emotions relevant in their daily activity as a starting point for the session. In the following year, LB facilitated a reflective attitude on what emerged, taking notes on spontaneous reflections on the training and using open ended questions to keep track of the considerations of the team on the contents and the strategies that they learnt in the training. To increase the trustworthiness of the analysis and the reflexivity of the group, GM examined all the data as an independent, external researcher and facilitated two sessions of reflections on the draft version results in the draft version.

Data Collection and Analysis

The researchers (LB and GM) administered both a pre-and post-training with an assessment test of open-ended questions. It consisted of 13 questions anonymously investigating the relationship of death and the ability of listening to one's own needs and emotions, based on the literature from these topics (Novack et al., 1997) (see **Table 2** for the contents of the questions).

The researchers (LB and GM) conducted a thematic qualitative analysis (Elliott et al., 1999; Braun and Clarke, 2006; Gale et al., 2013; Hsieh and Shannon, 2016) of all materials (pre-and post-tests integrated with the field notes).

To generate initial codes, they independently labeled the texts and met to discuss them after. As the first step, the creation of categories and themes was developed with a "paper and pencil" approach. After themes emerged in the final shared list, researchers sorted and ordered data in charts using ATLAS qualitative analysis software. Subsequently, labels were combined to search for themes and sub-themes, comparing possible differences in the researchers' points of view. Both had assigned tags to the text through a recursive and iterative process of deduction and induction until they were able to select the most

TABLE 1 | Curricular details for each session of the intervention.

Date	Topics	Methodology	Time
September 2018	- Self-awareness in the care relationship - Listening to one's emotions - Process the emotions within a caring relationship; understand the pain, suffering, and the issues related to the search of meaning - Meditation: Relaxing the physical body through breathing	Interactive lesson, brainstorming, sharing of clinical cases and experiences	4 h
October 2018	- Disease and suffering from the point of view of yoga and meditation - Relationship between the patient's suffering and our emotions - Listening to oneself in the care relationship	Outdoor meeting Individual and group work	8 h
November 2018	- Meditation: Relaxing the physical body through breathing - Sharing of clinical cases	Individual and group work	4 h
February 2019	- Meditation: Relaxing the physical body through breathing - Death and Life from the point of view of the healthcare professionals	Brainstorming	3 h
April 2019	- Meditation techniques: relaxation of the body, breathing, and the visualization of colors - Use of breath during the communication with the patients and in the care relationship	Individual and group work	3 h

TABLE 2 | Pre- and post-training open-ended questions assessment test (Novack et al., 1997).

	Questions
1	Do you find pleasure in your work?
2	If so, in what context? - Otherwise, explain your lack of pleasure
3	What is the quality of your emotions and your thoughts? What words do you express and use during your work?
4	What words would you like to say? What words do you not want to or unable to express?
5	What do you take home with you from your work? (i.e., what is left inside after you leave?)
6	What is left of your job in your life?
7	What would you like to change about your job?
8	In what ways, if so, would you like your colleagues to behave?
9	Why did you choose this job? What do you expect from your job?
10	Can you describe a positive word and a negative word that describe your colleagues?
11	How do you listen to yourself? How do you relate to other people?
12	How do you deal with disease and death?
13	Could you write a single word that describes death for you?

relevant themes and sub-themes (Elliott et al., 1999; Hsieh and Shannon, 2016).

Afterward, the themes were reviewed and refined to assure their internal coherence. As such, a consensus among the researchers was reached in defining and naming the themes. Researchers identified as many themes as possible to accurately represent the content of the complete data set, and the findings were described through a thematic description, in order to explain the meaning of the most predominant and relevant themes (Hsieh and Shannon, 2016).

The resulting core themes were discussed with all trainees (Braun and Clarke, 2006; Gale et al., 2013) in a reflective session after the conclusion of the formal training with the purpose of gaining their opinion on the results and adding relevant information to the results.

Ethical Considerations

Because the study addressed educational practices and quality improvement, the hospital's Internal regulation on the competent body of the Hospital (CME Scientific Committee) did not require specific informed consent procedures. Nevertheless, all participant information was handled as confidential, and informed participant's consent was verbally gathered throughout. As the participation in the training implied involvement in the study, teacher made sure that participants were fully aware of this.

RESULTS

Thematic Analysis

Four major themes emerged from the notes taken by the two researchers (LB and GM) and the pre-and post-tests: (1) "Professional role and personal feelings"; (2) "Inside and outside the team"; (3) "Do I listen to my emotions in the care relationship?"; (4) "Death: theirs vs. mine (see **Table 3** for the major theme exemplars pre-test and post-test)."

(1) "*Professional role and personal feelings*"

During the pre-test, the participants expressed the need to say "words of proximity" to patients. However, they also expressed a fear of being perceived as less competent inside and outside of the professional role. The fear that the patient could leave also emerged, and this emotional component was perceived as inadequate.

"*Sometimes I would like to say something not only about the work, but also about a personal daily life (...), words that, however, refer me to an inability*" (P2).

According to the post-test, the discrepancy between professional role and personal identity seemed to decrease. Furthermore, a greater awareness of *presence* in the care relationship and the recognition of its *quality* emerged.

"*I find pleasure when I feel effective in what I do, if I am aware of what I do. I find pleasure when I am myself*" (P3).

At the end of the training, the trainees used phrases centered more on the feeling of an increased "lightness" regarding

TABLE 3 | Major Theme Exemplars pre-test and post-test.

Themes	Verbatim of the trainees pre-training	Verbatim of the trainees post-training
"Professional role and personal feelings"	"*I would like to say a word of closeness, but my professional role and the fear of being less competent are stopping me.*" (P1) "*Sometimes I would like to say something not only about the work, but also about a personal daily life (...), words that, however, refer me to an inability.*" (P2) "*I seem unable to say "in words" that I am there for that person, who is unique and beautiful, to make her feel precious. This thing makes me feel inefficient.*" (P3)	"*I find pleasure when I feel effective in what I do, if I am aware of what I do. I find pleasure when I am myself*" (P3) "*I can almost always express what I think, and I know how to be silent when this is worth more than a word.*" (P6)
"In and outside the team"	"*I wish my colleagues would take more moments to share their emotions because I think they can relate to me.*" (P2) "*I would like my colleagues to have more patience with colleagues from other Service*" (P3)	"*I would like the colleagues of the other Services to see more of the beauty of what I do, so they would be more cooperative. However. it's not bad.*" (P1) "*I would like my colleagues from the other Services to listen more to themselves and to others.*" (P6) "*As for "non-working" relationships, I would like us to take less for granted, help each other more, and also share how we feel.*" (P3) "*I would like my colleagues to be cooperative and non-judgmental to better share our skills and knowledge with colleagues from other departments*" (P5)
"Do I listen to me? Not always"	"*I listen to myself at times but not always in depth.*" (P1) "*I listen to the physical symptoms because I somatize everything.*" (P4)	"*I listen to myself by realizing my physical sensations and understanding my reactions.*" (P1) "*I think a lot to keep something from what I live.*" (P3) "*I listen to myself all the time and try to be in tune with myself.*" (P6) "*I try to use irony to help relieve myself of tensions.*" (P5)
"The death: the others and not mine"	"*I try to realize that it is a part of life, even if it is very difficult to be aware of it; I struggle to think of myself in the path of illness*" (P2) "*My greatest fear is physical suffering; with death my relationship is calmer.*" (P5)	"*I relate to the disease by facing it, keeping it in mind with death and consequently giving great importance to life.*" (P1) "*Death is there, but it is not seen. We would not even want to see it if we could; patients have far more resources than we think we have for ourselves. They amaze us and teach us.*" (P6)

their emotional burden, based on the research's file notes during the team meetings (LB). During the meetings the trainees focused more on their emotions by recognizing and expressing them as well as talking about their difficulties in the relationship.

(2) "*Inside and outside the team*"

According to the pre-test, a distinction between the team colleagues and colleagues from the other services of the hospital developed due to the participants' expectations of greater collaboration from their colleagues from other units.

"*I would like my colleagues to have more patience with colleagues from other Service*" (P3).

At the end of the course, a greater understanding toward colleagues outside the team was reported in the evaluation forms and team meetings.

"*I would like the colleagues of the other Services to see more of the beauty of what I do, so they would be more cooperative. However, it's not bad*" (P1).

The trainees also reported more interest in the emotional experience of colleagues from their own and other services, according to the field notes of the researcher (LB).

(3) "*Do I listen my own emotions in the care relationship?*"

During the pre-test, sporadic listening was reported, regarding one's own emotions.

Some participants reported developing the habit of listening more to themselves during and after the medical visits, starting from physical symptoms and others carving out an individual inner space.

"*I listen to myself at times but not always in depth*" (P1).

At the end of the training, there was a greater emphasis in listening to oneself and motivation to share one's emotional states with colleagues.

"*I listen to myself by realizing my physical sensations and understanding my reactions*" (P1).

(4) "*Death: theirs* vs. *mine*"

According to the pre-test, death was recognized as present in the care relationship, even when it is not named.

"*I try to realize that it is part of life, even if it is very difficult to be aware of it; I struggle to think of myself in the path of illness*" (P2).

At the end of the training, the participants recognized the death of the patients as well as their own, as seen from the thematic analysis.

"*I relate to the disease by facing it, keeping it in mind with death and consequently giving great importance to life*" (P1).

In reference to the research field notes (LB), the importance of dealing with death by talking about dignity, in particular in reference to the Model of Chochinov (2002), and part of the team's background was revealed.

Table 4 shows the results of the satisfaction questionnaires after the intervention. In general, the trainees found the themes of the training interesting (80% interesting; 20% very interesting), however, from the field notes difficulties became evident regarding the language used which, having been not technical, because the trainer does not work in the hospital setting.

TABLE 4 | Results of the satisfaction questionnaires.

Question	% of respondents for each value of the scale reported in brackets. Total number of respondents: 6
Were the training objectives presented clearly? *(In a 1–6 scale)*	20% (4) 60% (5) 20% (6)
Have the aims been achieved? *(In a 1–6 scale)*	40% (4) 40% (5) 20% (6)
Is what I learned consistent with the skill requirements of my professional activities?(In a 1–6 scale)	20% (4) 60% (5) 20% (6)
What have I learned is concretely applicable in my clinical practice? *(In a 1–6 scale)*	40% (4) 40% (5) 20% (6)
Was the teaching method effective? *(In a 1–6 scale)*	40% (4) 40% (5) 20% (6)
Were the themes interesting? *(In a 1–6 scale)*	80% (5) 20% (6)

DISCUSSION

Self-care is an important enabler to the care of others. In our study, the meditation teacher was chosen with the aim to improve self-awareness of emotions in the care relationship and to foster self-care, starting from body relaxation and use of meditation techniques.

Our study identified a methodology in the action-research to improve a training program with satisfaction and qualitative evidence of the impact on the palliative practice. The participants identified oral and written feedback from the trainer and the researchers (LB and GM) during and after the training, as a method to improve the course contents. The researcher's field notes taken during and after the training have been deemed as useful to customize the teaching (see **Figure 1**). Due to the increasing need in field of self-care, the action-research may be an effective way of developing programs to have a real impact on a professional's practice in accordance with available resources.

HCPs discussed meaningful experiences with patients, listening to themselves in a broader concept of "learning to learn" (Bateson, 1997) from self-awareness of own emotions rather than self-criticism, as suggested by a constructivist and self-compassion approach (Petrocchi et al., 2014; Neimeyer et al., 2016; Neff et al., 2020). At the end of the training, there was a greater emphasis in listening to oneself and motivation to share one's emotional states with colleagues, supported by a self-compassion approach. This approach involves responding kindly to one's own suffering and failures, rather than neglecting one's well-being or engaging in judgment and self-criticism (Petrocchi et al., 2014; Neff et al., 2020), according to the field notes of the researcher (LB). The oral and written feedback from participants revealed important changes developed during the team meetings, such as greater attention was given to one's emotional experience during the discussion of clinical cases.

Phrases like "*This patient is…*" and "*These families are…*" were changed to "*My difficulty was…,*" "*I felt that way,*" and "*I ask the team for help,*" as reported in the research's files notes (LB). Some authors underlined that effective self-care practice involves self-awareness, self-compassion, and the implementation of a variety of strategies across inner life domains (Mills et al., 2020; Moroni et al., 2020). Greater awareness of the ability to cultivate positive emotions such as self-compassion should be promote as a part of self-care practice, as reported in a systematic integrative review on self-compassion in hospice and PC (Garcia et al., 2021).

At the end of the training, the participants also reported more interest in the emotional experience of colleagues from their own and other services. A qualitative study that explored the meaning and practice of self-care in PC HCPs, reported that self-compassion was considered essential for self-care and related to compassion for others, as our study suggested (Mills et al., 2018). In particular, treating oneself with kindness, awareness of common humanity, and avoiding over identification with emotions can contribute to the personal well-being of hospice and PC HCPs (Garcia et al., 2021). The trainees actively applied these principles that also emerged from the Dignity Model (Buonaccorso et al., 2021; Tanzi and Buonaccorso, 2021). The lesson learned from the training course applied to the pandemic was that having a compassionate presence during the short visits to isolated COVID-19 patients at the Infectious Disease Unit helped to restore an increased perception of dignity and humanity (Tanzi et al., 2020; Tanzi and Buonaccorso, 2021). Solitary death in the extraordinary emergency that HCPs have experienced has required increased skills and closeness to these patients, in terms of compassion and conscious presence (Moroni et al., 2020). The compassionate support, self-care, and quality of life are also important concerns for the HCPs (Adams et al., 2020; Mills et al., 2020). Prioritizing self-care by developing a plan is an effective strategy that can be supported by a specific intervention as Self-Care Matters, a free resource available online[1]. It is drawn from contemporary research to shed light on understanding, practicing, and planning self-care through the voice of experienced clinicians (Palliative Care Australia, 2020).

Individual self-care plans in combination with Staff Supportive initiatives are indicated as practice to prioritize in such emergencies (Mills et al., 2015, 2018; Sansó et al., 2015). As reported in a cross-sectional online survey of PC Spanish professionals, the cultivation of inner life for better professional quality of life and compassionate care, and its repercussion on professionals' wellbeing, take place across sex, age, and controlling for important work variables, such as work overload or workload control. When compared to these traditional organizational variables, self-compassion and coping with death have stronger effects on professional quality of life, which emphasizes the importance of properly cultivating an inner life in HCPs to provide compassionate care (Galiana et al., 2021).

Through the training, the our team began to reflect on a self-care plan as a team that considered personal needs in the context of PC. For the incoming year two training on "spirituality" and "compassion and self-compassion" were organized with spiritual assistants and psychotherapists who work in hospice and PC to reflect on their own spirituality and compassionate presence as HCPs.

Useful Tips for Future Editions

Reflective sessions with the participants highlighted some possible improvements of the initial program, useful for future editions of similar initiatives in their context or in similar environments. In our experience, it was useful to keep an open discussion with the participant on the right number of sessions. In fact, while three meetings were initially planned, the group decided to extend the training to five meetings total, to give participants the time to learn meditative techniques within specific PC context and to get more familiar with a new language related to non-medical disciplines. As a result, in our model we developed a solution of five meetings of 4 h, monthly.

Furthermore, one session was conducted outdoor, to facilitate the learning of physical body relaxation and meditation techniques.

The core of our intervention was to encourage a meta-perspective in which the trainees developed greater perspicacity pertaining to their professional role in the working alliance and also recognizing the contribution of their personal emotions to impasse experienced with patients. In our experience, the trainees reported the importance of identifying a trainer who carries out at least part of his activity within a context of patient care. This, from our experience, would make it easier to use a "common" language. The limit of identifying trainers outside the CP setting could be linked to the fact of using techniques that belong to other traditions (Buddhist, Tibetan…) without, however, integrating them with Western culture and in the context of PC. The oral and written feedback from participants revealed the importance of having a dedicated operator who already works with the team and who is able to translate the language learned during the training into daily clinical practices. In our study, this work of continuing the learned contents was facilitated during the following team meetings in which the operator (LB) participated in her usual role as supporting psychologist.

Coping with death and awareness are important predictors of quality of life, being positively related to Compassion Satisfaction (Galiana et al., 2021; Garcia et al., 2021). In the increasingly needed field of self-awareness, a more participatory format, like the action-research design, may be an effective way of improving programs to have a real impact on professionals' practice in accordance with available resources and local context's needs. This methodology allows to better tailor the educational experience, especially considering that the language used to speak about self-awareness can be difficult to develop.

---

[1]https://palliativecare.org.au/resources/self-care-matters

Limitations

Regarding limitations, we highlight that our sample size of six participants was small. This was due to the type of intervention in that only the working staff of the interested unit was necessary to be involved to build a more tailored training experience. However, our study is a qualitative research/data analysis that is not intended to generalize the results. In this way, we wanted to propose an experience to contribute to advancing knowledge in an area of increasing importance in PC—self-care as a method to cope with suffering and death.

Furthermore, the SPCS had already participated in other courses on bioethics, psychological skills, and spirituality. Therefore, the training was aimed at HCPs previously trained on similar topics. Finally, the presence of a competent figure as a psychologist who gives continuity to the contents after the course and helps the team to translate them into practice might be a great facilitator for learning, but local resources do not always allow the continuous presence of a psychologist.

While this qualitative reporting of an impactful experience may help in developing similar and useful experiences, we acknowledge that only different and more quantitative types of researchers could help to understand the optimal elements and combined impact of staff support and self-care and the method that these can be best implemented in normal circumstances and also adjusted to respond to situations of heightened stress or complexity (Sansó et al., 2015; Adams et al., 2020).

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical approval was not provided for this study on human participants because the study addressed educational practices and quality improvement, consequently the hospital's Internal regulation on the competent body of the Hospital (CME Scientific Committee) did not require specific informed consent procedures. Ethical review and approval was not required for this study on human participants in accordance with the local legislation and institutional requirements. Nevertheless, all participant information was handled as confidential, and informed participant's consent was verbally gathered throughout. As the participation in the training implied involvement in the study, teacher made sure that participants were fully aware of this. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

REFERENCES

Adams, M., Chase, J., Doyle, C., and Jason, M. (2020). Self-care planning supports clinical care: putting total care into practice. *Prog. Palliat. Care* 28:5, 305–307. doi: 10.1080/09699260.2020.1799815

Bateson, G. (1997). Verso un'ecologia della mente. *Biblioteca Sci.* 32:604.

Best, M., Leget, C., Goodhead, A., and Paal, P. (2020). An EAPC white paper on multi-disciplinary edu-cation for spiritual care in palliative care. *BMC Palliative Care* 19:9. doi: 10.1186/s12904-019-0508-4

Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qualit. Res. Psychol.* 3, 77–101. doi: 10.1191/1478088706qp063oa

Brighton, L. J., Selman, L. E., Bristowe, K., Edwards, B., Koffman, J., and Evans, C. J. (2019). Emotional labour in palliative and end-of-life care communication: a qualitative study with generalist palliative care providers. *Patient Educ. Counseling* 102, 494–502. doi: 10.1016/j.pec.2018.10.013

Buonaccorso, L., Tanzi, S., De Panfilis, L., Ghirotto, L., Autelitano, C., Chochinov, H. M., et al. (2021). Meanings emerging from dignity therapy amongst cancer patients. *J. Pain Symp. Manage.* [Epub ahead of print]. doi: 10.1016/j.jpainsymman.2021.02.028

Childers, J., and Arnold, B. (2019). The inner lives of doctors: physician emotion in the care of the seriously Ill. *Am. J. Bio.*19, 29–34. doi: 10.1080/15265161.2019.1674409

Chochinov, H. M. (2002). Dignity-conserving care–a new model for palliative care: helping the patient feel valued. *JAMA* 287, 2253–2260. doi: 10.1001/jama.287.17.2253

Cole, T. R., and Carlin, N. (2009). The suffering of physicians. *Lancet* 374, 1414–1415. doi: 10.1016/s0140-6736(09)61851-1

De Panfilis, L., Tanzi, S., Perin, M., Turola, E., and Artioli, G. (2020). "Teach for ethics in palliative care": a mixed-method evaluation of a medical ethics training programme. *BMC Palliative Care* 19:149. doi: 10.1186/s12904-020-00653-7

Elliott, R., Fischer, C. T., and Rennie, D. L. (1999). Evolving guidelines for publication of qualitative research studies in psychology and related fields. *Br. J. Clin. Psychol.* 38, 215–229. doi: 10.1348/014466599162782

Froggatt, K., and Hockley, J. (2011). Action research in palliative care: defining an evaluation methodology. *Palliative Med.* 25, 782–787. doi: 10.1177/0269216311420483

Gale, N. K., Heath, G., Cameron, E., Rashid, S., and Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med. Res. Methodol.* 13:117. doi: 10.1186/1471-2288-13-117

Galiana, L., Sansó, N., Martínez, I. M., Vidal-Blanco, G., Oliver, A., and Larkin, P. J. (2021). Palliative care professionals' inner life: exploring the mediating role of self-compassion in the prediction of compassion satis-faction, compassion fatigue, burnout and wellbeing. *J. Pain Symp. Manage.* 63, 112–123. doi: 10.1016/j.jpainsymman.2021.07.004

Garcia, A. C. M., Silva, B. D., da Silva, L. C. O., and Mill, J. (2021). Self-compassion in hospice and palliative care. *J. Hospice Palliative Nur.* 23, 145–154. doi: 10.1097/NJH.0000000000000727

Hockley, J., and Froggatt, K. (2006). The development of palliative care knowledge in care homes for older people: the place of action research. *Palliative Med.* 20, 835–843. doi: 10.1177/0269216306073111

Hockley, J., and Stacpoole, M. (2014). The use of action research as a methodology in healthcare research. *Eur. J. Palliative Care* 21, 110–114.

Hsieh, H. F., and Shannon, S. E. (2016). Three approaches to qualitative content analysis. *Qualit. Health Res.* 15, 1277–1288.

Joint Royal Colleges of Physicians Training Board (2020). *Specialty Training Curriculum for Palliative Medicine.* Available online at: https://www.jrcptb.org.uk/sites/default/files/Pall%20Med%20Curriculum%202022%20v%20%20for%20consultation%20Sept%2019.pdf (accessed November 25, 2020).

Jünger, S., and Payne, S. (2011). Guidance on postgraduate education for psychologists involved in palliative care. *Eur. J. Palliative Care* 18, 238–252.

Jünger, S., Payne, S., Costantini, A., Kalus, C., and Werth, J. L. (2010). The EAPC TASK Force on education for psychologists in palliative care. *Eur. J. Palliative Care* 17, 84–87.

Kearney, M. K., Weininger, R. B., Vachon, M. L. S., Harrison, R. L., and Mount, B. M. (2009). Self-care of physicians caring for patients at the end of life. being connected a key to my survival. *JAMA* 301, 155–164. doi: 10.1001/jama.2009.352

Meier, D. E., Back, A. L., and Morrison, R. S. (2001). The inner life of physicians and care of the seriously ill. *JAMA* 286, 3007–3014. doi: 10.1001/jama.286.23.3007

Mills, J., Ramachenderan, J., Chapman, M., Greenland, R., and Agar, M. (2020). Prioritising workforce wellbeing and resilience: what COVID-19 is reminding us about self-care and staff support. *Palliative Med.* 34, 1137–1139. doi: 10.1177/0269216320947966

Mills, J., Wand, T., and Fraser, J. A. (2015). On self-compassion and self-care in nursing: selfish or essential for compassionate care? *Int. J. Nur. Study* 52, 791–793. doi: 10.1016/j.ijnurstu.2014.10.009

Mills, J., Wand, T., and Fraser, J. A. (2018). Exploring the meaning and practice of self-care among palliative care nurses and doctors: a qualitative study. *BMC Palliative Care* 17:63. doi: 10.1186/s12904-018-0318-0

Moroni, M., Montanari, L., De Panfilis, L., Buonaccorso, L., and Tanzi, S. (2020). (Not) dying alone: recommendations from Italian palliative care during COVID-19 pandemic. *Blog BMJ Supportive Palliative Care.* Available online at: https://blogs.bmj.com/spcare/2020/06/23/not-dying-alone-recommendations-from-palliative-care-during-covid-19-pandemic/

Mount, B. M., Boston, P. H., and Cohen, S. R. (2007). Healing connections: on moving from suffer-ing to a sense of well-being. *J. Pain Symp. Manage.* 33, 372–388. doi: 10.1016/j.jpainsymman.2006.09.014

Neff, K. D., Toth-Kiraly, I., Knoc, M. C., Kuchar, A., and Davidson, O. (2020). The developement and validation of the state self-compassion scale (long- and short form). *Mindfulness* 12, 121–140. doi: 10.1007/s12671-020-01505-4

Neimeyer, R. A., Woodward, M., Pickover, A., and Melissa, S. (2016). Questioning our questions: a constructivist technique for clinical supervision. *J. Constr. Psychol.* 29, 100–111. doi: 10.1080/10720537.2015.1038406

Novack, D., Suchman, A., Clark, W., Epstein, R. M., Najberg, E., and Kaplan, C. (1997). Calibrating the physician. personal aware-ness and effective patient care. working group on promoting physician personal awareness, american academy on physician and patient. *JAMA* 278, 502–509. doi: 10.1001/jama.278.6.502

Palliative Care Australia (2020). *Self-Care Matters: A Self-Care Planning Tool.* Canberra: Austral-ian Capital Territory: PCA.

Peters, L., Cant, R., Sellick, K., O'Connor, M., Lee, S., Burney, S., et al. (2012). Is work stress in palliative care nurses a cause for concern? A literature review. *Int. J. Palliative Nur.* 18, 561–567. doi: 10.12968/ijpn.2012.18.11.561

Petrocchi, N., Ottaviani, C., and Couyoumdjian, A. (2014). Dimensionality of self-compassion: translation and construct of the self-compassion scale in an Italian sample. *J. Mental Health* 23, 72–77. doi: 10.3109/09638237.2013.841869

Puchalski, C., Jafari, N., Buller, H., Haythorn, T., Jacobs, C., and Ferrell, B. (2019). Interprofessional spiritual care education curriculum: a milestone toward the provision of spiritual care. *J. Palliative Med.* 23, 777–784. doi: 10.1089/jpm.2019.0375

Sansó, N., Galiana, L., Oliver, A., Pascual, A., Sinclair, S., and Benito, E. (2015). Palliative care professionals' inner life: ex-ploring the relationships among awareness, self-care, and compassion satisfaction and fatigue, burnout, and coping with death. *J. Pain Symp. Manage.* 50, 200–207. doi: 10.1016/j.jpainsymman.2015.02.013

Sinclair, S. (2011). Impact of death and dying on the personal lives and practices of palliative and hospice care professionals. *Multicenter Study CMAJ* 183, 180–187. doi: 10.1503/cmaj.100511

Smith, L., Rosenzweig, L., and Schmidt, M. (2010). Best practices in the reporting of participatory action research: embracing both the forest and the trees. *Counseling Psychol.* 38, 1115–1138. doi: 10.1177/0011000010037416

Società Italiana di Cure Palliative (2016). Available online at: https://www.sicp.it/?s=core+curriculum (accessed, 2021).

Tanzi, S., Alquati, S., Martucci, G., and De Panfilis, L. (2020). Learning a palliative care approach during the COVID-19 pandemic: a case study in an infectious diseases unit. *Palliative Med.* 34, 1220–1227. doi: 10.1177/0269216320947289

Tanzi, S., and Buonaccorso, L. (2021). Enhancing patient dignity: opportunities addressed by a specialized palliative care unit during the coronavirus pandemic. *J. Palliative Med.* 24:3. doi: 10.1089/jpm.2020.0661

Zulman, D. M., Haverfield, M. C., Shaw, J. G., Brown-Johnson, C. G., Schwartz, R., Tierney, A. A., et al. (2020). Practices to foster physician pres-ence and connection with patients in the clinical encounter. *JAMA* 323, 70–81. doi: 10.1001/jama.2019.19003

Gender Differences in Burnout Among Endocrinologists in China

Jing Wang[1,2], Lufa Zhang[1,2,3]*, Feng Jiang[2,3], Yuanli Liu[4], Mingxiao Wang[5], Yinuo Wu[6]* and Yi-Lang Tang[7,8]

[1] China Institute for Urban Governance, Shanghai Jiao Tong University, Shanghai, China, [2] School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai, China, [3] Institute of Healthy Yangtze River Delta, Shanghai Jiao Tong University, Shanghai, China, [4] School of Health Policy and Management, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China, [5] Department of Cardiology, Emergency General Hospital, Beijing, China, [6] Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China, [7] Department of Psychiatry and Behavioral Sciences, Emory University, Atlanta, GA, United States, [8] Atlanta VA Medical Center, Decatur, GA, United States

Objective: To survey the prevalence of burnout in a national sample of endocrinologists in China and to examine its correlates, with a special focus on gender differences.

Methods: An anonymous online survey was conducted among endocrinologists in 31 provincial government-owned "People's Hospitals" of each province in mainland China. Demographic and work-related factors were collected from participants. The Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was used to assess burnout, including emotional exhaustion (EE), depersonalization (DP), and reduced personal accomplishment (PA).

Results: A total of 711 endocrinologists (72.1% were female and mean age was 39.63 ± 8.51 years old) completed the survey. Burnout was reported by 32.8% of the participants. There were no significant gender differences in the overall prevalence of burnout or EE, DP, and PA (all $p > 0.05$). A multi-level linear regression revealed: (1) In male participants, PA was significantly associated with age ($\beta = 0.03$, $p = 0.003$), DP was inversely associated with age ($\beta = -0.06$, $p = 0.005$), EE was significantly associated with shorter sleep duration ($\beta = -0.25$, $p = 0.006$), and longer work hours ($\beta = 0.01$, $p = 0.016$). (2) In females, PA was significantly associated with age ($\beta = 0.01$, $p = 0.038$), EE and DP were both significantly associated with shorter sleep duration ($\beta = -0.19$, $p = 0.001$; and $\beta = -0.15$, $p = 0.011$, respectively). EE and DP were also associated with work hours ($\beta = 0.02$, $p < 0.001$; and $\beta = 0.01$, $p < 0.001$, respectively).

Conclusion: Nearly one-third of endocrinologists in China experienced burnout. Although there were no significant gender differences in the prevalence of overall burnout or EE, DP, and PA scores, male and female participants differed in factors associated with EE, DP, and PA. Interventions need to be tailored to target different aspects in male and female endocrinologists and target different subgroups.

Keywords: gender differences, burnout, endocrinologists, associated factors, prevalence

INTRODUCTION

The concept of burnout in healthcare professionals has been used to describe the emotional and psychological status related to job stress (Rotenstein et al., 2018). According to Maslach's foundational work in the 1980s, burnout generally has been defined as a combination of emotional exhaustion (EE), depersonalization (DP), and reduced personal accomplishment (PA) (West et al., 2018). Factors that have been shown to contribute to burnout include excessive workloads, long working hours, frequent call duties; and individual factors, such as poor coping strategies, perfectionism, educational debt, relationship status, sleep deprivation, etc. (Shanafelt et al., 2015; Patel et al., 2018; West et al., 2018; Hacimusalar et al., 2021; Lin et al., 2021). A series of studies have found that burnout in physicians was associated with increased medical errors, poor patient satisfaction, and decreased physicians' health and safety (Panagioti et al., 2018; Dyer, 2019; Hu et al., 2019; Wu et al., 2020). Therefore, it is essential to ascertain the prevalence and associated factors of burnout in physicians. However, the findings of existing studies have shown a wide range in burnout prevalence, likely due to assessment methods, different samples, and study quality (Rotenstein et al., 2018).

Endocrinologists have played a uniquely important role in the Chinese healthcare system, owing to a very high prevalence of diabetes and other related metabolic diseases (Li et al., 2020; Li Y. et al., 2021; Zhang L. et al., 2021). Like all healthcare professionals, endocrinologists are not immune to physician burnout and stress. According to the *Medscape Endocrinologist Lifestyle, Happiness & Burnout Report 2020*, 46% of endocrinologists in the United States reported burnout, which was higher than the overall level of all physicians (41%) (Medscape, 2020). A previous study demonstrated that the overall burnout rate among physicians from Chinese general hospitals was 31.28% (Wu et al., 2020), while the prevalence of burnout in Chinese endocrinologists is still unclear.

Gender difference in burnout has been an interest of research for the past two decades. Many early researchers argued that burnout is more of a female experience (Maslach et al., 2001). In healthcare settings, several studies showed significant gender differences in physician burnout prevalence and associated factors. A few studies found that female health workers had a higher risk of burning out (Aguwa et al., 2014; Granek et al., 2016; Eden et al., 2020; Loscalzo et al., 2021; McPeek-Hinz et al., 2021), and some suggested that educational level, socioeconomic status and working hours were associated with burnout in female physicians (Norlund et al., 2010). On the contrary, a few studies found no gender differences in physician burnout (Linzer et al., 2002; te Brake et al., 2003; Doraiswamy et al., 2021).

This study aimed to survey the prevalence of burnout in a national sample of endocrinologists in China and to examine its correlates, with a special focus on gender differences. We hypothesized that there would be gender differences in the rate of burnout, and in the association between burnout and correlates among Chinese endocrinologists.

MATERIALS AND METHODS

Study Design and Participants

A national cross-sectional survey was conducted from March 18 to 31, 2019. The study was a part of the China Healthcare Improvement Initiative, which was supported by the National Health Committee (Zhou et al., 2018). We purposely invited the "People's Hospital" of each province in mainland China, as they are the most prominent hospitals affiliated with each provincial government. All of them were general tertiary hospitals (National Health Commission of the People's Republic of China, 2020). Thirty-one hospitals participated, and all endocrinologists who were working in those hospitals at that time were invited to participate in the anonymous online survey. To reach all endocrinologists, we collaborated with the hospital administrators of these hospitals to organize the endocrinologists to participate in this survey. The weblink of the survey was delivered through WeChat, a popular social app in mainland China.

The research protocol was approved by the Ethics Committee of the Emergency General Hospital in Beijing. Each participant completed the consent form before they began the questionnaire.

Measures

Burnout was assessed using the 22-item Maslach Burnout Inventory-Human Services Survey (MBI-HSS)(Maslach and Jackson, 1986). This scale has been considered the gold standard tool for burnout measuring (Verweij et al., 2017). The Chinese version of MBI-HSS has been shown to have good reliability and validity (Li et al., 2003). The Cronbach's α was 0.96 in this study.

It consists of three subscales: EE–nine items; DP- five items; and reduced PA- eight items. Each item was scored on a 7-point Likert scale, ranging from 0 (stands for never) to 6 (stands for always). We defined overall burnout as EE score $\geq$27 and/or DP score $\geq$10, aligned with one of the most popular criteria (Rotenstein et al., 2018). The Cronbach's α was 0.91 for EE, 0.79 for DP, and 0.89 for PA, respectively.

Additionally, we collected the basic sociodemographic data (age, sex, marital status, education, number of children) and work-related factors, such as professional title (junior, middle, and senior), administration position (yes or no), working hours per week, night shifts per month, and sleep hours per day, based on literature review (te Brake et al., 2003; Norlund et al., 2010; Rotenstein et al., 2018).

Data Analysis

One-sample K-S test was used to detect the normality of obtained data. Descriptive analyses were used to describe the sample's socio-demographic, burnout symptoms, and work-related factors.

Since there is no consensus on the diagnostic criteria for burnout syndromes, some suggested the three subscales should be treated as continuous measures (Rotenstein et al., 2018). We adopted this approach in our analysis. The Chi-square test examined the gender difference of burnout prevalence. The Kruskal–Wallis test or Pearson correlation analysis was

TABLE 1 | Basic Characteristics of 711 endocrinologists in China.

Characteristic		N (%)	Male (198)	Female (513)	p
Relationship status					0.809
	Not married	75 (10.55)	20 (10.10)	55 (10.72)	
	Married	636 (89.45)	178 (89.90)	458 (89.28)	
Children					**0.008**
	None	149 (20.96)	32 (16.16)	117 (22.81)	
	One	457 (64.28)	125 (63.13)	332 (64.72)	
	More than one	105 (14.77)	41 (20.71)	64 (12.48)	
Educational level*					0.222
	Medical/college degree	122 (17.16)	36 (18.18)	86 (16.76)	
	Add on Master's degree	356 (50.07)	89 (44.95)	267 (52.05)	
	Add on Doctorate degree	233 (32.77)	73 (36.87)	160 (31.19)	
Professional title					**0.001**
	Junior	119 (16.74)	21 (10.61)	98 (19.10)	
	Middle	252 (35.44)	61 (30.81)	191 (37.23)	
	Senior	340 (48.82)	116 (58.59)	224 (43.66)	
Administration position					**<0.001**
	No	606 (85.23)	151 (76.26)	455 (88.69)	
	Yes	105 (14.77)	47 (23.74)	58 (11.31)	
		Mean (SD)	Mean (SD)	Mean (SD)	p
Age (years)		39.63 (8.51)	42.55 (8.49)	38.50 (8.26)	**<0.001**
Sleep hours /day		6.35 (0.76)	6.41 (0.73)	6.33 (0.78)	0.261
Work hours/week		55.06 (13.83)	54.81 (13.18)	55.16 (14.08)	0.762
		Median (IQR)	Median (IQR)	Median (IQR)	p
Night shifts/month		6 (1)	4 (3)	4 (2.25)	0.137

*In China, medical school graduates are awarded a bachelor's degree in medicine (similar to the European system). Some obtain a master's or doctorate degree in addition to their medical degree. Bold value for p < 0.05.

conducted to test the correlation between related factors and EE, DP, and PA in male and female participants. After that, significant factors were involved in further regression analysis. As all endocrinologists nested in hospitals, multilevel linear regression analyses were conducted to identify independent factors associated with EE, DP, PA in male and female samples, respectively.

We performed all statistical analyses using the STATA software version 16.0 (Stata Corporation, College Station, TX, United States), with the significance level at the *p*-value of 0.05 (two-tailed).

RESULTS

Sample Characteristics

In total, all endocrinologists ($N = 879$) nested in these 31 hospitals were invited to respond to this survey, and 711 endocrinologists (response rate = 80.89%) completed the questionnaire. **Table 1** shows the detailed information of their sociodemographic characteristics, job-related factors, and gender differences.

According to the Labor Law of China, workers should work no more than 44 h per week (Standing Committee of National People's Congress, 2019). However, nearly four-fifths (79.3%) of the endocrinologists in our sample reported working more than 44 h per week, with no significant gender difference (79.8 in males vs. 79.1% in females, $p = 0.847$).

The overall prevalence of burnout was 32.7% in this sample, again with no significant gender difference (34.3% in males and 32.2% in females, $p = 0.579$). There were no gender differences in EE, DP, PA scores either (all $p > 0.05$) (**Table 2**).

Univariate analyses showed that professional title was associated with EE, DP in males, and DP in females; administration position was only associated with PA in females. Age, sleep duration, work hours, and the number of night shifts was associated with some of the EE, DP, and DP scores among endocrinologists (**Table 3**).

Furthermore, EE, DP, and DP scores were transformed into the standard normal distribution (Z scores). In multilevel

TABLE 2 | Burnout in male ($N = 198$) and female ($N = 513$) endocrinologists in China.

	Total	Male	Female	p
	Mean (Median, IQR)	Mean (Median, IQR)	Mean (Median, IQR)	
EE	16.71 (15,15)	15.91 (14.5,14)	17.02 (15,14)	0.249[a]
DP	7.29 (6,7)	7.24 (6,7)	7.30 (6,7)	0.875[a]
PA	32.24 (33,17)	31.80 (33,19)	32.41 (34,16)	0.670[a]
	N (%)	N (%)	N (%)	
Burnout	233 (32.77%)	68 (34.34%)	165 (32.16%)	0.579[b]

[a]Kruskal-Wallis test.
[b]Chi square test.

TABLE 3 | Univariate analyses of factors associated with burnout in 711 endocrinologists in China.

Variable	Male						Female					
	EE		DP		PA		EE		DP		PA	
	Median (IQR)	p	Median (IQR)	p	Median (IQR)	p	Median (IQR)	p	Median (IQR)	p	Median (IQR)	p
Relationship status		0.209		0.171		0.915		0.848		0.748		0.883
Not married	17.5 (15)		7.5 (7.5)		34 (8.5)		14 (14)		6 (7)		33 (13)	
Married	14 (14)		6 (7)		32 (19)		15 (14)		6 (7)		34 (16)	
Children		0.251		0.352		0.404		0.643		0.255		0.457
None	19 (16)		7 (7.5)		32.5 (17)		15 (15)		6 (6)		35 (14)	
One	13 (14)		6 (7)		34 (18)		15 (15)		6 (7)		32.5 (17)	
More than one	15 (12)		5 (7)		30 (22)		14 (12)		5 (7.5)		36 (17.5)	
Educational level		0.396		0.231		0.715		0.086		0.558		0.524
Medical/college degree	12 (12)		4 (7)		31.5 (18)		13 (13)		6 (6)		34 (19)	
Add on Master's degree	15 (16)		6 (7)		33 (16)		16 (16)		6 (7)		32 (16)	
Add on Doctorate degree	14 (14)		6 (8)		34 (18)		13 (14)		6 (7)		36 (17)	
Professional title		**0.007**		**0.007**		0.103		0.256		**0.027**		0.657
Junior	22 (8)		10 (7)		29 (14)		14 (15)		6 (5)		34 (16)	
Middle	16 (19)		5 (7)		33 (18)		16 (20)		7 (9)		32 (16)	
Senior	12 (14)		6 (7)		33 (18.5)		14 (11.5)		5 (6)		35 (17.5)	
Administration position		0.125		0.489		0.908		0.143		0.248		**0.020**
No	15 (16)		6 (7)		33 (18)		15 (15)		6 (7)		33 (16)	
Yes	12 (14)		6 (7)		31 (20)		13 (13)		5 (5)		39.5 (17)	
	r	p	r	p	r	p	r	p	r	p	r	p
Age (years)	−0.27	**<0.001**	−0.27	**<0.001**	0.21	**0.003**	−0.06	0.203	−0.11	**0.014**	0.12	**<0.001**
Sleep hours /day	−0.18	**0.009**	−0.04	0.556	−0.07	0.341	−0.20	**<0.001**	−0.13	**0.003**	0.06	0.161
Work hours/week	0.26	**<0.001**	0.15	**0.030**	−0.07	0.300	0.31	**<0.001**	0.25	**<0.001**	−0.03	0.494
Night shifts/month	0.16	**0.024**	0.13	0.061	−0.14	0.054	0.15	**<0.001**	0.09	**0.049**	−0.05	0.219

Bold value for p < 0.05.

TABLE 4 | Multilevel analysis of associated factors for burnout among 198 male endocrinologists.

Variable	EE*				DP*				PA*			
	β	95% CI (Lower)	95% CI (Upper)	p	β	95% CI (Lower)	95% CI (Upper)	p	β	95% CI (Lower)	95% CI (Upper)	p
Age (years)	−0.02	−0.05	0.00	0.059	−0.03	−0.06	−0.01	**0.005**	0.03	0.01	0.04	**0.003**
Sleep hours /day	−0.25	−0.42	−0.07	**0.006**	–	–	–	–	–	–	–	–
Work hours/week	0.01	0.00	0.02	**0.016**	0.01	0.00	0.02	0.256	–	–	–	–
Night shifts/month	0.01	−0.05	0.06	0.765	–	–	–	–	–	–	–	–
Professional title (ref. Junior)												
Middle	−0.18	−0.65	0.30	0.465	−0.37	−0.86	0.11	0.130	–	–	–	–
Senior	−0.12	−0.67	0.44	0.680	−0.13	−0.70	0.44	0.650	–	–	–	–

Transformed into standardized normal variate.
Bold value for p < 0.05.

linear regression analysis for male and female endocrinologists, standardized EE, DP, and DP scores were used as dependent variables, while the significant variables identified in univariate analyses were enrolled as independent variables. **Table 4** demonstrates that shorter sleep duration was significantly associated with EE in males (β = −0.25, p = 0.006), while work hours were significantly associated with male EE (β = 0.01, p = 0.016). Additionally, age was significantly associated with male PA (β = 0.03, p = 0.003), but was inversely related to male DP (β = −0.06, p = 0.005).

Table 5 shows that shorter sleep duration was associated with female EE (β = −0.19, p = 0.001) and DP (β = −0.15, p = 0.011).

Work hours were significantly associated with EE (β = 0.02, p < 0.001) and DP (β = 0.01, p < 0.001) in females. Age was also significantly associated with PA in females (β = 0.01, p = 0.038).

DISCUSSION

This study was one of the first to survey the prevalence of burnout and the associated factors among Chinese endocrinologists. Our main findings include: (1) nearly one-third of participants reported burnout, and there was no significant gender difference in the overall prevalence of burnout; (2) a younger age was

TABLE 5 | Multilevel analysis of associated factors for burnout among 513 female endocrinologists.

Variable	EE*				DP*				PA*			
	β	95% CI (Lower)	95% CI (Upper)	p	β	95% CI (Lower)	95% CI (Upper)	p	β	95% CI (Lower)	95% CI (Upper)	p
Age (years)	–	–	–	–	−0.01	−0.03	0.01	0.193	0.01	0.00	0.02	**0.038**
Sleep hours /day	−0.19	−0.29	−0.08	**0.001**	−0.15	−0.26	−0.03	**0.011**	–	–	–	–
Work hours/week	0.02	0.01	0.03	**<0.001**	0.01	0.01	0.02	**<0.001**	–	–	–	–
Night shifts/month	0.02	−0.01	0.05	0.177	−0.01	−0.04	0.03	0.723	–	–	–	–
Professional title (ref. Junior)												
Middle	–	–	–	–	0.24	0.00	0.49	0.054	–	–	–	–
Senior	–	–	–	–	0.10	−0.25	0.45	0.563	–	–	–	–
Administration position (ref. No)	–	–	–	–	–	–	–	–	0.17	−0.11	0.45	0.229

*Transformed into standardized normal variate.
Bold value for p < 0.05.

associated with DP in males, but not in females; and (3) DP was significantly associated with shorter sleep duration and longer work hours in females, but not in males. This suggested that there might be gender differences in the mechanism of burnout between burnout (DP) and related factors.

In this study, we found that age was an independent factor associated with PA, while sleep hours and work hours were significantly associated with EE among male and female endocrinologists, which is in concordance with previous studies (West et al., 2018; Hacimusalar et al., 2021; Lin et al., 2021).

Our finding that there were no significant gender differences in the overall prevalence of burnout is different from most previous studies. Numerous studies showed that female physicians had a higher prevalence of burnout from countries including America, China, Sweden, Nigeria, etc. (Norlund et al., 2010; Dyrbye et al., 2011; Aguwa et al., 2014; Granek et al., 2016; Huang et al., 2019; Eden et al., 2020; Gold et al., 2021; Lee et al., 2021; McPeek-Hinz et al., 2021). A few other studies reported only marginal gender differences in physician burnout prevalence (Linzer et al., 2002; te Brake et al., 2003; Śliwiński et al., 2014; El Ghaziri et al., 2019; Doraiswamy et al., 2021). The differences may be due to sampling, research settings, cultures, assessment methods for burnout, and variable cut-off values—at least 142 unique burnout definitions or subscale criteria (Rotenstein et al., 2018). For example, previous studies have used the Shirom Melamed Burnout Questionnaire (Norlund et al., 2010), Freudenberger Burnout Scale (Aguwa et al., 2014), Mini-Z burnout scale (Gold et al., 2021), Utrechtse Burnout Schaal (te Brake et al., 2003), or Burnout Scale Inventory (Śliwiński et al., 2014). Others used one or two items to measure burnout (Granek et al., 2016; El Ghaziri et al., 2019; Eden et al., 2020; McPeek-Hinz et al., 2021). Huang et al. used a 7-point Likert scale for MBI-HSS, ranging from 1 to 7, instead of 0 to 6 (Ma et al., 2019). Meanwhile, Lee et al. (2021) used a 5-point Likert scale for MBI. The methodological heterogeneity may contribute to the variations among the studies. Our findings are consistent with a meta-analysis, which included 183 studies of different populations. They showed that the commonly held belief that female employees are more likely to experience burnout is not supported by data (Purvanova and Muros, 2010).

Additionally, previous studies demonstrated that the gender differences might be attributed to job-related and situational life factors (te Brake et al., 2003; Norlund et al., 2010). Our study showed no significant gender differences in most job-related factors between male and female endocrinologists. This may help explain why the overall prevalence and subscales of burnout male and female endocrinologists were comparable.

Depersonalization, which is defined as "a negative attitude toward customers and clients, a personal detachment, or loss of ideals," is generally believed to result from low job satisfaction or poor work-life balance (Maslach, 1993). Some researchers suggested resilience and coping strategies play an important role in affecting DP (Chong et al., 2021; Di Giuseppe et al., 2021; Di Trani et al., 2021; Li P. et al., 2021; Nituica et al., 2021; Perry et al., 2021). Studies also showed gender differences in coping strategies and resilience (Gargiulo et al., 2021; Reisch et al., 2021; Yan et al., 2021; Zhang X. et al., 2021), and this could partially explain the gender differences regarding the differential associations between work hours and sleep duration and DP (Di Giuseppe et al., 2021). As the etiology and mechanism of burnout remain elusive, these findings would help understand the pathogenesis of physician burnout. In the meantime, hospital management and healthcare policymakers need to pay more attention to short sleep duration and long work hours among female physicians to reduce DP or burnout.

The present study has a few limitations. First, the findings were based on a cross-sectional survey, and the nature of the design makes it difficult to infer causality for most factors. Second, the study data obtained may have recall bias, as is inherent in self-report questionnaire studies. Third, as the sample was only from tertiary public hospitals in China, the generalizability of the study conclusions may be limited. Finally, some important information related to burnout, such as personality and resilience, were not collected.

CONCLUSION

In a large national sample, we found that nearly one-third of endocrinologists experienced burnout and the subscales in the sample. Although we did not find gender differences in the overall prevalence of burnout in the sample, we found in male and female participants that the associated factors

were different, which indicated the mechanism of burnout in males and females might be different. This suggests that when developing interventions, hospital management should consider gender differences, and pay close attention to various aspects and target different subgroups, such as ensuring enough sleep duration and shortening work hours for female endocrinologists.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

YL and YW made substantial contributions to the study design. MW and YW collected data. JW and FJ analyzed the data. JW, LZ, and FJ interpreted the analysis results and completed the manuscripts. Y-LT contributed to data interpretation, presentation, and critical revision of the manuscript. All authors have read and approved the published version of the manuscript.

REFERENCES

Aguwa, E. N., Nduka, I., and Arinze-Onyia, S. U. (2014). Assessment of burnout among health workers and bankers in Aba south local government area, Abia state, south east nigeria. *Niger. J. Clin. Pract.* 17, 296–302. doi: 10.4103/1119-3077.130229

Chong, J. J., Tan, Y. Z., Chew, L. S. T., Tan, K. H., and Wang, A. (2021). Burnout and resilience among pharmacy technicians: a singapore study. *J. Am. Pharm. Assoc.* 2003:13. doi: 10.1016/j.japh.2021.09.013

Di Giuseppe, M., Nepa, G., Prout, T. A., Albertini, F., Marcelli, S., Orrù, G., et al. (2021). Stress, burnout, and resilience among healthcare workers during the COVID-19 emergency: the role of defense mechanisms. *Int. J. Environ. Res. Public Health* 18:258. doi: 10.3390/ijerph18105258

Di Trani, M., Mariani, R., Ferri, R., De Berardinis, D., and Frigo, M. G. (2021). From resilience to burnout in healthcare workers during the COVID-19 emergency: the role of the ability to tolerate uncertainty. *Front. Psychol.* 12:646435. doi: 10.3389/fpsyg.2021.646435

Doraiswamy, S., Chaabna, K., Jithesh, A., Mamtani, R., and Cheema, S. (2021). Physician burnout in the eastern mediterranean region: influence of gender and related factors - systematic review and meta-analysis. *J. Glob. Health* 11:04043. doi: 10.7189/jogh.11.04043

Dyer, O. (2019). Physician burnout costs US $4.6bn a year, study finds. *BMJ* 365:l2361. doi: 10.1136/bmj.l2361

Dyrbye, L. N., Shanafelt, T. D., Balch, C. M., Satele, D., Sloan, J., and Freischlag, J. (2011). Relationship between work-home conflicts and burnout among American surgeons: a comparison by sex. *Arch. Surg.* 146, 211–217. doi: 10.1001/archsurg.2010.310

Eden, A. R., Jabbarpour, Y., Morgan, Z. J., Dai, M., Coffman, M., and Bazemore, A. (2020). Gender differences in personal and organizational mechanisms to address burnout among family physicians. *J. Am. Board Fam. Med.* 33, 446–451. doi: 10.3122/jabfm.2020.03.190344

El Ghaziri, M., Dugan, A. G., Zhang, Y., Gore, R., and Castro, M. E. (2019). Sex and gender role differences in occupational exposures and work outcomes among registered nurses in correctional settings. *Ann. Work Exp. Health* 63, 568–582. doi: 10.1093/annweh/wxz018

Gargiulo, A. T., Peterson, L. M., and Grafe, L. A. (2021). Stress, coping, resilience, and sleep during the COVID-19 pandemic: a representative survey study of US adults. *Brain Behav.* 11:e2384. doi: 10.1002/brb3.2384

Gold, K. J., Kuznia, A. L., Laurie, A. R., and Williams, C. B. (2021). Gender differences in stress and burnout: department survey of academic family physicians. *J. Gen. Intern. Med.* 36, 1811–1813. doi: 10.1007/s11606-020-06287-y

Granek, L., Krzyzanowska, M. K., Nakash, O., Cohen, M., Ariad, S., Barbera, L., et al. (2016). Gender differences in the effect of grief reactions and burnout on emotional distress among clinical oncologists. *Cancer* 122, 3705–3714. doi: 10.1002/cncr.30236

Hacimusalar, Y., Misir, E., Civan Kahve, A., Demir Hacimusalar, G., Guclu, M. A., and Karaaslan, O. (2021). The effects of working and living conditions of physicians on burnout level and sleep quality. *Med. Lav.* 112, 346–359. doi: 10.23749/mdl.v112i5.11268

Hu, Y. Y., Ellis, R. J., Hewitt, D. B., Yang, A. D., Cheung, E. O., Moskowitz, J. T., et al. (2019). Discrimination, abuse, harassment, and burnout in surgical residency training. *N Engl. J. Med.* 381, 1741–1752. doi: 10.1056/NEJMsa1903759

Huang, S. L., Li, R. H., Fang, S. Y., and Tang, F. C. (2019). Well-being: its relationship with work-to-family conflict and burnout among males and females. *Int. J. Environ. Res. Public Health* 16:291. doi: 10.3390/ijerph16132291

Lee, S. J., Jung, S. I., Kim, M. G., Park, E., Kim, A. R., Kim, C. H., et al. (2021). The influencing factors of gender differences on mental burdens in young physiotherapists and occupational therapist. *Int. J. Environ. Res. Public Health* 18:858. doi: 10.3390/ijerph18062858

Li, C. P., Shi, K., Luo, Z. X., Li, L., and Yang, R. (2003). An investigation on job burnout of doctor and nurse. *Chin. J. Clin. Psychol.* 11, 170–172.

Li, P., Kuang, H., and Tan, H. (2021). The occurrence of post-traumatic stress disorder (PTSD), job burnout and its influencing factors among ICU nurses. *Am. J. Transl. Res.* 13, 8302–8308.

Li, Y., Guo, C., and Cao, Y. (2021). Secular incidence trends and effect of population aging on mortality due to type 1 and type 2 diabetes mellitus in China from 1990 to 2019: findings from the global burden of disease study 2019. *BMJ Open Diabetes Res. Care* 9:529. doi: 10.1136/bmjdrc-2021-002529

Li, Y., Teng, D., Shi, X., Qin, G., Qin, Y., Quan, H., et al. (2020). Prevalence of diabetes recorded in mainland China using 2018 diagnostic criteria from the american diabetes association: national cross sectional study. *BMJ* 369:m997. doi: 10.1136/bmj.m997

Lin, R. T., Lin, Y. T., Hsia, Y. F., and Kuo, C. C. (2021). Long working hours and burnout in health care workers: non-linear dose-response relationship and the effect mediated by sleeping hours-a cross-sectional study. *J. Occup. Health* 63:e12228. doi: 10.1002/1348-9585.12228

Linzer, M., Mcmurray, J. E., Visser, M. R., Oort, F. J., Smets, E., and De Haes, H. C. (2002). Sex differences in physician burnout in the united states and the netherlands. *J. Am. Med. Womens Assoc* 57, 191–193.

Loscalzo, Y., Marucci, S., Garofalo, P., Attanasio, R., Lisco, G., De Geronimo, V., et al. (2021). Assessment of burnout levels before and during COVID-19 pandemic: a web-based survey by the (Italian) association of medical endocrinologists (AME). *Endocr. Metab. Immune Dis. Drug Targets* 21, 2238–2252. doi: 10.2174/1871530321666210720123336

Ma, S., Huang, Y., Yang, Y., Ma, Y., Zhou, T., Zhao, H., et al. (2019). Prevalence of burnout and career satisfaction among oncologists in china: a national survey. *Oncologist* 24, e480–e489. doi: 10.1634/theoncologist.2018-0249

Maslach, C. (1993). "Burnout: a multidimensional perspective," in *Professional Burnout: Recent Developments in Theory and Research, Schaufeli Wb*, eds C. Maslach and T. Marek (Washington, DC: Taylor & Francis).

Maslach, C., Schaufeli, W. B., and Leiter, M. P. (2001). Job burnout. *Annu. Rev. Psychol.* 52, 397–422. doi: 10.1146/annurev.psych.52.1.397

Maslach, C. J., and Jackson, S. E. (1986). *Maslach Burnout Inventory Manual*, 2nd Edn. Palo Alto, CA: Consulting Psychologists Press.

McPeek-Hinz, E., Boazak, M., Sexton, J. B., Adair, K. C., West, V., Goldstein, B. A., et al. (2021). Clinician burnout associated with sex, clinician type, work culture, and use of electronic health records. *JAMA Net. Open* 4:e215686. doi: 10.1001/jamanetworkopen.2021.5686

Medscape (2020). *Medscape Endocrinologist Lifestyle, Happiness & Burnout Report 2020*. Available online at: https://www.medscape.com/slideshow/2020-lifestyle-endocrinologist-6012494#4 (accessed December 11, 2021)

National Health Commission of the People's Republic of China (2020). *China Health Statistical Yearbook*. Beijing: Press of Peking Union Medical College.

Nituica, C., Bota, O. A., Blebea, J., Cheng, C. I., and Slotman, G. J. (2021). Factors influencing resilience and burnout among resident physicians - a national survey. *BMC Med. Educ.* 21:514. doi: 10.1186/s12909-021-02950-y

Norlund, S., Reuterwall, C., Höög, J., Lindahl, B., Janlert, U., and Birgander, L. S. (2010). Burnout, working conditions and gender–results from the northern Sweden MONICA study. *BMC Public Health* 10:326. doi: 10.1186/1471-2458-10-326

Panagioti, M., Geraghty, K., Johnson, J., Zhou, A., Panagopoulou, E., Chew-Graham, C., et al. (2018). Association between physician burnout and patient safety, professionalism, and patient satisfaction: a systematic review and meta-analysis. *JAMA Int. Med.* 178, 1317–1330. doi: 10.1001/jamainternmed.2018.3713

Patel, R. S., Bachu, R., Adikey, A., Malik, M., and Shah, M. (2018). Factors related to physician burnout and its consequences: a review. *Behav Sci.* 8:98. doi: 10.3390/bs8110098

Perry, H., Naud, S., Fishman, M. D. C., and Slanetz, P. J. (2021). Longitudinal resilience and burnout in radiology residents. *J. Am. Coll. Radiol.* 18, 639–646. doi: 10.1016/j.jacr.2021.01.022

Purvanova, R. K., and Muros, R. P. (2010). Gender differences in burnout: a meta-analysis. *J. Vocational Behav.* 77, 168–185. doi: 10.1016/j.jvb.2010.04.006

Reisch, T., Heiler, G., Hurt, J., Klimek, P., Hanbury, A., and Thurner, S. (2021). Behavioral gender differences are reinforced during the COVID-19 crisis. *Sci. Rep.* 11:19241. doi: 10.1038/s41598-021-97394-1

Rotenstein, L. S., Torre, M., Ramos, M. A., Rosales, R. C., Guille, C., Sen, S., et al. (2018). Prevalence of burnout among physicians: a systematic review. *JAMA* 320, 1131–1150. doi: 10.1001/jama.2018.12777

Shanafelt, T. D., Hasan, O., Dyrbye, L. N., Sinsky, C., Satele, D., Sloan, J., et al. (2015). Changes in burnout and satisfaction with work-life balance in physicians and the general US working population between 2011 and 2014. *Mayo Clin. Proc.* 90, 1600–1613. doi: 10.1016/j.mayocp.2015.08.023

Śliwiński, Z., Starczyńska, M., Kotela, I., Kowalski, T., Kryś-Noszczyk, K., Lietz-Kijak, D., et al. (2014). Life satisfaction and risk of burnout among men and women working as physiotherapists. *Int. J. Occup. Med. Environ. Health* 27, 400–412. doi: 10.2478/s13382-014-0266-8

Standing Committee of National People's Congress (2019). *Labor Law of the People's Republic of China*. Beijing: National People's Congress of China.

te Brake, H., Bloemendal, E., and Hoogstraten, J. (2003). Gender differences in burnout among dutch dentists. *Commun. Dent Oral Epidemiol.* 31, 321–327. doi: 10.1034/j.1600-0528.2003.t01-1-00010.x

Verweij, H., Van Der Heijden, F., Van Hooff, M. L. M., Prins, J. T., Lagro-Janssen, A. L. M., Van Ravesteijn, H., et al. (2017). The contribution of work characteristics, home characteristics and gender to burnout in medical residents. *Adv. Health Sci. Educ. Theory Pract.* 22, 803–818. doi: 10.1007/s10459-016-9710-9

West, C. P., Dyrbye, L. N., and Shanafelt, T. D. (2018). Physician burnout: contributors, consequences and solutions. *J. Int. Med.* 283, 516–529. doi: 10.1111/joim.12752

Wu, Y., Jiang, F., Ma, J., Tang, Y. L., Wang, M., and Liu, Y. (2020). Experience of medical disputes, medical disturbances, verbal and physical violence, and burnout among physicians in china. *Front. Psychol.* 11:556517. doi: 10.3389/fpsyg.2020.556517

Yan, S., Xu, R., Stratton, T. D., Kavcic, V., Luo, D., Hou, F., et al. (2021). Sex differences and psychological stress: responses to the COVID-19 pandemic in China. *BMC Public Health* 21:79. doi: 10.1186/s12889-020-10085-w

Zhang, L., Chen, J., Zhang, J., Wu, W., Huang, K., Chen, R., et al. (2021). Regional disparities in obesity among a heterogeneous population of chinese children and adolescents. *JAMA Netw Open* 4:e2131040. doi: 10.1001/jamanetworkopen.2021.31040

Zhang, X., Deng, X., Mo, Y., Li, Y., Song, X., and Li, H. (2021). Relationship between infertility-related stress and resilience with posttraumatic growth in infertile couples: gender differences and dyadic interaction. *Hum. Reprod* 36, 1862–1870. doi: 10.1093/humrep/deab096

Zhou, H., Han, X., Zhang, J., Sun, J., Hu, L., Hu, G., et al. (2018). Job satisfaction and associated factors among medical staff in tertiary public hospitals: results from a national cross-sectional survey in china. *Int. J. Environ. Res. Public Health* 15:1528. doi: 10.3390/ijerph15071528

The Impostor Phenomenon Among Nursing Students and Nurses: A Scoping Review

Ying Peng[1,2], Shao-Wen Xiao[3], Hui Tu[1]*, Xiao-Yun Xiong[1], Zhao-Jia Ma[1], Wen-Jun Xu[1,2] and Ting Cheng[1,2]

[1] The Second Affiliated Hospital of Nanchang University, Nanchang, China, [2] School of Nursing, Nanchang University, Nanchang, China, [3] Peking University Shenzhen Hospital, Shenzhen, China

The impostor phenomenon (IP) refers to a false internal experience of low intelligence or ability that is associated with anxiety, depression, psychological distress, and burnout. The emotions associated with the IP affect not only personal mental health but also patient care. To address this issue, we need to completely understand the prevalence of and factors related to the IP and ways to resolve/overcome IP feelings. The aim of this scoping review was to identify the existing evidence regarding the IP among nursing students and nurses and determine gaps that can be addressed in future research. We conducted our study based on the scoping review methodological framework proposed by Arksey and O'Malley (2005) and advanced by Levac et al. (2010). After searching the Embase, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, Web of Science and ProQuest databases, we identified 11 studies for inclusion in this review. We found that while the IP exists in nursing students and nurses, clinical nurse specialist students and final-year nursing students are at significant risk of impostor behavior. We also found that research in the nursing field has focused on the prevalence of and factors related to the IP, but few studies have addressed ways to resolve/overcome IP feelings. Thus, research in this area should be increased. This scoping review presents research gaps that may serve as a starting point for future work on the IP in the nursing field.

Keywords: impostor phenomenon, impostor syndrome, mental health, nursing, scoping review

INTRODUCTION

The impostor phenomenon (IP), which is a concept that was proposed by Clance and Imes (1978), refers to "a false internal experience of low intelligence or ability." A literature review indicates that many studies have shown that the IP exists in different populations, such as managers, resident physicians, and medical students (Rohrmann et al., 2016; Villwock et al., 2016; Gottlieb et al., 2020), but that it is also common among nursing students and nurses (Christensen et al., 2016; Gill, 2020). While the IP has been well described in other fields, research on IP in the nursing field is limited, with available studies focusing primarily on the universality of the IP (Gómez-Morales, 2021).

Studies have reported that nursing students and nurses are prone to negative psychological problems, such as stress, anxiety, and depression (Henning et al., 1998; McGregor et al., 2008;

Mark and Smith, 2012; Villwock et al., 2016; Bernard et al., 2017; Al Maqbali et al., 2021). This is likely because nurses face powerful stressors on a daily basis, including conflicts with physicians, high workload, and with patients and their families (Mark and Smith, 2012; Al Maqbali et al., 2021). Negative psychological problems are prevalent among nurses, especially among nursing students (Tung et al., 2018; Wang et al., 2019). Nursing students struggle to cope with not only the stressors common in higher education institutions but also with the stressors of clinical practice. Furthermore, there is evidence that nursing students exhibit higher levels of negative psychological problems than the general student population (Bartlett et al., 2016). Although negative psychological problems are associated with many factors, many studies have demonstrated that the IP is a risk factor that impacts their mental health and that the IP is generally elevated in students compared to working professionals (Henning et al., 1998; McGregor et al., 2008; Neureiter and Traut-Mattausch, 2016; Villwock et al., 2016; Bernard et al., 2017; Brauer and Proyer, 2017, 2019). As vulnerable groups, both nursing students and nurses experience emotions associated with the IP that affect not only their personal mental health but also their level of patient care (Gómez-Morales, 2021). This may be because the IP can cause low self-esteem and even burnout (Mitchell, 2005; Villwock et al., 2016). Accordingly, it is important to pay attention to the IP among nursing students and nurses.

While there new research in this field is accumulating, there are no scoping reviews on the IP among nursing students and nurses. To understand the evidence related to the IP in the nursing field and identify the research gaps, we conducted a scoping review on the IP among nursing students and nurses.

Our review involved two research questions: (a) What evidence is there to identify, assess, and resolve/overcome the IP among nursing students and nurses? (b) What are the gaps in the evidence base? Our main concerns were the prevalence of the IP among this population, its related factors, assessment tools for identifying it, and methods and techniques for resolving or overcoming impostor feelings.

METHODS

While we applied the scoping review methodology proposed by Arksey and O'Malley (2005) and advanced by Levac et al. (2010), we did not perform the sixth step, i.e., consultation, because we studied the literature on the IP among nursing students and nurses and, thus, did not involve other stakeholders' views on this issue.

Identifying the Research Question
The purpose of this review was to identify the existing literature on the IP among nursing students and nurses and the research gaps within this literature. To achieve these goals, we put forward the following research questions: (a) What evidence is there to identify, assess, and resolve/overcome the IP among nursing students and nurses? (b) What are the gaps in the evidence base?

Identifying Relevant Studies
Two researchers who have extensive evidence-based knowledge and who have each participated in systematic review searches many times searched the following databases: Embase, PubMed, CINAHL (EBSCO), Cochrane Library, Web of Science, and ProQuest. The following search terms were used: impostor syndrome/imposter syndrome/impostor phenomenon/imposter phenomenon/impostorism/imposterism and nurse*/nursing personnel/registered nurses/registered nurse*. The search time was limited to the time between establishment of the database and 17 March 2021. The language was limited to English. See **Appendix 1** for the Ying Peng's search strategy of the PubMed database. After the search was completed, we read the reference list of each article and found no new relevant articles. In addition, we discussed and identified four common core journals. Keywords in these journals were manually searched to identify missing documents, and no new documents were found.

Study Selection
The literature inclusion criteria were as follows: (a) nursing students or nurses as the research subjects, (b) original research, and (c) any type of research design. Studies whose subjects were healthcare attendees (HCAs) or certified nursing assistants (CANs/CNAs) were excluded. Documents that did not discuss IP or opinions or debate articles were also excluded. Two researchers independently screened the articles according to the inclusion and exclusion criteria. The screening method was based on a two-stage plan (title and abstract, full text). After individual screening, the results of the two researchers were compared to determine the final included literature. If a disagreement occurred in this process, the two researchers discussed the issue together to reach consensus. If consensus could not be reached, a third person was consulted. See the literature screening flow in **Figure 1**.

Charting the Data
We codesigned the data charting form based on research questions using Microsoft Excel and determined the categories of the extracted variables. Two researchers independently extracted the data from the first five documents, and then all team members met to discuss the trial of the form and determine the final categories of the extracted variables. The extracted variables included author, year, country, study type, sample size, participants, assessment tools, and major findings. The two researchers independently extracted the data and compared the two extraction results to obtain the final results. If a disagreement occurred in this process, the two researchers discussed it together to reach consensus. If a consensus could not be reached, another researcher was consulted. In the process of comparing the differences in data extraction results, the two researchers met and discussed the results three times.

Collating, Summarizing, and Reporting the Results
We collated and summarized the research results and described them using two methods. First, the scope, nature and distribution of the included studies were summarized based on descriptive

FIGURE 1 | Literature screening process.
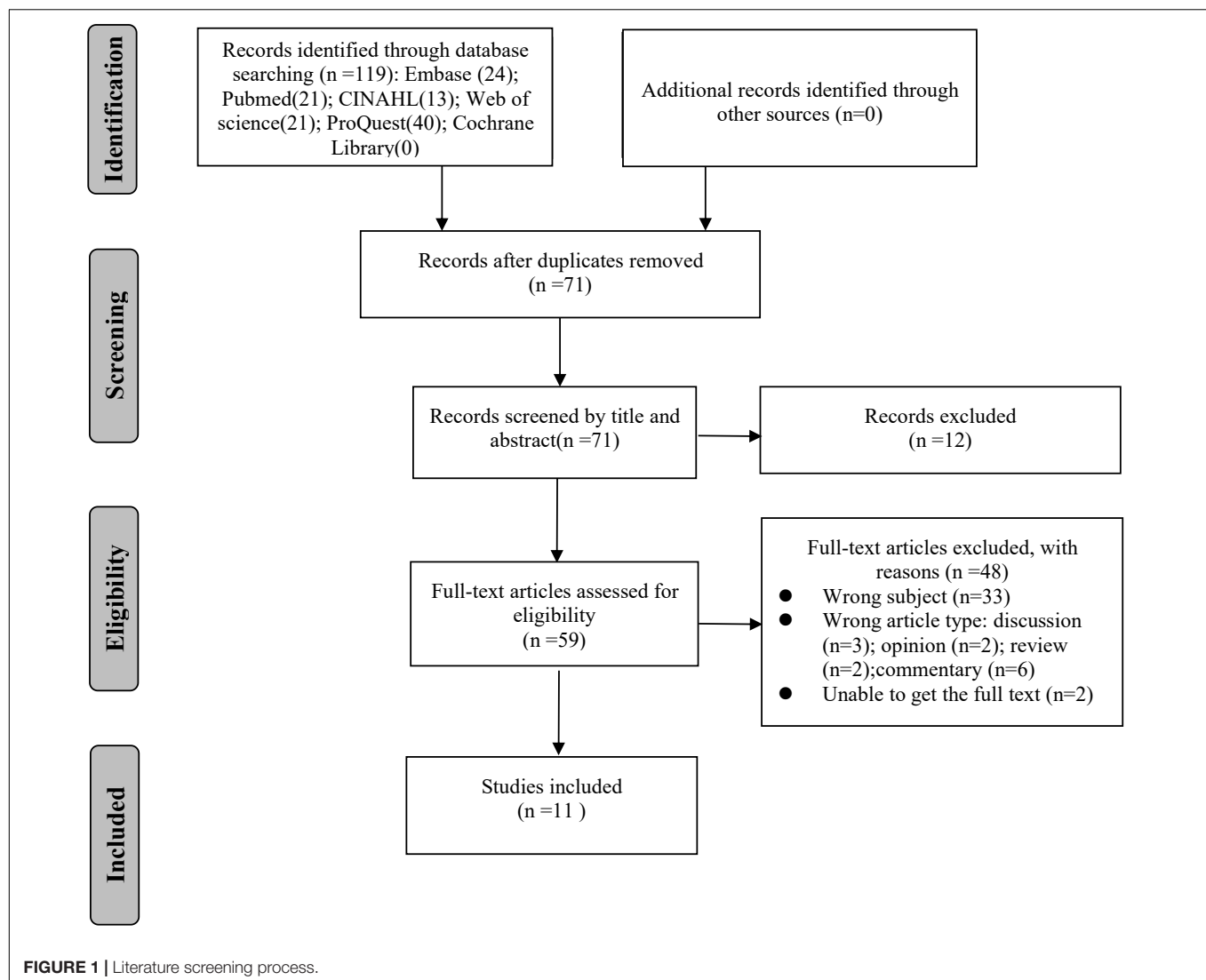
statistics. Second, we conducted a narrative review of the existing information on the aforementioned research questions. Our literature review results report is organized around these two approaches.

RESULTS

Descriptive Statistics Summary

Based on the identified literature, research in this area has increased since 2016. Most studies were from the United States (Smith-Clark, 1988; Hollingsworth, 1995; Engberg, 1996; Even, 1999; Klein, 2000; Vance, 2002; Mitchell, 2005; Ares, 2018; Haney et al., 2018), and only one study was from Australia (Christensen et al., 2016). In six studies, the research subjects were nurses (Smith-Clark, 1988; Hollingsworth, 1995; Engberg, 1996; Ellerie, 1997; Even, 1999; Mitchell, 2005). In five studies, the research subjects were nursing students (Klein, 2000; Vance, 2002; Christensen et al., 2016; Ares, 2018; Haney et al., 2018).

Nine were survey studies (Smith-Clark, 1988; Engberg, 1996; Ellerie, 1997; Even, 1999; Klein, 2000; Vance, 2002; Mitchell, 2005; Christensen et al., 2016; Ares, 2018), and two were mixed studies (Hollingsworth, 1995; Haney et al., 2018). See **Table 1** for details.

Prevalence of Impostor Phenomenon in the Population

Of the 11 studies included, six studies used the Clance Impostor Phenomenon Scale (CIPS) to assess prevalence (Even, 1999; Klein, 2000; Mitchell, 2005; Christensen et al., 2016; Ares, 2018; Haney et al., 2018), three studies used both the CIPS and Harvey Impostor Scale (HIS) (Hollingsworth, 1995; Engberg, 1996; Vance, 2002), and only two studies used the HIS (Smith-Clark, 1988; Ellerie, 1997). Studies measuring the prevalence of IP among nursing students showed that it ranged from 19.33 to 100% (Klein, 2000; Vance, 2002; Christensen et al., 2016; Ares, 2018; Haney et al., 2018). Clinical nursing students and final-year nursing students were at great risk of IP (Christensen et al., 2016; Ares, 2018). Tina et al. found that the IP prevalence among 14

TABLE 1 | Basic information of the included articles.

Study	Country	Study type	Sample size, participants	Assessment tools	Major findings
Haney et al., 2018	United States	Qualitative study; survey	447 Interprofessional students	CIPS	(a) 50% of the entire group had a score of 60 or greater. (b) There is a substantial risk of IP behaviors in clinical nurse specialist students. In 14 clinical nurse specialist students, 9 scored between 41 and 60, 3 scored between 61 and 80, and 2 scored greater than 80. (c) Educational institutions with clinical nurse specialist programmes can easily incorporate content on impostor syndrome into their existing curriculum.
Ares, 2018	United States	Survey	68 Clinical nurse specialist students	CIPS	The prevalence of IP experiences at the moderate, frequent, or intense levels was 74.6%.
Christensen et al., 2016	Australia	Survey	223 Final year nursing students	CIPS	(a) Moderate IP experiences (45.1% of participants); frequent impostor feelings (33.4% of participants); intense IP experiences (>8.3%). (b) A total of 38.5% of the sample was classified as feeling like "impostors."
Mitchell, 2005	United States	Survey	114 Nurse educators; a large random sample of a target population	CIPS	(a) This sample on the whole did not report impostor feelings (mean score < 62). (b) IP was not correlated with self-esteem ($r = -0.013$, $p = 0.891$). (c) IP was not correlated with age, gender, academic rank, number of years as a faculty member, highest degree achieved, or tenure in nurse educators ($p = 0.553$).
Vance, 2002	United States	Survey	32 Family nurse practitioner students	HIS; CIPS	(a) The mean impostor score for the total sample was a relatively low 46.6 ± 15.05. (b) IP was correlated with students' beliefs that they would graduate with the skill level needed for advanced practice ($r = -0.2278$) and their confidence regarding their success in their future role as a nurse practitioner ($r = -0.2972$). (c) IP was correlated with numbers of years of nursing practice ($r = -0.2904$, $p = 0.107$). (d) IP was correlated with age ($r = -0.1463$, $p = 0.424$). (e) IP was correlated with familial support ($r = -0.1915$, $p = 0.294$). (f) IP was not correlated with gender or marital status ($t = 0.54$, $df = 30$) ($t = 0.72$, $df = 28.58$).
Klein, 2000	United States	Survey	181 Baccalaureate nursing students	CIPS	(a) A total of 19.33% of the students reported IP. (b) IP was not correlated with the students current age, amount of college already completed, years of previous full-time work, number of children, hours preparing for clinical, current GPA or grade on the last test. (c) IP was correlated with role function behavior and the students' perceptions of competency ($r = 0.427$) ($p < 0.001$). (d) The study indicated that with generic senior baccalaureate nursing students, and IP has positive consequences.
Even, 1999	United States	Survey	129 RN preceptors	CIPS	(a) A total of 10% of the participants experienced moderate to intense levels of IP. (b) A significant negative correlation was found between impostorism and self-perceived qualification for the preceptor role. (c) Feelings reported by RN preceptors employed at acute care hospitals suggest that such an employment setting slightly increased the risk of feelings associated with IP.
Ellerie, 1997	United States	Survey	109 RN first assistants (RNFAs)	HIS	(a) The total RNFA sample results indicated that they did not experience IP. (b) IP was correlated with years of experience in the operating room ($r = -0.1049$) and years of experience in nursing ($r = -0.0001$).
Engberg, 1996	United States	Survey	222 Primary care providers	HIPS; CIPS	(a) The mean IP score for the total sample was a relatively low 29.2 ± 14.93. (b) IP was not correlated with personal and practice characteristics for the total group. (c) For nurse practitioners (NPs), marital status was the only characteristic found to be related to the IP score.
Hollingsworth, 1995	United States	Qualitative study; survey	527 Enterostomal therapy (ET) nurses	HIS; CIPS	(a) ET nurses had a minor intensity of IP manifestations. (b) Recent graduates of a non-traditional ETNEP showed a slightly higher incidence of IP manifestations than both experienced ET nurses and non-ET nurses. (c) As the individual respondents passed age 48 years, IP manifestations declined in intensity. (d) IP intensity was not correlated with age, gender, race/ethnicity, or programme type.
Smith-Clark, 1988	United States	Survey	110 RNs	HIS	(a) The RNs in this study demonstrated relatively low IP scale scores. (b) The possible range of scores was 0–84. The scores ranged from 4 to 58 with an overall mean of 25.50. (c) It appears that the subjects did not experience an intense level of impostor feelings. (d) This finding is similar to Topping's results obtained with university professors (1983).

CIPS, Clance Impostor Phenomenon Scale; HIS, Harvey Impostor Scale; IP, Impostor Phenomenon; RN, Registered Nurses.

clinical nursing students was 100% (Ares, 2018). Martin et al. studied 223 final-year nursing students and found that the rate of IP was 86.8%, and these participants experienced moderate and higher levels of impostor feelings (Christensen et al., 2016). No study assessed the IP incidence rate of nurses.

Factors Related to Impostor Phenomenon in the Population

The initial view was that IP mostly occurred in successful women (Clance and Imes, 1978), but most nursing literature showed that the proportion of men and women experiencing IP was similar and that gender was not statistically significantly related to IP (Smith-Clark, 1988; Hollingsworth, 1995; Engberg, 1996; Ellerie, 1997; Vance, 2002; Mitchell, 2005). There is also controversy about race as a factor of IP. Studies outside the nursing field have suggested that race has a significant impact on IP, but two nursing field studies showed that race had no correlation with IP (Smith-Clark, 1988; Hollingsworth, 1995). Several studies have found that nursing students and nurses with low self-confidence and self-esteem have increased IP incidence.

Ways to Resolve/Overcome Impostor Phenomenon Feelings

Impostor phenomenon is considered a stable feeling (does not change over time or with situations), and IP can relate to mental health problems, such as depression, anxiety, and psychological distress (Henning et al., 1998; McGregor et al., 2008; Villwock et al., 2016; Bernard et al., 2017). Therefore, it is important to overcome impostor feelings. In our review, two studies suggested that individuals should be aware that IP is a normal experience at a certain stage and that their peers may also experience the same self-doubt (Hollingsworth, 1995; Studdard, 2002). Another study suggested that educational institutions with clinical nursing courses should incorporate IP content into their existing courses, conduct IP emotional education for students and establish mentoring relationships with students (Haney et al., 2018).

DISCUSSION

We identified the existing literature on IP among nursing students and nurses. Since 2016, research on IP among nursing students and nurses has seemed to increase. We found that most of the research is performed in the United States and mainly focuses on the universality of IP in this population. Notably, most of these studies are survey studies, and there are few mixed studies. Although the number of mixed studies is limited, mixed research methods can better understand the IP experience among nursing students and nurses.

Our review highlights some gaps in the existing research. First, the gold standard for IP assessment has not yet been established. Karina et al. noted that this is affected by the conceptual clarity of the IP dimensions and the lack of psychometric data (Mak et al., 2019). The assessment of IP lacks uniformity, which seriously affects the comparison between studies and thus affects the drawing of broader conclusion. Although the CIPS

is the most commonly used assessment tool for researchers, the current research has not determined its advantages over other tools. This seems to be a way forward. Future confirmatory research should determine the dimensions of IP to solve the conceptual clarification of structural dimensions and report necessary psychometric data.

Second, we found that the nursing field has given little attention to the IP. Research on the IP focuses primarily on the universality of IP in the population, and thus, little is known about the impact of different activities to overcome the experience of self-doubt and its consequences, a finding that aligns with the study results of Gómez-Morales (2021).

The findings with respect to gender and race as two factors related to the IP contradict those of previous studies. In our review, none of the research results indicated that gender and race are related to the IP. A possible reason is that in the majority of studies, the respondents' gender and race were not balanced. For example, most of the study respondents were white women. Therefore, it is recommended that future research regarding the IP in the nursing field avoid this bias by expanding the sample size to verify whether the two factors are related to the IP. In addition, the IP has a negative impact on mental health, whereas the positive impact of the IP has received little attention, which is perhaps another research direction. Future research can also link IP-related factors with their impacts on mental health to explore how a specific factor regulates the IP and mental health and to understand how they, i.e., the specific factor, the IP and mental health, interact. We also found a paucity of intervention studies, although a study outside of the nursing field noted that systematic intervention is the only method that addresses the IP (Freeman and Peisah, 2021). Based on the related evidence of the factors influencing the IP, future studies should develop customized interventions specifically for the degree of the IP and explore the effects of those interventions on impostor feelings.

Research on resolving/overcoming impostor feelings has not been fully studied. In our review, only a few studies even mentioned methods for resolving/overcoming impostor feelings (Haney et al., 2018), and those methods have not received the attention they deserve. However, as many studies have found that the IP can cause mental health problems, such as depression, anxiety, low self-esteem, and psychological distress (Henning et al., 1998; McGregor et al., 2008; Villwock et al., 2016; Bernard et al., 2017), this is a call for future research to develop methods that will resolve/overcome impostor feelings at both the individual and institutional levels and to perform confirmatory research.

Finally, it is anticipated that future studies will consider these research gaps as starting points for future studies on the IP among nursing students and nurses.

Limitations

The process of conducting this scoping review was subject to the following limitations. First, the review was performed without the cooperation of a librarian. Second, the research subjects were directly limited to the nurses and nursing students within the searches. In addition, we reviewed literature up to

March 2021, and thus, any literature published after that date was not included.

CONCLUSION

It is concluded that the IP exists among nursing students and nurses. This scoping review identifies the existing literature on the IP among nursing students and nurses and identifies the gaps in the current research. We expect that follow-up studies will consider this review to be a starting point for conducting valuable research on the IP among nursing students and nurses.

AUTHOR CONTRIBUTIONS

YP and S-WX participated in the methodology and analysis. Z-JM, W-JX, and TC contributed to data analysis. YP, S-WX, and HT contributed to the writing. YP was the main contributor to manuscript writing. HT and X-YX took part in manuscript revision. All authors participated in designing the study, read, and agreed to the published version of the manuscript.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Al Maqbali, M., Al Sinani, M., and Al-Lenjawi, B. (2021). Prevalence of stress, depression, anxiety and sleep disturbance among nurses during the COVID-19 pandemic: a systematic review and meta-analysis. *J. Psychosom. Res.* 141:110343. doi: 10.1016/j.jpsychores.2020.110343

Ares, T. L. (2018). Role transition after clinical nurse specialist education. *Clin. Nurse Spec.* 32, 71–80. doi: 10.1097/NUR.0000000000000357

Arksey, H., and O'Malley, L. (2005). Scoping studies: towards a methodological framework. *Int. J. Soc. Res. Methodol.* 8, 19–32. doi: 10.1080/1364557032000119616

Bartlett, M. L., Taylor, H., and Nelson, J. D. (2016). Comparison of mental health characteristics and stress between baccalaureate nursing students and non-nursing students. *J. Nurs. Educ.* 55, 87–90. doi: 10.3928/01484834-20160114-05

Bernard, D. L., Lige, Q. M., Willis, H. A., Sosoo, E. E., and Neblett, E. W. (2017). Impostor phenomenon and mental health: the influence of racial discrimination and gender. *J. Counsel. Psychol.* 64:155. doi: 10.1037/cou0000197

Brauer, K., and Proyer, R. T. (2017). Are Impostors playful? testing the association of adult playfulness with the impostor phenomenon. *Pers. Individ. Diff.* 116, 57–62.

Brauer, K., and Proyer, R. T. (2019). The ridiculed Impostor: testing the associations between dispositions toward ridicule and being laughed at and the Impostor Phenomenon. *Curr. Psychol.* 1, 1–10. doi: 10.1007/s12144-019-00262-5

Christensen, M., Aubeeluck, A., Fergusson, D., Craft, J., Knight, J., Wirihana, L., et al. (2016). Do student nurses experience Imposter Phenomenon? An international comparison of Final Year Undergraduate Nursing Students readiness for registration. *J. Adv. Nurs.* 72, 2784–2793. doi: 10.1111/jan.13034

Clance, P. R., and Imes, S. A. (1978). The imposter phenomenon in high achieving women: dynamics and therapeutic intervention. *Psychotherapy* 15, 241–247. doi: 10.1037/h0086006

Ellerie, S. C. (1997). *The Impostor Phenomenon: A Study of its Incidence in Registered Nurse First Assistants.* Boca Raton, FL: Florida Atlantic University.

Engberg, L. B. (1996). *The Impostor Phenomenon Among Nurse Practitioners, Physician Assistants, and Family Practice Physicians.* Spokane, WA: Gonzaga University.

Even, M. M. (1999). *The Impostor Phenomenon: A Descriptive Study of its Incidence Among Registered Nurse Preceptors.* Lubbock, TX: Texas Tech University.

Freeman, J., and Peisah, C. (2021). Imposter syndrome in doctors beyond training: a narrative review. *Australas. Psychiatry* 10398562211036121. doi: 10.1177/10398562211036121

Gill, P. (2020). Imposter syndrome–why is it so common among nurse researchers and is it really a problem. *Nurse Res.* 28, 30–36. doi: 10.7748/nr.2020.e1750

Gómez-Morales, A. (2021). Impostor phenomenon: a concept analysis. *Nurs. Sci. Q.* 34, 309–315. doi: 10.1177/08943184211010462

Gottlieb, M., Chung, A., Battaglioli, N., Sebok-Syer, S. S., and Kalantari, A. (2020). Impostor syndrome among physicians and physicians in training: a scoping review. *Med. Educ.* 54, 116–124. doi: 10.1111/medu.13956

Haney, T. S., Birkholz, L., and Rutledge, C. (2018). A workshop for addressing the impact of the impostor syndrome on clinical nurse specialists. *Clin. Nurse Spec.* 32, 189–194. doi: 10.1097/NUR.0000000000000386

Henning, K., Ey, S., and Shaw, D. (1998). Perfectionism, the imposter phenomenon and psychological adjustment in medical, dental, nursing and pharmacy students. *Med. Educ.* 32, 456–464. doi: 10.1046/j.1365-2923.1998.00234.x

Hollingsworth, M. B. (1995). *The Impostor Phenomenon and Enterostomal Therapy Nurses: Profiles and Training Implications.* Albuquerque, NM: The University of New Mexico.

Klein, G. J. M. (2000). *The Relationships Among Anxiety, Self-Concept, The Impostor Phenomenon, and Generic Senior Baccalaureate Nursing Students' Perceptions of Clinical Competency.* Chester, PA: Widener University School of Nursing.

Levac, D., Colquhoun, H., and O'Brien, K. K. (2010). Scoping studies: advancing the methodology. *Implement. Sci.* 5, 1–9. doi: 10.1186/17x48-5908-5-69

Mak, K. K., Kleitman, S., and Abbott, M. J. (2019). Impostor phenomenon measurement scales: a systematic review. *Front. Psychol.* 10:671. doi: 10.3389/fpsyg.2019.00671

Mark, G., and Smith, A. P. (2012). Occupational stress, job characteristics, coping, and the mental health of nurses. *Br. J. Health Psychol.* 17, 505–521. doi: 10.1111/j.2044-8287.2011.02051.x

McGregor, L. N., Gee, D. E., and Posey, K. E. (2008). I feel like a fraud and it depresses me: the relation between the imposter phenomenon and depression. *Soc. Behav. Pers. Int. J.* 36, 43–48. doi: 10.2224/sbp.2008.36.1.43

Mitchell, F. A. (2005). *A Study to Determine the Incidence and Relationship of Demographic Variables and Self–Esteem to the Impostor Phenomenon Among Nurse Educators.* Unpublished Ph.D. Hattiesburg, MS: The University of Southern Mississippi.

Neureiter, M., and Traut-Mattausch, E. (2016). An inner barrier to career development: preconditions of the impostor phenomenon and consequences for career development. *Front. Psychol.* 7:48. doi: 10.3389/fpsyg.2016.00048

Rohrmann, S., Bechtoldt, M. N., and Leonhardt, M. (2016). Validation of the impostor phenomenon among managers. *Front. Psychol.* 7:821. doi: 10.3389/fpsyg.2016.00821

Smith-Clark, J. J. (1988). *The Impostor Phenomenon: A Study of the Construct in Registered Nurses.* Los Angeles, CA: California School of Professional Psychology.

Studdard, S. S. (2002). Adult women students in the academy: impostors or members? *J. Contin. High. Educ.* 50, 24–37. doi: 10.1080/07377366.2002. 10401202

Tung, Y. J., Lo, K. K., Ho, R. C., and Tam, W. S. W. (2018). Prevalence of depression among nursing students: a systematic review and meta-analysis. *Nurse Educ. Today* 63, 119–129. doi: 10.1016/j.nedt.2018. 01.009

Vance, S. K. (2002). *Incidence of the Imposter Phenomenon Among Nurse Practitioner Students*. Spokane, WA: Gonzaga University.

Villwock, J. A., Sobin, L. B., Koester, L. A., and Harris, T. M. (2016). Impostor syndrome and burnout among American medical students: a pilot study. *Int. J. Med. Educ.* 7:364. doi: 10.5116/ijme.5801.eac4

Wang, A. H., Lee, C. T., and Espin, S. (2019). Undergraduate nursing students' experiences of anxiety-producing situations in clinical practicums: a descriptive survey study. *Nurse Educ. Today* 76, 103–108. doi: 10.1016/j.nedt.2019. 01.016

APPENDIX 1: RETRIEVAL STRATEGY

Search	Query
#1	"imposter syndrome" [Supplementary Concept]
#2	(((("imposter syndrome"[Title/Abstract]) OR ("impostor phenomenon"[Title/Abstract])) OR ("imposter phenomenon"[Title/Abstract])) OR ("impostorism"[Title/Abstract])) OR ("imposterism"[Title/Abstract])
#3	#1 OR #2
#4	("Nurses"[Mesh])
#5	(("Nursing Personnel"[Title/Abstract]) OR ("Registered Nurses"[Title/Abstract])) OR ("Registered Nurse*" [Title/Abstract])
#6	#4 OR #5
#7	#3 AND #6 Filters: from 1000/1/1 to 2021/3/17

Frontline Mongolian Healthcare Professionals and Adverse Mental Health Conditions During the Peak of COVID-19 Pandemic

Basbish Tsogbadrakh[1], Enkhjargal Yanjmaa[1], Oyungoo Badamdorj[1]*,
Dorjderem Choijiljav[1], Enkhjargal Gendenjamts[2], Oyun-erdene Ayush[3], Odonjil Pojin[1],
Battogtokh Davaakhuu[1], Tuya Sukhbat[1], Baigalmaa Dovdon[1], Oyunsuren Davaasuren[4]
and Azadeh Stark[5,6,7]

[1] School of Nursing, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia, [2] Inova Fairfax Hospital, Falls Church, VA, United States, [3] General Hospital Darkhan-Uul, Darkhan, Mongolia, [4] School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia, [5] Henry Ford Health System, Detroit, MI, United States, [6] School of Interdisciplinary Studies, The University of Texas at Dallas, Richardson, TX, United States, [7] Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand

Background: The relatively young and inexperienced healthcare professionals in Mongolia faced with an unprecedent service demand in response to the COVID-19 pandemic. Due to the small size of the healthcare workforce the Mongolian Health Ministry had no choice but to mandate continuous and long workhours from the healthcare workforce. Many of the healthcare professionals exhibited signs and symptoms of mental health disorders. This study aimed to discern the prevalence various mental health concerns, i.e., depression, anxiety and stress, insomnia, and to discern the factors that increased susceptibility to mental health disorders among frontline healthcare professionals providing healthcare services for COVID-19 patients in Mongolia.

Methods: A Cross-sectional research design was implemented. We collected data from 965 healthcare professional, randomly selected from 18 government hospitals, in four regions of Mongolia. Data were collected using the Depression Anxiety Stress-21, the General Self-Efficacy Scale, and the Insomnia Severity Index instruments. We constructed the scale of Pandemic Response Symptoms (PaReSy) which captured stress, depression, and anxiety. Data were analyzed using descriptive statistics, Kruskal–Wallis statistical test and multinominal logistic regression analysis.

Results: Prevalence of depression (52.3%, CI 95%: 49.1–55.5%), anxiety (70.2%, CI 95%: 67.2–73.0%), and stress (35.8%, CI 95%: 32.7–38.9%) was documented among Mongolian healthcare professionals. Perception of self-efficacy reduced susceptibility to PaReSy either at mild/moderate (OR = 0.948, 95% CI = 0.911–0.988, $P = 0.011$) or severe/extremely severe level (OR = 0.911, 95% CI = 0.861–0.963, $P = 0.001$). Within each stratum of insomnia, the risk of experiencing PaReSy increased almost linearly both in the category of mild/moderate PaReSy and in the category of severe/extremely severe PaReSy.

Conclusion: Improving self-efficacy and sleeping quality can assist healthcare workers to manage depression, anxiety, and stress. Findings provide important evidence to implement measures and strategies to assist healthcare professionals in low- and middle-income countries to constructively address their mental health concerns and needs.

INTRODUCTION

The pandemic of 2020–2021 has put an unprecedented burden on the healthcare workforce and healthcare infrastructure across the globe, but particularly in low- and middle-income countries (Hopman et al., 2020). This unprecedented burden, although multifactorial, partially can be attributed to the austerity measures that were implemented in response to the global economic crisis of 2008 (Gené-Badia et al., 2012; Reeves et al., 2014). Governments and private sectors imposed financial austerities and health policies and procedures to reduce the cost while improving the cost-effectiveness of delivery of healthcare services (Buchan et al., 2013). These changes put more emphasis and demand on the role and responsibilities of the healthcare force, which propagated the epidemic of burnout among the healthcare professionals and therefore exodus of many from the field (Mattei et al., 2017). Concerns about the shortage of healthcare professionals, across the spectrum of expertise, in 21st century were addressed extensively before the 2020 pandemic (Lipstein and Kellermann, 2016; World Health Organization, 2021a). The gravity of COVID-19 pandemic on the healthcare sector was exacerbated because of the shortage of healthcare workforce. World Health Organization (2021b) has highlighted the excessive burden of COVID-19 on healthcare force and has called for urgent action to address the basic needs and measures necessary to ameliorate the impact of pandemic on physical and mental wellbeing of healthcare workforce.

Despite the decisive actions of the government of Mongolia, the country did not remain immune to the pandemic. The State Emergency Committee and the Ministry of Health reported the first verified COVID-19 case of community transmission on November 11/2020 (Situation Report for Covid-19, 2020). The precipitous increase in the incidence of COVID-19 was experienced after March 2021 (Covid-19 Situation Report for Mongolia #58, 2021). The impact of COVID-19 on Mongolian society has been severe due to the limited number of healthcare professionals; for example, a total of 13,112 nursing professionals constitutes the population of the nursing workforce throughout the country (Mongolia Center for Health Development, 2019). Meanwhile, the current pandemic has had multiple mental and psychological side effects, i.e., depression, anxiety, or stress on the Mongolian healthcare professionals. Our professional

concerns and ethical obligations required us to systematically and scientifically assess and document prevalence of various mental and psychological side effects of the COVID-19 pandemic among Mongolian healthcare professionals. This study aimed to discern the mental health of Mongolian frontline healthcare workers during the peak of COVID-19 pandemic.

MATERIALS AND METHODS

Setting

Mongolia, a country of 3.3 million population, is bordered by China and Russia. The country, which is largely a plateau, with the average elevation of 5,180 feet above sea level, enjoys continental climate. About half of the population of Mongolia (1.6 million, or 48%) reside in Ulaanbaatar, the capital of Mongolia. The city which sits in the Tuul River valley (surrounded by Khangai and Khentii mountain regions) is vulnerable to the meteorological phenomenon of thermal inversion, particularly during the cold season. Ulaanbaatar is susceptible to various respiratory diseases, due to its high population density, air pollution that is caused by fumes of car exhaust systems and coal burning heating devices and the repeated thermal inversions (Chimeddorj et al., 2021). The first case of COVID-19 in Mongolia was documented in November 11/2020 in the city of Ulaanbaatar; by March 2021, the entire country was impacted, despite the four mandated lock downs and facial mask requirements (Covid-19 Situation Report for Mongolia #62, 2021).

In Mongolia the healthcare policy of eight beds per 1,000 population were stipulated, based on data from healthcare services utilization and econometric analysis, to address the hospital-base healthcare needs of the Mongolian population. However, during the peak of COVID-19 pandemic, in the capital city the bed occupancy rate in the intensive care units reached to 96.1% and the overall hospital bed occupancy was at 98.9% (Covid-19 Situation Report for Mongolia #58, 2021). In response, the Emergency Commissions of the State and the Capital City assigned the Ulaanbaatar Health Department to open additional hospital beds for emergency use. The Health Department along with district hospitals responded by supplying additional 1,200 beds and the necessary medical equipment, i.e., ventilating machines, oxygen supplies, to address the pandemic. In collaboration with UNICEF Mongolia, Ministry of Health (MoH) and Mongolian Red Cross Society (MRCS) distributed disinfectants, hygiene supplies and PPEs to 1,410 frontline workers, positioned at border controls and high-risk areas

---

Abbreviations: DASS, Depression Anxiety Stress Scale; GSES, General Self-Efficacy Scale; ISI, Insomnia Severity Scale; UK, United Kingdom; HCW, Healthcare workers; WHO, World Health Organization; PaReSy, Pandemic Response Symptoms; PPE, Personal Protective Equipment; UNICEF, United Nations International Children's Emergency Fund; MoH, Ministry of Health; MRCS, Mongolian Red Cross Society; UNPF, United Nations Population Fund.

(Covid-19 Situation update, Mongolia Update#12, 2021). On 28 October, 2020, additional PPEs were procured through the Luxembourg Cooperation Grant and were delivered to the community hospitals throughout Mongolia (Situation Report #4, 2020 on COVID-19 response). Despite the efforts of the Mongolian government and the support of the international community, the demand on for healthcare services far exceeded the supplies and the personnel; the frontline workers, were experiencing longer working hours, more than usual workload and, without any doubt, they were concerned about their own and their family members health and wellbeing; all of these created the optimal milieu for mental duress and psychological stress.

Study Design

This was a descriptive cross-sectional study to investigate the prevalence various mental health concerns, i.e., depression, anxiety and stress, insomnia, and to discern the factors that increased susceptibility to mental health disorders among frontline healthcare professionals providing healthcare services at different hospitals designated for COVID-19 patients in Mongolia.

Population and Sample

The total number of 7,080 healthcare professionals working on the frontline to combat COVID-19 pandemic in Mongolia was used to estimate the sample size for our study (Mongolia Center for Health Development, 2021). We applied the Hsieh sample size formula for logistic regression (Hsieh, 1989) to calculate the sample size of our study; our calculation yielded a sample size of 1,085 (inflated 20% for non-responders) healthcare professionals [$\alpha = 0.05$, odds ratio (OR) = 1.3, power of the test (1-β) = 0.80] who were recruited from 18 hospitals, owned, and operated by the government of Mongolia. We applied proportional stratified random sampling technique to adjust for the size of healthcare professionals in each hospital (Burns and Grove, 2010; **Table 1** and **Figure 1**).

Eligibility Criteria

Healthcare professionals were eligible to participate in our study if: (1) They were frontline healthcare workers during the peak of COVID-19 pandemic; (2) They were actively employed by the government hospital system; (3) They were willing to participate in our study. We excluded healthcare professionals who had participated in the pre-testing stage of our study; we imposed this restriction to reduce the likelihood of information bias.

Research Instrument

The first section of our instrument was designed to capture demographic data, i.e., age, gender, level of education, occupation, and years of experience in the healthcare sector. The General Self-Efficacy Scale (GSES) constituted the second section (Schwarzer and Jerusalem, 1995). In this section, our focus was to measure the confidence and self-efficacy of the study participants in coping with the challenges and stresses of delivery of healthcare services. The scale consisted of 10 items and each item was placed on a 1–4 Likert scale, ranging from

1 (strongly disagree) to 4 (strongly agree). The total score for this section could range from 10 to 40, with a higher score indicating a greater confidence and self-efficacy. We stratified the final scores into three categories: (1) Low (scores between 10 and 20); (2) Moderate (scores between 21 and 30); and (3) High (scores between 31 and 40). The Cronbach's alpha coefficient of internal consistency for reliability at pre- and post-testing was calculated at 0.87.

The third section of our research instrument was designed to assess insomnia. This section was architected based on the 1993 Insomnia Severity Index (ISI) instrument (Morin, 1993). This section comprised of seven items. The Likert scale for each item ranged from the value of 0 (none/not at all interfering) to the value of 4 (very severe or very much interfering). We stratified the final scores for this section into four categories: (1) No clinically significant insomnia (scores between 0 and 7); (2) Sub-threshold insomnia (scores between 8 and 14); (3) Clinical insomnia at moderate severity (scores between 15 and 21) and finally (4) Clinical insomnia at severe level (scores 22–28). The Cronbach's alpha coefficient of internal consistency reliability for pre-testing was 0.89, while this value was 0.90 for post-testing. Finally, the fourth section of our research instrument was designed to assess depression, anxiety, and stress of the study participants. We adopted the Depression Anxiety Stress (DASS) instrument (Lovibond and Lovibond, 1995). This section contained 21 items; each item was given a range of 0–3 on the Likert scale, with the value 0 indicated "not all/never" while the value of 3 suggested "very must/most of the time." The final scores were classified into five categories according to the recommended cut-off scores for conventional severity labels (Lovibond and Lovibond, 1995; **Table 2**). The Cronbach's alpha coefficient of internal consistency for reliability at pre-testing was calculated at 0.96, while for post-testing, this value was 0.94. Questionnaires was translated into Khalkha dialect by one of the researchers with proficiency in English language and Khalkha dialect. The Khalkha translated version was evaluated by a mental healthcare professional for content validity and comprehensibility. Finally, two nursing professionals, independent of each other, one residing in the United States and the other in Mongolia, evaluated the final version of our research instrument for its content validity.

Data Collection

This study was approved by the Ethical Board of the Mongolian National University of Medical Sciences (#2021/3-05). We approached the director of each participating hospital and obtained his/her approval before implementing our study. The director at each hospital assigned a research assistant to our study. We used the Google forms (A link to access our research instrument is available upon request) to distribute the research instrument to the 1,085 healthcare professionals who had consented to participate in our study. At each hospital, one of the members of the research team and the designated research assistant assumed the responsibility for the distribution of the research instrument and collection of data. Study participants completed the research instruments at a time convenient to them and returned their anonymously completed instruments

TABLE 1 | Number of study participants stratified by participating hospital.

Province	Name of hospital	Population of healthcare professionals	Sample size
Ulaanbaatar city	Military Hospital	298	36
	General Hospital for Special Civil Servants	323	39
	First State Central Hospital	824	99
	Second State Central Hospital	564	68
	Third State Central Hospital	800	96
	National Center for Communicable Diseases	750	90
	National Center for Maternal and Child Health of Mongolia	800	96
	First Maternity Hospital	282	78
	Mongolian Japanese Teaching Hospital, MNUMS	362	53
	National Dermatology Center of Mongolia	79	11
	Songinokhairkhan District Health Center	324	60
	Hospital for Injury and Trauma	812	98
	Bayangol District Health Center	300	79
	Chingeltei District Health Center	300	36
	Khan Uul District Hospital	324	39
Regional hospitals	Khovd, Khuvsgul Aimag Regional Diagnostic and Treatment Center (Western Region Hospital)	722	124
	Darkhan, Orkhon Aimag Regional Diagnostic and Treatment Center (Central Region Hospital)	837	109
	Dornod Aimag Regional Diagnostic and Treatment Center (Eastern Region Hospital)	300	60

FIGURE 1 | Flow diagram of recruitment of study participants and distribution of the study survey instruments.
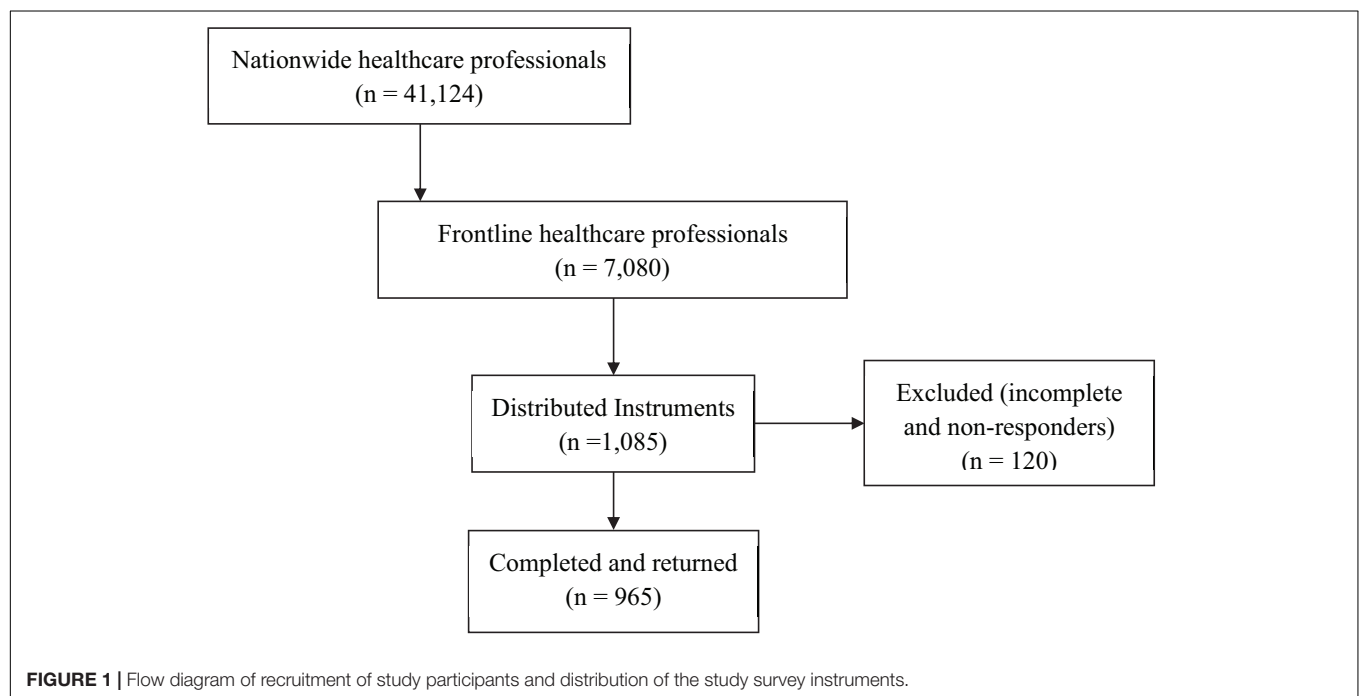
to the research assistant. Data were collected from April 1st through June 30, 2021.

Statistical Analysis

We used descriptive statistics to summarize the demographic characteristics of the study participants and the outcomes of ISI, GSES, and DASS assessments. Study participants were categorized by their professional title and differences in frequency distributions of the measured symptoms, perceived self-efficacy, depression, stress, and anxiety were assessed using the Kruskal–Wallis statistical test of significance. For variables that reached the level of statistical significance, we applied Dunn-Bonferroni *post hoc* method.

We then proceeded with applying the multinominal logistic regression statistical technique to determine the variables that best were associated with the risk of depression, anxiety, and stress during the peak response to the patient load. Due to the collinearity of the three responses (anxiety, stress, and depression), we developed the "Pandemic Response Symptoms (PaReSy)." Study participants, based on their reported responses,

TABLE 2 | Classification of depression anxiety stress scores according to the conventional cut-off points established by Lovibond and Lovibond (1995).

Levels of symptoms manifestation	Depression symptoms score	Anxiety symptoms score	Stress symptoms score
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely severe	28≤	20≤	34≤

TABLE 3 | Classification of study participants by their reported levels of depression, anxiety, and stress.

Pandemic response symptoms	Depression	Anxiety	Stress	DASS[1]
Normal	0–9	0–7	0–14	0–30
Mild/moderate	10–20	8–14	15–25	31–59
Severe/extremely severe	21≤	15≤	26≤	60≤

[1]DASS, Depression Anxiety Stress Scale.

were categorized into "Normal Response Symptoms" group or "Mild/Moderate Response Symptoms" or "Severe/Extremely Severe" groups (**Table 3**). In developing the best fitted model, we also dichotomized the level of self-efficacy by collapsing the low and moderate levels. This approach was justified because of the low number of persons in the stratum of low self-efficacy in every category of healthcare profession; similarly, we collapsed the two strata of moderate and severe insomnia into one category because of the low number of persons in the severe insomnia across the groups of healthcare professionals. Finally, the variable age was categorized in to three groups: 20–29, 30–39, and 40 and older. We proceeded with estimating the individual effect of each variable, gender, age, education, professional classification, years of work experience, having children, self-efficacy, and insomnia on PaReSy/outcome. Variables with a P-value < 0.10 from the univariate analyses were considered as candidate variables. Interaction between the two variables, insomnia, and self-efficacy, on the outcome also was tested at $P \leq 0.10$. The final model contained only variables that were significant at $P \leq 0.05$. All statistical tested were two-sided and analysis were performed using SPSS Statistics 21.0 software.

RESULTS

Of the total of 1,085 research instruments that were distributed, 965 (88.9%) were completed and returned (**Figure 1**). Of these 965 completed instruments, 881 (91.3%) were completed and returned by female healthcare professionals. Most of the respondents (79.6%, $n = 671$) were between ages of 20 and 39 years (**Table 1**). About 64% ($n = 618$) of them had completed their baccalaureate academic training in medical sciences. Stratification of the study participants by their professions, categorize 51% ($n = 494$) as nursing professionals, 21.8% ($n = 210$)

as physicians; the remaining 27% ($n = 261$) were healthcare professionals with various technical expertise (**Table 4**).

The distribution of prevalence of anxiety, and perception of self-efficacy among different groups of healthcare providers reached the level of statistical significance (**Table 5**). Results from Dunn-Bonferroni *post hoc* statistical technique, suggested the level of anxiety ($\chi^2 = 75.008$, SE $\pm$ 22.895) was statistically significantly different between the nursing professionals and staff physicians, with the nursing professionals experiencing a higher level of anxiety ($P = 0.001$). While the level of anxiety among physicians in-training was statistically significantly higher than the nursing professionals ($\chi^2 = 89.187$, SE $\pm$ 30.225) ($P = 0.003$); finally, results of our statistical analysis suggested that the level of anxiety among radiologist technicians was higher compared with the physicians in-training ($\chi^2 = 130.143$ SE $\pm$ 65.328) ($P = 0.046$).

Differences in perception of self-efficacy also reached the level of statistical significance. Results from Dunn-Bonferroni *post hoc* statistical analysis suggested that physicians in training had lower self-efficacy perception compared to the nursing professionals ($\chi^2 = 97.815$, SE $\pm$ 29.761) ($P = 0.001$), or midwives ($\chi^2 = 101.104$, SE $\pm$ 45.002) ($P = 0.026$), or staff physicians ($\chi^2 = 93.720$, SE $\pm$ 33.026) ($P = 0.005$); however, perception of self-efficacy of physicians in-training was

TABLE 4 | Demographic characteristics of the healthcare workers ($n = 965$).

Demographic characteristics	Frequency	Percentage (%)
Gender		
Female	881	91.3
Male	84	8.7
Age in decades		
20–29	326	33.8
30–39	345	35.8
40–49	200	20.7
50–59	92	9.5
60–69	2	0.2
Education		
High school	270	28.0
4-year baccalaureate academic training	618	64.0
More than 4-year academic training	77	8.0
Professional classification		
Nursing	494	51.2
Attending staff physician	210	21.8
Physician in-training	102	10.5
Laboratory technician	57	5.9
Sterilization technician	58	6.0
Radiology technician	22	2.3
Midwives	22	2.3
Work experience (years)		
1–5	381	39.4
6–10	207	21.5
11–15	126	13.1
More than 15	251	26.0
Have children		
Yes	770	79.8
No	195	20.2

TABLE 5 | Distribution of insomnia, self-efficacy, depression, anxiety, and stress by profession.

Outcome	Nurses N (%)	Staff physician N (%)	Physician in training N (%)	Laboratory technician N (%)	Sterilization technicians N (%)	Radiology technicians N (%)	Midwives N (%)	P-value
Self-efficacy								$\chi^2 = 12.271$, $P = 0.015$
Low	4 (0.8)	5 (2.4)	2 (2.0)	1 (1.8)	–	–	2 (3.4)	
Moderate	397 (80.4)	162 (77.1)	83 (81.4)	44 (77.2)	17 (77.3)	16 (72.7)	41 (70.7)	
High	93 (18.8)	43 (20.5)	17 (16.7)	12 (21.1)	5 (22.7)	6 (27.3)	15 (25.9)	
Insomnia								$\chi^2 = 10.354$, $P = 0.053$
No insomnia	163 (33.0)	80 (38.1)	34 (33.3)	27 (47.4)	9 (40.9)	7 (31.8)	16 (27.6)	
Subthreshold	216 (43.8)	90 (42.9)	45 (44.1)	25 (43.9)	11 (50.0)	9 (40.9)	32 (55.2)	
Moderate insomnia	92 (18.6)	33 (15.7)	20 (19.6)	5 (8.8)	2 (9.1)	6 (27.3)	9 (15.5)	
Severe insomnia	23 (4.6)	7 (3.3)	3 (2.9)	–	–	–	1 (1.7)	
Depression								$\chi^2 = 5.071$, $P = 0.280$
Normal	227 (46.0)	112 (53.3)	41 (40.2)	29 (50.9)	11 (50.0)	12 (54.5)	28 (48.3)	
Mild	87 (17.5)	40 (19.0)	20 (19.6)	8 (14.0)	2 (9.1)	3 (13.6)	11 (19.0)	
Moderate	119 (24.1)	41 (19.5)	26 (25.5)	13 (22.8)	8 (36.4)	5 (22.7)	17 (29.3)	
Severe	31 (6.3)	10 (4.8)	7 (6.9)	3 (5.3)	1 (4.5)	1 (4.5)	1 (1.7)	
Extremely severe	30 (6.1)	7 (3.3)	8 (7.8)	4 (7.0)	–	1 (4.5)	1 (1.7)	
Anxiety								$\chi^2 = 16.064$, $P = 0.003$
Normal	127 (25.7)	77 (36.7)	36 (35.3)	19 (33.3)	7 (31.8)	5 (22.7)	17 (29.3)	
Mild	48 (9.7)	17 (8.1)	8 (7.8)	3 (5.3)	1 (4.5)	1 (4.5)	6 (10.3)	
Moderate	133 (26.9)	53 (25.2)	34 (33.3)	17 (29.8)	9 (40.9)	6 (27.3)	10 (17.2)	
Severe	71 (14.4)	33 (15.7)	9 (8.8)	7 (12.3)	1 (4.5)	3 (13.6)	13 (22.4)	
Extremely severe	115 (23.3)	30 (14.3)	15 (14.7)	11 (19.3)	4 (18.2)	7 (31.8)	12 (20.7)	
Stress								$\chi^2 = 4.446$, $P = 0.349$
Normal	311 (63.0)	144 (68.6)	58 (56.9)	37 (64.9)	18 (81.8)	14 (63.6)	38 (65.5)	
Mild	68 (13.8)	32 (15.2)	21 (20.6)	7 (12.3)	–	3 (13.6)	12 (20.7)	
Moderate	53 (10.7)	18 (8.6)	11 (10.8)	6 (10.5)	2 (9.1)	3 (13.6)	5 (8.6)	
Severe	46 (9.3)	11 (5.2)	9 (8.8)	5 (8.8)	2 (9.1)	2 (9.1)	2 (3.4)	
Extremely severe	16 (3.2)	5 (2.4)	3 (2.9)	2 (3.5)	–	–	1 (1.7)	

statistically significantly higher than the sterilization technicians ($\chi^2 = 146.454$, SE ± 64.326) ($P = 0.023$).

Results from the multinominal logistic regression yielded healthcare professionals in the age category of 40 or older were less likely (OR = 0.677, 95% CI = 0.461–0.993, $P = 0.046$) to experience mild/moderate level of PaReSy relative to the younger healthcare providers (**Table 6**). Although, we did not detect a statistically significant association between age group and severe/extremely severe PaReSy (**Table 6**). Quite interestingly, we did not detect any statistically significant association between gender, or education or family structure (having children or not) and the categories of PaReSy (**Table 6**). Results from the multinominal logistic regression analysis, yielded that staff physicians relative to the nursing professionals were less likely to experience mild/moderate level of PaReSy (OR = 0.702, 95% CI = 0.487–1.012, $P = 0.058$) or severe/extremely severe level of PaReSy (OR = 0.494, 95% CI = 0.288–0.847, $P = 0.010$). Perception of self-efficacy was protective against experiencing mild/moderate PaReSy (OR = 0.948, 95% CI = 0.911–0.988,

$P = 0.011$) or severe/extremely severe PaReSy (OR = 0.911, 95% CI = 0.861–0.963, $P = 0.001$).

Finally, we detected statistically significant association between insomnia and PaReSy (**Table 6**). Within each stratum of insomnia, the risk of experiencing PaReSy increased almost linearly both in the category of mild/moderate PaReSy and in the category of severe/extremely severe PaReSy, although the confidence interval was large in the category of PaReSy because of the relatively small numbers. Individuals who had reported sub-threshold levels of insomnia were almost four times more likely (OR = 4.07, 95% CI = 2.95–5.66, $P = 0.000$) to experience mild/moderate levels of PaReSy or severe/extremely severe PaReSy (OR = 19.23, 95% CI = 7.54–49.02, $P = 0.000$) relative to individuals who had reported on no insomnia. The risk of experiencing mild/moderate PaReSy increased to slightly more than 6-fold for individuals who had reported moderate insomnia (OR = 6.83, 95% CI = 4.20–11.09, $P = 0.000$), while for others moderate insomnia increased the risk of (OR = 93.27, 95% CI = 34.75–250.38, $P = 0.000$) PaReSy to the level of

TABLE 6 | Results of multinominal logistic regression.

	Mild/Moderate PaReSy[1] Referent: Normal PaReSy			Severe/Extremely PaReSy Referent: Normal PaReSy		
	OR[2]	95% CI[3]	P-value	OR	95% CI	P-value
Age						
30–40 vs. 20–29	1.157	0.812–1.647	0.419	0.986	0.576–1.688	0.959
41≤ vs. 20–29	0.677	0.461–0.993	0.046	1.069	0.618–1.850	0.810
Gender						
Male vs. female	1.338	0.808–2.215	0.258	1.072	0.498–2.309	0.859
Education						
Diploma vs. bachelor	1.140	0.808–1.609	0.455	1.401	0.860–2.283	0.176
Master≤ vs. bachelor	1.430	0.812–2.520	0.216	1.009	0.432–2.353	0.984
Profession						
Staff physicians vs. nurses	0.702	0.487–1.012	0.058	0.494	0.288–0.847	0.010
Laboratory tech vs. nurses	0.931	0.512–1.693	0.814	0.727	0.313–1.690	0.459
Physicians in training vs. nurses	0.919	0.513–1.645	0.776	0.515	0.204–1.303	0.161
Sterilization tech vs. nurses	1.128	0.702–1.813	0.618	0.753	0.383–1.481	0.411
Midwives vs. nurses	0.642	0.243–1.698	0.372	0.902	0.277–2.937	0.864
Radiology tech vs. nurses	1.090	0.432–2.752	0.855	0.777	0.204–2.960	0.711
Children						
Yes vs. No	1.247	0.876–1.774	0.221	1.171	0.722–1.900	0.521
Perceived self-efficacy						
Yes vs. No	0.948	911–0.988	0.011	0.911	0.861–0.963	0.001
Insomnia						
Sub-threshold vs. No	4.075	2.952–5.626	0.000	19.226	7.541–49.016	0.000
Moderate vs. No	6.826	4.201–11.093	0.000	93.273	34.747–250.379	0.000
Severe vs. No	5.560	1.663–18.590	0.005	265.649	65.836–1071.888	0.000

[1]PaReSy, Pandemic Response Symptoms; [2]OR, Odds ratio; [3]95% CI, 95% confidence interval.

severe/extremely severe; this risk was more than 200 fold (OR = 265.65, 95% CI = 65.84–1071.89, P = 0.000) for individuals who had experienced severe insomnia.

DISCUSSION

Immediately after the WHO declaration of global COVID-19 pandemic on March 11, 2020, the government of Mongolia implemented strict travel and other public health measures across the country. In consequence, the public health impact of COVID-19 pandemic in Mongolia was less than other countries such as the United States; yet the healthcare infrastructure and the healthcare workforce in Mongolia experienced unprecedented strains in the delivery of healthcare services while facing with shortage of personal protective equipment and effective clinical therapeutic interventions. During the peak of the pandemic, many of our colleagues and frontline healthcare providers were experiencing various signs and symptoms of depression and psychological duress. Our professional ethics obligated us to systematically assess, document and report on the mental health and well-being of the Mongolian healthcare professionals. Although the concern about mental health of healthcare professionals was global, the decline in mental health of healthcare professionals in countries with limited number of healthcare providers and infrastructures became a paramount concern (Barzilay et al., 2020; Teixeira et al., 2020; Barua et al., 2021).

We constructed the instrument of Pandemic Response Symptoms (PaReSy) which captured stress, depression, and anxiety. Our data suggested that age was a protective factor against experiencing PaReSy; we attribute this finding to the work and life experiences of older healthcare professionals which enabled them to better cope with the stress of responding to the pandemic demands. Results are consistent with previous studies which found junior healthcare workers (HCW) suffer more from work-related stress (Dosil et al., 2020; Margaretha et al., 2020; Vizheh et al., 2020; Danet, 2021; Lee et al., 2021).

Our findings suggest that the nursing professionals were more likely to experience PaReSy relative to the staff physicians. We attribute the susceptibility of nurses to PaReSy to their role and responsibilities in providing continuous healthcare services and having more frequent interactions and deeper communications with patients; furthermore, the Mongolian healthcare work force, especially the nursing workforce, is relatively young; many of them had never experienced a sudden and precipitous increase in the number of patients requiring intensive and critical care. Results of our analysis strongly suggest that low perception of self-efficacy increased susceptibility to PaReSy. Many of the younger nursing staff had coping difficulties with the loss of their patients; we believe that many of the nursing staff internalized losses of their patients and therefore had reported their self-efficacies as low in dealing with the demands of the pandemic. Studies have been revealing high prevalence rates of depression, anxiety, insomnia and loss of self-efficacy among

HCWs, treating infected patients (Vagni et al., 2020; Yıldırım and Özaslan, 2021). Conversely, better self-efficacy may play an important role in reducing anxiety and stress (Simonetti et al., 2021). Also, this study found that the prevalence of anxiety, sleep disorders and low levels of self-efficacy was consisted with Italian nurses providing care to patients with suspected or confirmed COVID-19.

Finally, our findings suggested that insomnia statistically significantly increased the susceptibility of the healthcare workforce to PaReSy. During the peak of the pandemic, many of the healthcare professionals, but particularly the nursing staff, were required to work beyond the international standard of 8-h per day. The size of Mongolian healthcare workforce is relatively small, the sudden increase in the demand for healthcare services offered no choice for the Mongolian Health Ministry but to mandate continuous and long workhours from the healthcare workforce, but particularly from the nursing professionals. The changes in workhours and separation from family members were compounded with the limited supplies of PPE, medications and/or the other needed medical technological interventions to treat patients. Additionally, healthcare providers in Mongolia, particularly those in the frontline, were concerned about their own wellbeing because of being at high risk of exposure to the COVID-19 virus. Findings from a meta-analysis of 46 studies, well documented that healthcare workers experienced anxiety and mental duress about their personal safety because of inadequate PPE, insufficient resources, and inconsistent information (Billings et al., 2021).

Our finding is consistent with previous studies which found that poor sleep quality was common during the pandemic and was associated with a 2–3 times the risk of reporting state anxiety, moderate depression, and stress. In addition, insomnia has been suggested to cause depression and/or anxiety disorders (Huang and Zhao, 2020; Zhang et al., 2020; Varma et al., 2021). Anxiety and sleep disorders have a great impact on the psychophysical health of nurses, affecting professional performance and patient safety (Simonetti et al., 2021). Moreover, our results are consistent with insomnia being a risk factor for the development of anxiety disorders (Barakat et al., 2016; Albasheer et al., 2020; Hsu and Chang, 2020; Barua et al., 2021).

Incidence of COVID-19, about 24 months after WHO declaration of COVID-19 pandemic has declined in Mongolia. This decline is attributed to the heroic work of the healthcare providers across the spectrum of professional expertise, the strict mandates enforced by the government of Mongolia, and the support of the Mongolian community by respecting and observing the public health restrictions. However, the uncertainties about the long-term impact of this pandemic on the healthcare workforce remain. For example, concerns have been raised about the older and therefore more experienced healthcare professional, particularly the nursing professionals, leaving the healthcare force. Mongolian government has taken decisive actions such as training more healthcare professionals to alleviate the long-term impact of the COVID-19 pandemic. Although, this is the right move, other measures must be addressed through legislations and implementation of public policies and to increase the size and experience of healthcare workforce in Mongolia.

Strengths and Limitations

The main strengths of our study were the inclusion of a spectrum of frontline healthcare workers and its relatively large sample size. Our study had two limitations. The cross-sectional design of our study did not permit us to adequately discern the reason for the observed various mental health conditions among the frontline healthcare providers. Additionally, we relied on self-reported data; the respondents in our study were not evaluated by professional mental healthcare providers, i.e., psychologists; therefore, it is likely that a fraction of the respondents could have been in the state of denial about their mental health conditions. However, the overarching objective of our study was to systematically and scientifically assess and document prevalence of various mental and psychological side effects of the COVID-19 pandemic among Mongolian healthcare professionals, which is the first step in developing constructive strategies in correcting a health concern and/or condition. Our study further shed the light on the impact of work conditions on mental health of healthcare professionals, particularly among low- and middle-income countries. Future longitudinal research should be implemented to clarify the changes in stressors on mental health and assessment of effective long-term coping strategies.

IMPLICATIONS

Poor mental health negatively impacts both the healthcare workforce and the organization. Policymakers, administrators, and healthcare professionals need to work in tandem in reaching consensus to promote healthcare professionals' psychological wellbeing.

CONCLUSION

Nursing professionals and less experienced healthcare providers were at a greater risk for various psychological duress during the peak of COVID-19 pandemic. Policies, and administrative measures should be encouraged and implemented to support strengthening of personal skills of healthcare professionals when facing with difficult and stress causing situation at workplace.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Board of the Mongolian National University of Medical Sciences (#2021/3-05). The

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

AUTHOR CONTRIBUTIONS

EY, BT, and DC translated the questionnaires. OB, OD, and EG evaluated the content validity and comprehensibility. EY, OB, DC, EG, O-eA, OP, BDa, TS, and BDo performed the data collections. BT, OB, and AS performed the data analysis and interpretation. BT, DC, and OB wrote the first draft of the manuscript. AS performed the review and editing. All authors have involved and contributed equally to the development of concepts, design, and definition of intellectual content, and discussed and approved the final version of the manuscript.

REFERENCES

Albasheer, O. B., Al Bahhawi, T., Ryani, M., Arishi, A. M., Hakami, O. M., Maashi, S. M., et al. (2020). Prevalence of insomnia and relationship with depression, anxiety and stress among Jazan University students: A cross-sectional study. *Cogent Psychol.* 7:1789424.

Barakat, D., Elwasify, M., Elwasify, M., and Radwan, D. (2016). Relation between insomnia and stress, anxiety, and depression among Egyptian medical students. *Middle East Curr. Psychiat.* 23, 119–127. doi: 10.1097/01.xme.0000484345.57567.a9

Barua, L., Zaman, M. S., Omi, F. R., and Faruque, M. (2021). Psychological burden of the COVID-19 pandemic and its associated factors among frontline doctors of Bangladesh: a cross-sectional study. *F1000Research* 9:1304. doi: 10.12688/f1000research.27189.3

Barzilay, R., Moore, T. M., Greenberg, D. M., DiDomenico, G. E., Brown, L. A., White, L. K., et al. (2020). Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for healthcare providers. *Translat. Psychiat.* 10, 1–8. doi: 10.1038/s41398-020-00982-4

Buchan, J., O'May, F., and Dussault, G. (2013). Nursing workforce policy and the economic crisis: a global overview. *J. Nurs. Scholars.* 45, 298–307. doi: 10.1111/jnu.12028

Burns, N., and Grove, S. K. (2010). *Understanding nursing research*: Building an evidence-based practice. Berlin: Elsevier Health Sciences.

Billings, J., Ching, B. C. F., Gkofa, V., Greene, T., and Bloomfield, M. (2021). Experiences of frontline healthcare workers and their views about support during COVID-19 and previous pandemics: A systematic review and qualitative meta-synthesis. *BMC Health Serv. Res.* 21:1–17. doi: 10.1186/s12913-021-06917-z

Chimeddorj, B., Byambatsogt, G., Ryenchindorj, E., et al. (2021). SARS-CoV-2 seroprevalence in Mongolia: Results from a national population survey. *Lancet Regional Health Western Pacific* 17:100317. doi: 10.1016/j.lanwpc.2021.100317

Covid-19 Situation update, Mongolia Update#12 (2021). *International Federation of Red Cross.* Available online at: https://go.ifrc.org/reports/14436 (accessed June 22, 2021).

Covid-19 Situation Report for Mongolia #58 (2021). *Ministry of Health, Mongolia. As of 13 June 2021.* Available online at: https://www.who.int/mongolia/internal-publications-detail/covid-19-situation-report-for-mongolia-58 (accessed June 13, 2021)

Covid-19 Situation Report for Mongolia #62 (2021). *Ministry of Health, Mongolia. 12 July 2021.* Available online at: https://www.who.int/mongolia/internal-publications-detail/covid-19-situation-report-for-mongolia-62 (accessed July 12, 2021)

Danet, A. D. (2021). Psychological impact of COVID-19 pandemic in Western frontline healthcare professionals. A systematic review. *Med. Clín.* 7, 449–458.

Dosil, M., Ozamiz-Etxebarria, N., Redondo, I., Picaza, M., and Jaureguizar, J. (2020). Psychological symptoms in health professionals in Spain after the first wave of the COVID-19 pandemic. *Front. Psychol.* 11:60612. doi: 10.3389/fpsyg.2020.606121

Gené-Badia, J., Gallo, P., Hernández-Quevedo, C., and García-Armesto, S. (2012). Spanish health care cuts: penny wise and pound foolish? *Health Policy* 106, 23–28. doi: 10.1016/j.healthpol.2012.02.001

Huang, Y., and Zhao, N. (2020). Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiat. Res.* 288:112954.

Hsieh, F. Y. (1989). Sample size tables for logistic regression. *Statist. Med.* 8, 795–802. doi: 10.1002/sim.4780080704

Hsu, Y. W., and Chang, C. P. (2020). Stress of life events and anxiety as mediators of the association between insomnia and triglycerides in college students. *J. Am. College Health* 2020, 1–7. doi: 10.1080/07448481.2020.1799805

Hopman, J., Allegranzi, B., and Mehtar, S. (2020). Managing COVID-19 in low-and middle-income countries. *JAMA* 323, 1549–1550. doi: 10.1001/jama.2020.4169

Lee, J., Lee, H. J., Hong, Y., Shin, Y. W., Chung, S., and Park, J. (2021). Risk perception, unhealthy behavior, and anxiety due to viral epidemic among healthcare workers: the relationships with depressive and insomnia symptoms during COVID-19. *Front. Psychiat.* 12:358. doi: 10.3389/fpsyt.2021.615387

Lipstein, S. H., and Kellermann, A. L. (2016). Workforce for 21st-century health and health care. *JAMA* 316, 1665–1666. doi: 10.1001/jama.2016.13715

Lovibond, P. F., and Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav. Res. Therapy* 33, 335–343. doi: 10.1016/0005-7967(94)00075-u

Margaretha, S. E. P. M., Effendy, C., Kusnanto, H., Hasinuddin, M., and Madura, S. N. H. (2020). Determinants psychological distress of Indonesian health care providers during covid-19 pandemic. *Profession* 116, 1–17.

Mattei, A., Fiasca, F., Mazzei, M., Abbossida, V., and Bianchini, V. (2017). Burnout among healthcare workers at L'Aquila: its prevalence and associated factors. *Psychol. Health Med.* 22, 1262–1270. doi: 10.1080/13548506.2017.1327667

Morin, C. M. (1993). *Insomnia: Psychological assessment and management.* New York, NY: Guilford press.

Mongolia Center for Health Development (2019). *Health Indicators 2019.* Available online at: http://hdc.gov.mn/media/uploads/2020-08/2019-eruul_mendin_uzuulelt_MU_mail.indd_2020_____7___21final.pdf (accessed May 21, 2020)

Mongolia Center for Health Development (2021). *Health Statistical Information.* Available online at: http://hdc.gov.mn/media/uploads/2021-10/2021-09_Sariin_medee.pdf (accessed May 21, 2021)

Reeves, A., McKee, M., Basu, S., and Stuckler, D. (2014). The political economy of austerity and healthcare: Cross-national analysis of expenditure changes in 27 European nations 1995–2011. *Health Policy* 115, 1–8. doi: 10.1016/j.healthpol.2013.11.008

Simonetti, V., Durante, A., Ambrosca, R., Arcadi, P., Graziano, G., Pucciarelli, G., et al. (2021). Anxiety, sleep disorders and self-efficacy among nurses during COVID-19 pandemic: A large cross-sectional study. *J. Clin. Nurs.* 30, 1360–1371. doi: 10.1111/jocn.15685

Situation Report for Covid-19 (2020). *Ministry of Health, Mongolia.* Available online at: https://mrc-ide.github.io/global-lmic-reports/MNG (accessed June 23, 2020).

Situation Report #4 (2020). *2020 on COVID-19 response, UNFPA MONGOLIA.* Available online at: https://www.unfpa.org/resources/covid-19-situation-report-no-4-unfpa-mongolia (accessed October 09, 2020)

Schwarzer, R., and Jerusalem, M. (1995). Generalized self-efficacy scale. Measures in health psychology: A user's portfolio. *Causal Control Beliefs* 1, 35–37. doi: 10.1097/PHM.0b013e318230fb68

Teixeira, C. F. D. S., Soares, C. M., Souza, E. A., Lisboa, E. S., Pinto, I. C. D. M., Andrade, L. R. D., et al. (2020). A saúde dos profissionais de saúde no enfrentamento da pandemia de Covid-19. *Ciência Saúde Coletiva* 25, 3465–3474.

Vagni, M., Maiorano, T., Giostra, V., and Pajardi, D. (2020). Coping with COVID-19: emergency stress, secondary trauma and self-efficacy in healthcare and emergency workers in Italy. *Front. Psychol.* 11:566912. doi: 10.3389/fpsyg.2020.566912

Varma, P., Burge, M., Meaklim, H., Junge, M., and Jackson, M. L. (2021). Poor Sleep Quality and Its Relationship with Individual Characteristics, Personal Experiences and Mental Health during the COVID-19 Pandemic. *Int. J. Environ. Res. Public Health* 18:6030. doi: 10.3390/ijerph1811 6030

Vizheh, M., Qorbani, M., Arzaghi, S. M., Muhidin, S., Javanmard, Z., and Esmaeili, M. (2020). The mental health of healthcare workers in the COVID-19 pandemic: A systematic review. *J. Diabet. Metab. Disord.* 19, 1967–1978.

World Health Organization (2021a). *Health Workforce*. Available online at: https://www.who.int/health-topics/health-workforce#tab=tab_1 (accessed April 21, 2021)

World Health Organization (2021b). *COVID-19 Strategic Preparedness and Response Plan. 2021 (SPRP 2021)*. Available online at: https://www.who.int/publications/i/item/WHO-WHE-2021.02 (accessed February 24, 2021)

Yıldırım, M., and Özaslan, A. (2021). Worry, severity, controllability, and preventive behaviours of COVID-19 and their associations with mental health of Turkish healthcare workers working at a pandemic hospital. *Int. J. Mental Health Addic.* 2021, 1–15. doi: 10.1007/s11469-021-00515-0

Zhang, W. R., Wang, K., Yin, L., Zhao, W. F., Xue, Q., Peng, M., et al. (2020). Mental health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. *Psychother. Psychosomat.* 89, 242–250. doi: 10.1159/000507639

Study of Mental Health Status of the Resident Physicians in China During the COVID-19 Pandemic

Shuang-Zhen Jia[1], Yu-Zhen Zhao[1], Jia-Qi Liu[1], Xu Guo[1], Mo-Xian Chen[2], Shao-Ming Zhou[1]* and Jian-Li Zhou[1]*

[1] Division of Gastroenterology, Shenzhen Children's Hospital, Shenzhen, China, [2] Co-Innovation Center for Sustainable Forestry in Southern China and Key Laboratory of National Forestry and Grassland Administration on Subtropical Forest Biodiversity Conservation, College of Biology and the Environment, Nanjing Forestry University, Nanjing, China

Objective: Investigating the mental health status of Chinese resident physicians during the 2019 new coronavirus outbreak.

Methods: A cluster sampling method was adopted to collect all China-wide resident physicians during the epidemic period as the research subjects. The Symptom Checklist-90 self-rating scale was used to assess mental health using WeChat electronic questionnaires.

Results: In total, 511 electronic questionnaires were recovered, all of which were valid. The negative psychological detection rate was 93.9% (480/511). Among the symptoms on the self-rating scale, more than half of the Chinese resident physicians had mild to moderate symptoms of mental unhealthiness, and a few had asymptomatic or severe unhealthy mental states. In particular, the detection rate of abnormality was 88.3% (451/511), obsessive-compulsive symptoms was 90.4% (462/511), the sensitive interpersonal relationship was 90.6% (463/511), depression abnormality was 90.8% (464)/511), anxiety abnormality was 88.3% (451/511), hostility abnormality was 85.3% (436/511), terror abnormality was 84.9% (434/511), paranoia abnormality was 86.9% (444/511), psychotic abnormalities was 89.0% (455/511), and abnormal sleeping and eating status was 90.8% (464/511). The scores of various psychological symptoms of pediatric resident physicians were significantly lower than those of non-pediatrics ($p < 0.05$).

Conclusion: The new coronavirus epidemic has a greater impact on the mental health of Chinese resident physicians.

INTRODUCTION

The novel coronavirus (2019-nCoV) infection broke out in China in November 2019 and quickly developed into a global pandemic (Zhou et al., 2020). As of July 26, 2020, more than 15 million cases of COVID-19 have been documented worldwide, with nearly 618,000 deaths (Atzrodt et al., 2020; Wu and McGoogan, 2020). This has become a public health emergency of international

concern and will surely affect everyone in the world. In the SARS outbreak 17 years ago, some researchers observed adverse psychological problems in medical staff (Chan and Huak, 2004; Chen et al., 2005; Phua, 2005; Lin et al., 2007; Wu et al., 2009).

The new coronavirus is highly contagious and can be transmitted through multiple channels, such as respiratory droplets, air, and direct contact. It has become a global epidemic in a short period of time (Rothan and Byrareddy, 2020; Wu and McGoogan, 2020). The human population is generally susceptible and lacks specific medicines to target this virus, thus resulting in a relatively high mortality rate (Tebala and Bond-Smith, 2020). In the early stages of the disease outbreak, people generally lacked awareness of the new coronavirus, and the implementation of prevention and control measures, such as lockdowns, definitely had a huge impact on the quality of life and physical and mental health of the human population (Wu and McGoogan, 2020).

In the past 20 years, there have been many global epidemics, including the severe acute respiratory syndrome (SARS) that was prevalent in China and Asian countries in 2003, the H1N1 influenza that broke out in 2009, the Middle East Respiratory Syndrome (MERS) that occurred in 2012, and the Ebola virus pandemic that occurred in Africa in 2014 (Peiris et al., 2003; Baden et al., 2009; Zumla et al., 2015; Leligdowicz et al., 2016). Each of these had different effects on different regions and different groups of people. Among them, medical personnel are the frontliners in the fight against these deadly viruses. During the SARS period, significant psychological changes were found in patients with SARS and high-risk medical staff, suggesting that they may have varying degrees of negative psychological states (Kisely et al., 2020). Young resident physicians who were directly involved in the diagnosis and treatment of patients with new coronavirus infections had mental health and psychological risks that deserve more attention. Therefore, the purpose of this study is to assess the mental health status of Chinese resident physicians using the Symptom Checklist-90 (SCL-90) self-rating scale and to understand the impact of the epidemic on the mental health of these residents.

MATERIALS AND METHODS

Material

From November 2019 to May 2020, the resident physicians who were undergoing residency training process in China, including 3 classes, namely, 2017, 2018, and 2019, were included as research subjects. These resident physicians worked in five major departments, including internal medicine, surgery, obstetrics and gynecology, pediatrics, and emergency/ICU. Resident physicians from the departments of psychology, oral cavity, ENT, ophthalmology, rehabilitation, etc., were not included in the research.

Methods Used in This Study

The survey, conducted in the form of an answer sheet, including the survey content, purpose, filling method, and requirements for reporting time, was sent out by WeChat or QR-code. Researchers conducted a comprehensive analysis

and evaluation of the submitted questionnaire later on. The questionnaire included general information about these resident physicians, such as gender, age, educational background, grade of training, departments, whether they were on duty during the epidemic, etc. The SCL-90 self-rating scale consisted of 90 items divided into 10 major factors, namely, somatization, obsessive-compulsive symptoms, horror, hostility, anxiety, depression, paranoia, interpersonal sensitivity, mental illness, and eating and sleeping habits. The total score was 450 points, and a score of over 160 indicated positive symptoms. Furthermore, each factor score (S) was divided into four levels, that is, $S \leq 1$ was regarded as asymptomatic, 2 points $\leq S < 3$ was regarded as mild symptoms, 3 points $\leq S < 4$ was considered moderate symptoms, and $S \geq 4$ was considered severe symptoms. This study was reviewed by the hospital ethics committee, and all research subjects provided informed consent.

Statistical Methods

Descriptive analysis was used for general information. All the measurement data passed the normal distribution test and the homogeneity of variance test. Data with the normal distribution and had homogeneous variance were analyzed by t-test or variance analysis and were labeled as X ± SD. The data that did not fit the normal distribution or were with uneven variance were subjected to the non-parametric test rank sum test. The results were described in quartiles Q1–Q3. Quantity data passed the Chi-square or Fisher test. Scores of psychological symptoms were compared using the Kruskal–Wallis test in all departments and the Mann–Whitney U-test between any two departments. A two-sided test at $\alpha = 0.05$, $p < 0.05$ indicated that the differences were statistically significant.

All statistical analyses were performed using SPSS 26.0 software and R 3.5.1 for Windows (R Foundation for Statistical Computing, Vienna, Austria) with the "ggplot2" and "ggpubr" packages.

RESULTS

Sample

A cluster sampling method was adopted to investigate a total of 511 resident physicians who were undergoing residency training in China during the epidemic. Among them, 297 were males and 214 were females, accounting for 58.1 and 41.9%, respectively. The enrolled resident physicians were 20–29 years old, with an average age of 23.9 ± 1.85 years old. In particular, a total of 197 (38.6%) of these resident physicians were from the class of 2017, 239 (46.8%) from the class of 2018, and 75 (14.7%) from the class of 2019. Furthermore, 239 (46.8%) held bachelor's degrees, and 255 (49.9%) and 17 (3.3%) were masters and doctors, respectively. A total of 287 (56.2%) and 224 (43.8%) people were on and off duty, respectively.

SCL-90 Scale Test Results and Severity Analysis on 511 Resident Physicians

Among 511 resident physicians, 480 (93.9%) had a total score above the normal range on the SCL-90 test. In particular,

the detection rate of somatization abnormalities was 88.3% (451/511), the detection rate of obsessive-compulsive symptoms was 90.4% (462/511), the detection rate of interpersonal sensitivity abnormalities is 90.6% (463/511), the detection rate of depression abnormalities was 90.8% (464/511), the detection rate of anxiety abnormality was 88.3% (451/511), the detection rate of hostile abnormality was 85.3% (436/511), the detection rate of terror abnormality was 84.9% (434/511), the abnormal detection rate of paranoia was 86.9% (444/511), the detection rate of psychotic abnormalities was 89.0% (455/511), and the detection rate of sleeping and eating abnormalities was 90.8% (464/511).

Further comparison of the degree of various symptoms and mild abnormalities accounts for the highest proportion among tested resident physicians. For example, somatization accounted for 47.4% (242/511), compulsion for 47.2% (241/511), interpersonal relationship for 42.9% (219/511), depression for 46.2% (236/511), anxiety for 46.6% (238/511), hostility for 35.4% (181/511), terror for 44.0% (225/511), paranoia for 44.6% (228/511), psychosis for 50.1% (256/511), and sleeping and eating for 46.0% (235/511). Among various symptoms, severe abnormalities accounted for the least proportion of tested doctors, with a range of 12.5–23.9% for every tested parameter, such as somatization for 17.2% (88/511), compulsion for 15.8% (81/511), interpersonal relationships for 12.9% (66/511), depression for 12.9% (66/511), anxiety for 12.5% (64/511), hostility for 23.9% (122/511), horror for 15.7% (80/511), paranoia for 12.9% (66/511), psychotic for 16.0% (82/511), and sleeping state for 13.9% (71/511).

Comparison of Psychological Evaluation Scores of the Resident Physicians in Different Specialties

Group comparisons suggested that the scores of 10 psychological symptoms of resident physicians in three departments, including internal medicine, surgery, and emergency/ICU, were significantly higher than those of pediatric resident physicians ($p < 0.05$). In contrast, there is no significant difference in the scores of these three departments themselves ($p > 0.05$). Furthermore, resident physicians from obstetrics and

gynecology presented higher scores on two parameters, such as somatization and compulsive psychological symptoms, than the scores of pediatric resident physicians ($p < 0.05$), whereas no differences were observed in the rest of the eight psychological symptoms evaluated in this study ($p > 0.05$). We found that resident physicians in the emergency or ICU departments have more serious psychological problems than resident physicians in pediatric departments, including abnormalities in somatization, depression, and eating and sleeping habits (**Table 1**).

Among the 511 resident physicians, 83 (16.2%) were pediatric resident physicians, and 428 (83.8%) were non-pediatric resident physicians (e.g., internal medicine, surgery, obstetrics and gynecology, and emergency/ICU). Through independent sample t-test analysis, it was shown that the scores of various psychological symptoms of doctors from the pediatric department were significantly lower than the scores of resident physicians with non-pediatric specialties ($p < 0.05$). The positive detection rate of residents is relatively high, which is mainly manifested as a mild psychological disorder (**Figure 1**). In particular, some resident physicians have moderate psychological problems and very few resident physicians have severe psychological conditions (**Figure 2**).

DISCUSSION

Up to February 11, 2020, a total of 72,314 COVID-19 cases have been reported in mainland China. Most of these patients were aged between 30 and 79 years old, accounting for 86.6% of the total reported cases (Chinese Center For Disease Control And Prevention, 2020). Relatively few reports of children and adolescents were documented. In recent years, with the continuous increase of public emergencies, the demand for high-quality emergency care is increasing. In fact, in our traditional society, people, as members of society, will have varying degrees of psychological impact due to the acceleration of their lives, changes in family conflicts, and pressure at work. In 2018, Yu et al. (2019) used a cluster sampling method in 12 cities in China and applied a large-scale SCL-90 test to survey Chinese people whose age ranged from 18 to 60 years. This study found

TABLE 1 | Scores of psychological symptoms among resident physicians in different specialties.

Items	Department					P
	Medical	**Surgical**	**Obstetrics and gynecology**	**Pediatrics**	**Emergency room/ICU**	
Somatization	2.87 ± 0.78	2.99 ± 0.81	2.98 ± 0.73	2.50 ± 1.15	3.02 ± 0.85	0.010
Compulsive symptom	2.93 ± 0.77	3.02 ± 0.83	2.98 ± 0.71	2.57 ± 1.06	3.07 ± 0.74	0.020
Interpersonal sensitivity	2.98 ± 0.74	3.04 ± 0.78	2.94 ± 0.75	2.58 ± 1.09	3.08 ± 0.68	0.035
Depression	3.00 ± 0.71	3.02 ± 0.80	2.96 ± 0.69	2.52 ± 1.05	3.05 ± 0.77	0.008
Anxiety	2.85 ± 0.72	2.96 ± 0.82	2.77 ± 0.82	2.45 ± 1.04	3.00 ± 0.75	0.004
Hostility	3.11 ± 0.90	3.05 ± 0.95	2.76 ± 0.84	2.59 ± 1.19	3.07 ± 1.01	0.006
Phobia	2.88 ± 0.80	2.96 ± 0.89	2.70 ± 0.85	2.44 ± 1.13	2.95 ± 0.90	0.001
Paranoid	2.88 ± 0.81	2.93 ± 0.83	2.73 ± 0.76	2.45 ± 1.10	3.04 ± 0.71	0.002
Psychotic symptom	2.93 ± 0.74	2.94 ± 0.82	2.81 ± 0.74	2.46 ± 1.10	3.01 ± 0.84	0.005
Sleeping and eating habits	2.89 ± 0.74	3.01 ± 0.80	2.83 ± 0.81	2.53 ± 1.12	3.13 ± 0.73	0.002

FIGURE 1 | Distribution characteristics of psychological symptoms among 511 resident physicians.

that young people may have higher risk of having psychological problems. Furthermore, a British survey also suggested that 31.6% of doctors felt excessive anxiety, 61.7% felt depression, and 46.7% had sleep disorders (Vincent et al., 2015). It shows that the psychological changes in medical staff fluctuate with negative stimulus factors, i.e., pain, anxiety, illness, and death, they face each day of their lives.

As a special group in clinical work, resident physicians have relatively little clinical experience and lack of emergency response. Thus, their psychological aspects need to withstand greater challenges. Current studies have shown that residents are prone to psychological problems. In addition, the incidence of depression or depressive symptoms among them is annually increasing from 20.9 to 43.2% (Al-Maddah et al., 2015; Mata et al., 2015). At the same time, they appear to be a high-risk group for suicide. This demonstrated that the new coronavirus pandemic has a greater psychological impact on young doctors. As clinical medical staff at the frontline, they initially had little understanding of the new coronavirus and, therefore, had insufficient psychological preparation and knowledge. Furthermore, they are exposed to medical sharps, blood, and body fluids of patients, increasing the risk of infection. Moreover, their work environment has changed due to the increase in workload and the need for prevention and control measures, which, along with the fear of infections for themselves and their family members, has greatly increased their risk for psychological problems. If these psychological problems are not immediately solved, they will not only endanger the physical and mental health of fellow doctors, but also cause medical errors and mistakes during clinical treatment (Zhang et al., 2019). Therefore, as an important stage in the transformation of qualified doctors, the mental health of young doctors should be carefully monitored. Long-term mental illness will lead to severe diseases in the neurological or endocrine systems (Deng et al., 2018). Therefore, resident physicians have become a high-risk group for mental illnesses. Hence, their psychological problems should receive extensive attention.

A psychological study of 330 resident physicians found that the overall burnout rate in China before COVID-19 was 71.4% (Huang et al., 2020). In our study, we had a higher percentage of psychological problems among resident physicians during the COVID-19 pandemic. Judging from the positive detection rate of psychological symptoms, psychological problems such as

hostility, interpersonal sensitivity, depression, and compulsion were major causes. In particular, the severe unhealthy mental state was mainly caused by two symptoms, namely, hostility and somatization. Hostility is manifested as boredom in daily life and an inability to control one's temper, whereas somatization is mainly manifested in physical discomfort from time to time, including discomforts in the cardiovascular, gastrointestinal, and respiratory systems, such as headaches, backaches, and muscle aches. Recent studies have shown that after an emergency breakout, approximately 70% of psychological trauma can be healed automatically, whereas the remaining 30% of these cases will later have a series of psychological and physical symptoms, including anxiety, depression, physical disorders, eating and sleep disorders, and alcohol or drug dependence (Yao, 2008). Therefore, it is beneficial for public health to pay special attention to the mental health of resident physicians. Building a good psychological support and intervention system and assisting these frontline medical staff to actively cope with pressure are conducive approaches, stimulating the enthusiasm of these young doctors (Xu et al., 2018).

There are high requirements in the comprehensive quality of medical staff in order to accommodate the characteristics of severe patient conditions, frequent emergencies, and heavy workload in emergency departments. Therefore, it not only requires strong medical technology to deal with critically ill patients, but also strong physical strength to cope with the heavy workload. At the same time, doctors in emergency departments require strong psychological abilities to deal with emergencies such as their own inability, the suffering and helplessness of patients, family sadness, and medical disputes. These matters will lead to the medical illness of doctors in emergency departments (Zhang et al., 2018). In this study, we found that resident physicians in emergency/ICU departments have more serious psychological problems than resident physicians in pediatric departments. These problems include abnormalities in somatization, depressi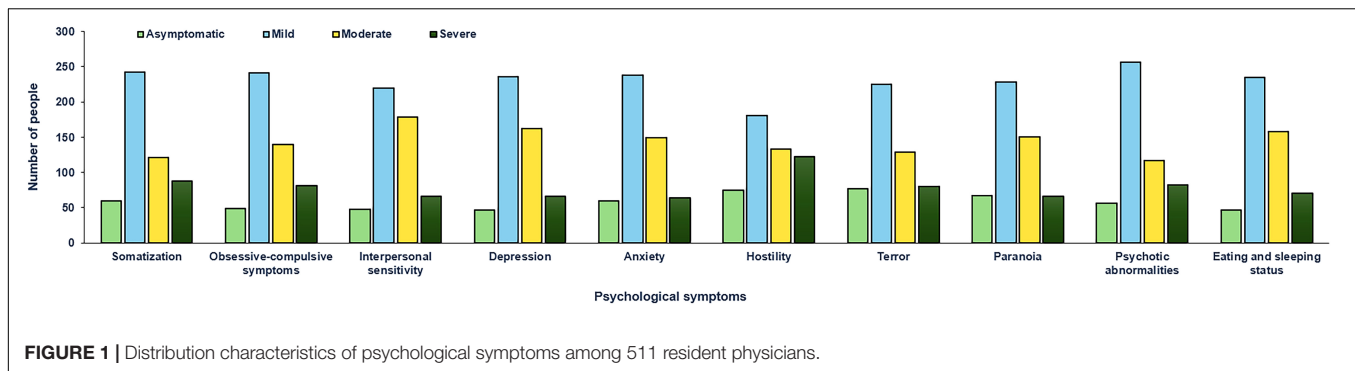on, and eating and sleeping habits, demonstrating that resident physicians in emergency/ICU departments are prone to psychological problems. Furthermore, it is common for resident physicians to experience frequent discomfort in their cardiovascular, gastrointestinal, and respiratory systems, along with headaches, backaches, muscle aches, and other symptoms in their daily lives. In addition, they are suffering from
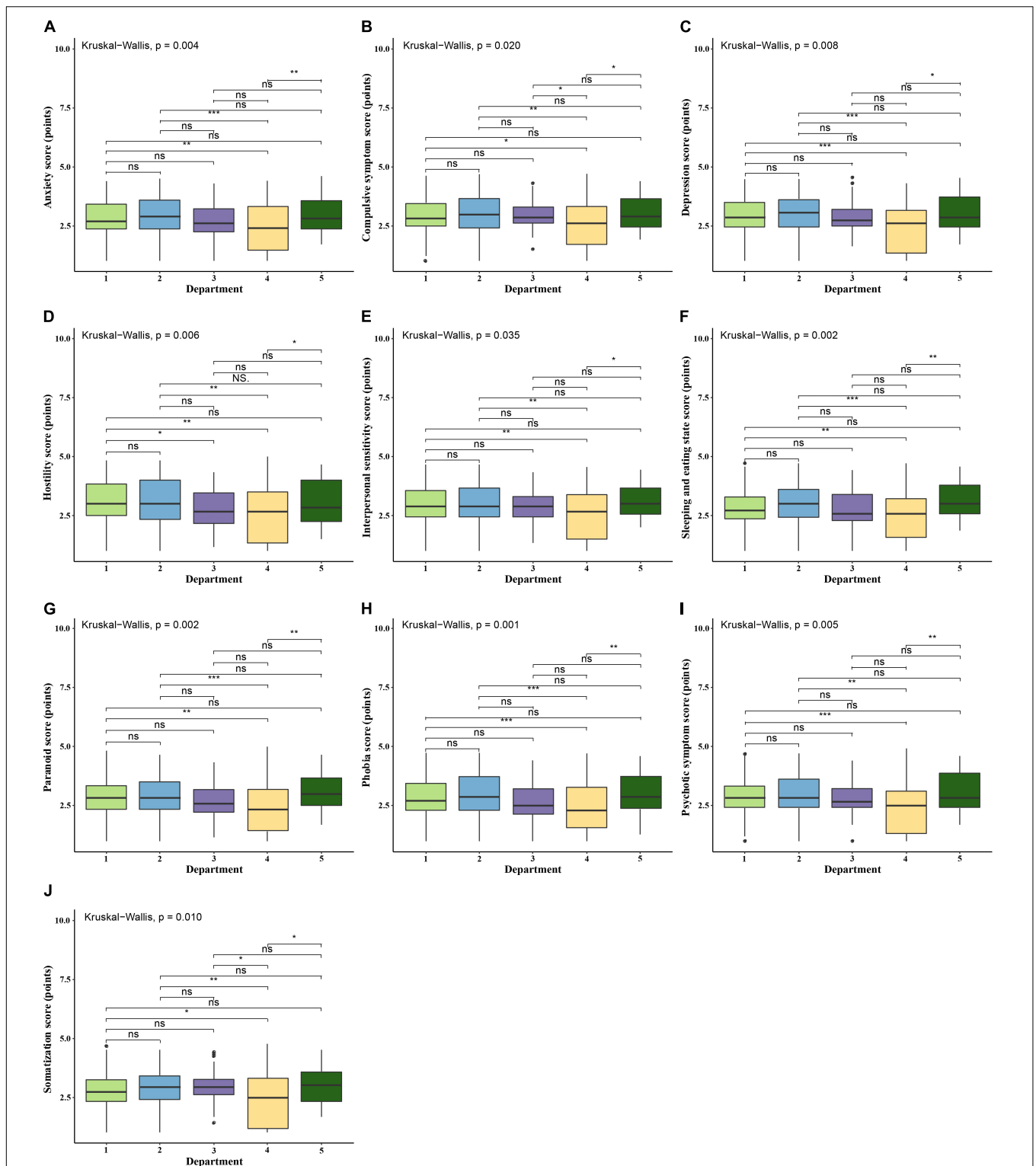
FIGURE 2 | Comparison of psychological evaluation scores of the resident physicians in different specialties. ns, not statistically significant. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$. 1, Medical department; 2, Surgical department; 3, Obstetrics and gynecology department; 4, Pediatrics department; 5, Emergency room/ICU. **(A)** Comparison of scores of "Anxiety" among resident physicians in different specialties. **(B)** Comparison of scores of "Compulsive symptom" among resident physicians in different specialties. **(C)** Comparison of scores of "Depression" among resident physicians in different specialties. **(D)** Comparison of scores of "Hostility" among resident physicians in different specialties. **(E)** Comparison of scores of "Interpersonal sensitivity" among resident physicians in different specialties. **(F)** Comparison of scores of "Sleeping and eating habits" among resident physicians in different specialties. **(G)** Comparison of scores of "Paranoid" among resident physicians in different specialties. **(H)** Comparison of scores of "Phobia" among resident physicians in different specialties. **(I)** Comparison of scores of "Psychotic symptom" among resident physicians in different specialties. **(J)** Comparison of scores of "Somatization" among resident physicians in different specialties.

disappointment, pessimism, and suicidal ideas due to a lack of motivation in their daily lives.

The emergency and ICU departments have become the first places for patients, making residents face a greater degree of high pressure. Therefore, it is very important to improve the psychological quality of emergency care and reduce the negative psychological impacts caused by patients' deaths, especially for resident physicians who have just entered emergency care. In the continuing education of modern medicine, the training institutions and teachers should focus on training the professional level of the young doctors, improving their communication skills and their ability to respond to emergencies. Furthermore, we should continuously improve the psychology of the emergency/ICU departments through regular psychological consultation for resident physicians, further strengthening their psychological endurance to negative impacts in order to achieve better performance in clinical work. In addition, the government needs to publicize efforts that have been made by hospitals and doctors to ease the doctor–patient relationship by ensuring that the public has a positive awareness of doctors, especially in emergency and ICU departments (Shen et al., 2017).

CONCLUSION

In conclusion, according to the survey results of this study, the mental health status of 511 resident physicians was lower than the national standard performance during the COVID-19 epidemic period. Factors such as whether these young doctors were on duty or not and various performances among different departments have suggested that we should carry out targeted psychological interventions in our daily work. In addition, particular attention needs to be paid to doctors in emergency and ICU departments who work during the epidemic. However, the shortcomings of this survey include our method of distribution of the questionnaires. We distributed electronic questionnaires using the internet, hence it is not yet possible to accurately verify the identity of the research subjects and the authenticity and representativeness of the content filled in them. Furthermore, the research sample size is not yet sufficient, and there is a lack of data tracking mechanisms, so it is temporarily impossible to assess whether the above psychological problems will exist for

a long time. In the future, it is urgent to carry out a study with a larger sample size and longer follow-up observations to better understand the impact of the COVID-19 epidemic on the mental health of Chinese resident physicians.

DATA AVAILABILITY STATEMENT

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

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

J-LZ and S-MZ designed the research. J-LZ, S-MZ, and S-ZJ conducted the research. S-ZJ analyzed the data, wrote the manuscript, and was primary responsibility for final content. J-LZ, S-MZ, M-XC, S-ZJ, Y-ZZ, J-QL, and XG critically read and revised the manuscript. All authors read and approved the final manuscript.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Al-Maddah, E. M., Al-Dabal, B. K., and Khalil, M. S. (2015). Prevalence of sleep deprivation and relation with depressive symptoms among medical residents in king fahd university hospital, Saudi Arabia. *Sultan Qaboos Univ. Med. J.* 15, e78–e84.

Atzrodt, C. L., Maknojia, I., McCarthy, R. D. P., Oldfield, T. M., Po, J., Ta, K. T. L., et al. (2020). A Guide to COVID-19: a global pandemic caused by the novel coronavirus SARS-CoV-2. *FEBS J.* 287, 3633–3650. doi: 10.1111/febs.15375

Baden, L. R., Drazen, J. M., Kritek, P. A., Curfman, G. D., Morrissey, S., and Campion, E. W. (2009). H1N1 influenza a disease–information for health professionals. *N. Engl. J. Med.* 360, 2666–2667. doi: 10.1056/NEJMe0903992

Chan, A. O., and Huak, C. Y. (2004). Psychological impact of the 2003 severe acute respiratory syndrome outbreak on health care workers in a medium

size regional general hospital in Singapore. *Occup. Med. (Lond.)* 54, 190–196. doi: 10.1093/occmed/kqh027

Chen, C. S., Wu, H. Y., Yang, P., and Yen, C. F. (2005). Psychological distress of nurses in Taiwan who worked during the outbreak of SARS. *Psychiatr. Serv.* 56, 76–79. doi: 10.1176/appi.ps.56.1.76

Chinese Center For Disease Control And Prevention (2020). Guidelines for COVID-19 epidemiological investigations. *China CDC Wkly.* 2, 327–328. doi: 10.46234/ccdcw2020.083

Deng, S., Yang, N., Li, S., Wang, W., Yan, H., and Li, H. (2018). Doctors' job satisfaction and its relationships with doctor-patient relationship and work-family conflict in china: a structural equation modeling. *Inquiry* 55:46958018790831. doi: 10.1177/0046958018790831

Huang, L., Caspari, J. H., Sun, X., Thai, J., Li, Y., Chen, F. Z., et al. (2020). Risk and protective factors for burnout among physicians from standardized residency

training programs in Shanghai: a cross-sectional study. *BMC Health Serv. Res.* 20:965. doi: 10.1186/s12913-020-05816-z

Kisely, S., Warren, N., McMahon, L., Dalais, C., Henry, I., and Siskind, D. (2020). Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: rapid review and meta-analysis. *BMJ* 369:m1642. doi: 10.1136/bmj.m1642

Leligdowicz, A., Fischer, W. A., Uyeki, T. M., Fletcher, T. E., Adhikari, N. K. J., Portella, G., et al. (2016). Ebola virus disease and critical illness. *Crit. Care* 20:217.

Lin, C. Y., Peng, Y. C., Wu, Y. H., Chang, J., Chan, C. H., and Yang, D. Y. (2007). The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emerg. Med. J.* 24, 12–17. doi: 10.1136/emj.2006.035089

Mata, D. A., Ramos, M. A., Bansal, N., Khan, R., Guille, C., Di Angelantonio, E., et al. (2015). Prevalence of depression and depressive symptoms among resident physicians: a systematic review and meta-analysis. *JAMA* 314, 2373–2383. doi: 10.1001/jama.2015.15845

Peiris, J. S. M., Yuen, K. Y., Osterhaus, A. D. M. E., and Stöhr, K. (2003). The severe acute respiratory syndrome. *N. Engl. J. Med.* 349, 2431–2441.

Phua, D. H. (2005). Coping responses of emergency physicians and nurses to the 2003 severe acute respiratory syndrome outbreak. *Acad. Emerg. Med.* 12, 322–328. doi: 10.1197/j.aem.2004.11.015

Rothan, H. A., and Byrareddy, S. N. (2020). The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J. Autoimmun.* 109:102433. doi: 10.1016/j.jaut.2020.102433

Shen, Y. F., He, Y. X., Jian, R., and Zhu, X. F. (2017). Mental health status and influencing factors of resident standardized trainees in a first class of the third grade hospital. *West Chinese Med. J.* 32, 112–116.

Tebala, G. D., and Bond-Smith, G. (2020). Guidelines and recommendations during the COVID-19 pandemic: a word of caution. *Am. J. Surg.* 220, 1526–1527. doi: 10.1016/j.amjsurg.2020.06.005

Vincent, C., Wearden, A., and French, D. P. (2015). Making health care safer: what is the contribution of health psychology? *Br. J. Health Psychol.* 20, 681–687. doi: 10.1111/bjhp.12166

Wu, P., Fang, Y., Guan, Z., Fan, B., Kong, J., Yao, Z., et al. (2009). The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. *Can. J. Psychiatry* 54, 302–311. doi: 10.1177/070674370905400504

Wu, Z., and McGoogan, J. M. (2020). Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19)

outbreak in china. *JAMA* 323, 1239–1242. doi: 10.1001/jama.2020.2648

Xu, Q., Chen, L., Liu, Z. H., and Song, X. Q. (2018). Investigation and analysis of adult educational student's mental health in medical university. *Chinese J. Health Psychol.* 16, 24–26.

Yao, Y. H. (2008). High-risk population of psychological crisis after earthquake disaster and its intervention. *Chinese J. Modern Prevent. Med.* 35, 2405–2406.

Yu, Y., Wan, C., Huebner, E. S., Zhao, X., Zeng, W., and Shang, L. (2019). Psychometric properties of the symptom check list 90 (SCL-90) for Chinese undergraduate students. *J. Ment. Health* 28, 213–219. doi: 10.1080/09638237.2018.1521939

Zhang, L., Wu, H., Du, M. H., and Wang, Z. Y. (2018). The current situation of mental health in standardized training residents and impact factors analysis. *Chinese J. Med. Educ.* 38, 694–698.

Zhang, X., Hu, W., Wu, Y., Wang, Z., and Chen, S. (2019). Surveys of mental health status of residents in different grades. *Chinese J. Grad. Med. Educ.* 3, 541–544.

Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., et al. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 395, 1054–1062.

Zumla, A., Hui, D. S., and Perlman, S. (2015). Middle east respiratory syndrome. *Lancet* 386, 995–1007.

Emotional State of Chinese Healthcare Workers During COVID-19 Pandemic

Minggang Jiang[1†], Xu Shao[2†], Shengyi Rao[1], Yu Ling[1], Zhilian Pi[1], Yongqiang Shao[1], Shuaixiang Zhao[1], Li Yang[1], Huiming Wang[3], Wei Chen[2]* and Jinsong Tang[2]*

[1] Department of Psychiatry, The Fourth People's Hospital of Jiande, Hangzhou, China, [2] Department of Psychiatry, Sir Run Run Shaw Hospital, Zhejiang University School of Medicine, Hangzhou, China, [3] Department of Public Health, Health Bureau of Jiande City, Hangzhou, China

Objective: Anti-epidemic work against coronavirus disease (COVID) has become routine work in China. Our study was intended to investigate the emotional and psychological state of healthcare workers and look for the association between sociodemographic factors/profession-related condition and emotional state.

Methods: A cross-sectional survey was conducted online among healthcare workers from various backgrounds. Symptoms of anxiety and depression were assessed by the Chinese versions of the seven-item Generalized Anxiety Disorder (GAD-7) and the nine-item Patient Health Questionnaire (PHQ-9), respectively. Supplementary questions (**Supplementary Material**) were recorded to describe the participants' information about workplace violence, profession, and attitude related to the COVID pandemic. Wherever suitable, independent t-test, and one-way ANOVA were performed to detect group differences of GAD-7 and PHQ-9 total scores after grouping by sociodemographic variables, respectively, such as age, gender, marital status, educational level, after-tax income, department category, job title, experience of workplace violence, and anti-epidemic participation. Multiple linear regression analyses (stepwise method) were utilized in order to look for the potential associated factors of GAD-7 and PHQ-9 total scores.

Results: A total of 2,139 questionnaires with valid response were completed. Approximately 86.44% of participants had minimal symptoms of anxiety, 11.08% mild, 1.59% moderate, and 0.89% severe. Meanwhile, 81.34% had minimal symptoms of depression, 14.07% mild, 2.90% moderate, 1.17% moderately severe, and 0.51% severe. Student's t-test showed that participants with female gender, with experience of workplace violence scored higher on both GAD-7 and PHQ-9, and participants with experience of anti-epidemic front-line work during pandemic scored lower on both GAD-7 and PHQ-9. ANOVA showed that participants aging from 31 to 40, with higher educational level, with middle level of annual after-tax income, with department of internal medicine or surgery, or with middle level of job title scored higher on both GAD-7 and PHQ-9. Regression analyses showed that female gender, high job title, and the experience of workplace violence positively were associated with anxiety or

depression. Doctoral education, department (other *vs.* psychiatry), job enthusiasm, and professional self-identity were negatively associated with anxiety or depression. Additionally, psychological support was negatively associated with depression.

Conclusion: As the epidemic prevention and control against COVID-19 become normalized in China, emotional state of healthcare workers deserves extensive attention. Our study revealed that gender, educational level, department category, job title, the experience of workplace violence, job enthusiasm, and professional self-identity are the most important influencing factors of physician's anxiety and depression. Self-tailored psychological intervention should be based on the predisposing factors above to mentally prepare healthcare workers for this long-lasting battle against COVID-19.

Keywords: mental health, healthcare workers, depression, COVID-19, anxiety

INTRODUCTION

Since the beginning of 2020, the outbreak of the coronavirus disease 2019 (COVID-19) pandemic has become a public health emergency that caused international concern (WHO, 2020). The COVID-19 has a high incidence, strong infectivity, and certain mortality, which seriously threatened the life and health of all mankind (Hui et al., 2020). As this epidemic is not likely to end any time soon, healthcare workers worldwide are undergoing a long-last battle against COVID-19. During the pandemic, the United Nations already highlighted that front-line healthcare workers had a considerable vulnerability to having mental health needs (United Nations, 2020). Compared to other populations, healthcare workers are at great risk of exposure to COVID-19, thus faced with a tremendous level of stress (Chen et al., 2020; Shanafelt et al., 2020). Also, healthcare workers have to witness patients dying alone and then notify this traumatic affair to families, which could result in excessive stress and burnout (Yin et al., 2020). Under this heavy psychological stress, a study reported that 28.6% of healthcare workers suffered from moderate to severe mental disturbances, with young women affected the most (Kang et al., 2020). The psychological burden and overall wellness of healthcare workers have received huge awareness, with research showing high rates of burnout, psychological stress, and suicide (Santarone et al., 2020). Therefore, the mental health status of healthcare workers is worthy of investigation during this global pandemic.

For fear of infection or death during the outbreak, healthcare workers may experience various acute psychological effects, such as symptoms of anxiety and depression (Bao et al., 2020). Epidemiological research in China has reported that approximately 11–50% of healthcare workers reported significant anxiety symptoms (Lai et al., 2020; Liu C. Y. et al., 2020; Liu Q. et al., 2020), and approximately 43–50% of Chinese healthcare workers reported significant depressive symptoms (Lai et al., 2020; Zhu et al., 2020).

And several studies have been performed to look for the predisposing factors of anxiety and depression among healthcare workers. Gender studies found that compared to male, women during the COVID-19 pandemic were more likely to experience anxiety (Islam et al., 2020, 2021) and depression

(Sudha et al., 2018; Banna et al., 2020; González-Sanguino et al., 2020; Islam et al., 2020, 2021). Healthcare workers aging from 31 to 40 had higher anxiety and depression than other age groups (Jagiasi et al., 2021). Being married was risk factor of anxiety, not depression (Liu et al., 2021). Healthcare workers in departments responsible for care of COVID-19 patients (i.e., department of emergency, intensive care unit, infections disease) had greater likelihood of developing anxiety and depression than other departments (Lai et al., 2020; Lu et al., 2020). Intermediate technical title was associated with severe anxiety and depression (Lai et al., 2020). Additional analyses revealed that healthcare workers with educational degree lower than doctor had significantly higher anxiety and depression than those with doctoral degree (Elliott et al., 2021). These results have suggested that the development of emotional issues among healthcare workers during this pandemic is related to multiple sociodemographic factors, such as gender, age, marital status, department, job title, and educational level.

The emotional state may also be influenced by many psychosocial factors characteristic of the Chinese medical environment. First, the workplace violence against healthcare workers has been a serious public problem in China (Ma et al., 2021), and how this kind of act changes during the pandemic is meaningful to find out. Second, Chinese primary healthcare workers are not satisfied with job welfare and income (Sang et al., 2022), often excessive devotion with mismatching reward. No study so far has investigated the association between workplace violence/salary satisfaction and emotional issues. Third, during the pandemic, Chinese public media has made wide propaganda for healthcare workers selflessly shouldering the responsibility of saving lives, but how this social media exposure influences healthcare workers' emotional states remains unknown. Previous studies showed that a lack of social or emotional support was associated with anxiety or depression (Jagiasi et al., 2021) and that social support for medical staff was negatively associated with anxiety and stress (Xiao et al., 2020). Considering this, media publicity may be a protective factor of emotional issues.

Besides the psychosocial factors above, vocational evaluation is also a crucial factor worthy of investigation. Based on the experience of previous epidemics, healthcare workers would expect recognition from the health authorities (Koh et al., 2005;

Khalid et al., 2016). According to a study during the outbreak in China, the most important factors which motivate the healthcare workers to continue working were social and moral responsibilities and professional obligation (Cai et al., 2020). Along with uncertainty and burden in the workplace, healthcare workers are at the risk for reduced perception of work accomplishment, negative attitude toward work, and disengagement from work (Demerouti et al., 2003; Malach-Pines, 2005; Albott et al., 2020). Healthcare workers may also suffer from stigmatization (Schubert et al., 2021), consequently reducing self-esteem and self-efficacy (Corrigan et al., 2006). These studies have shown a dramatic shift of vocational evaluation during this pandemic, such as job satisfaction and career identity, but how it contributes to healthcare workers' emotional states remains unknown, thus calling for further investigation.

This study was designed to fully capture the effect of different sociodemographic variables and vocational evaluation on emotional states of anxiety or depression under the environment of COVID-19 pandemic. We delivered an online survey among healthcare workers in Jiande City, Zhejiang Province, China, and recorded sociodemographic data and screening scores of the seven-item Generalized Anxiety Disorder Questionnaire (GAD-7) and the nine-item Patient Health Questionnaire (PHQ-9). Supplementary questions (**Supplementary Material**) were asked mainly about vocational evaluation, and other work-relation conditions were also recorded such as workplace violence, anti-epidemic participation, and psychological resource. We hypothesize that: (1) participants with female gender, from the department with a high risk of medical exposure or with a low educational level score higher on GAD-7 and PHQ-9; (2) negative vocational evaluation was associated with high scores of GAD-7 and PHQ-9.

MATERIALS AND METHODS

Participants

Healthcare workers from public hospitals in Jiande City, Zhejiang Province, China, took part in the current study. There are altogether 21 public hospitals in the whole city, such as municipal hospitals, community healthcare centers, and township health centers, with over 3,000 healthcare workers. Altogether, 2,190 participants answered the whole survey, and the response rate was over 70%. Data of 51 individuals were ruled out due to invalid responses. Among the remaining 2,139 participants, there were 584 men (27.30%) and 1,555 women (72.70%). The mean age of this population was 34.99 years $\pm$ 9.34 *SD*, with age ranging from 20 to 60 years. This study was conducted in accordance with the Declaration of Helsinki. The study protocol was approved by a local ethics committee (Ethics Committee of the Fourth People's Hospital of Jiande City, No. 2020002-05) and all participants gave their digital informed consent.

Questionnaire Measures and Procedure

This survey was designed to investigate the emotional and psychological states of healthcare workers during this COVID-19 pandemic. Questionnaires were delivered online from December

2020 to January 2021, and participants filled out the survey *via* electronic devices (e.g., mobile phone, laptop, etc.). The questionnaire link was disseminated *via* WeChat, the most commonly used instant messenger in China. Sociodemographic data were collected, namely age, gender, marital status, educational level, after-tax income, department category, job title, and working age. The screening tools of emotional issues and psychosocial questions were described as follows.

The Seven-Item Generalized Anxiety Disorder Questionnaire

The GAD-7 is a brief self-report measure detecting generalized anxiety disorder (GAD) based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association, 2000) symptom criteria. Each of the seven items asks individuals how often each symptom bothered them during the past 2 weeks. The total score ranges from 0 to 27, with response option on each item ranging from "not at all" (0 point) to "nearly every day" (three point). A score of 10 or greater on the GAD-7 represents a reasonable cut point for identifying cases of GAD. Cut points of 5, 10, and 15 are interpreted, respectively, as representing mild, moderate, and severe levels of anxiety on the GAD-7. This instrument was proved to have good internal and test-retest reliability, as well as convergent, construct, criterion, procedural, and factorial validity (Spitzer et al., 2006). The Chinese version of the GAD-7 was first introduced and validated among general hospital outpatients in 2010, and an optimal cutoff point of 10 was replicated (He et al., 2010). The internal reliability was 0.93 in the current study.

The Nine-Item Patient Health Questionnaire

The PHQ-9 is the nine-item depression module from the full Patient Health Questionnaire (PHQ) (Spitzer et al., 1999). The PHQ-9 is a structure-validated self-report questionnaire commonly utilized for identifying potential people with depression based on the DSM-IV symptom criteria for a major depressive episode (Kroenke et al., 2001). As a severity measure, the total score ranges from 0 to 27, with response option on each item ranging from "not at all" (zero point) to "nearly every day" (three point). A score of 10 or greater on the PHQ-9 represents a reasonable cut point for identifying cases of major depression. Cut points of 5, 10, 15, and 20 are interpreted, respectively, as representing mild, moderate, moderately severe, and severe levels of depression. The PHQ-9 has been validated across various Chinese populations showing stably satisfactory feasibility, reliability, and validity (Chen et al., 2010, 2013; Liu et al., 2011; Yu et al., 2012; Zhang et al., 2013). The internal reliability was 0.93 in the current study.

Psychosocial Questions Related to Vocation During COVID-19 Pandemic

As are listed in **Supplementary Material**, the first variable was named as the experience of workplace violence, with seven yes-or-no items asking individuals the experiences of workplace violence during the past 12 months. The total score ranges from 0 to 7, with a higher score indicating more experiences of violence. The second variable was named as salary satisfaction,

with one single-choice item asking individuals about their salary satisfaction. The third variable was named as anti-epidemic participation, with one yes-or-no item asking individuals whether they have participated in front-line work against COVID-19. The fourth variable was named as media publicity, with one five-point item asking how individuals feel about publicity for healthcare workers during the pandemic. The fifth variable was named as job enthusiasm, with eleven items with five-Likert point measuring individuals' job enthusiasm and motivation during the pandemic. The total score ranges from 11 to 55, with a higher score indicating greater willingness to devote oneself in medical and anti-epidemic activities. The sixth variable was named as professional self-identity, with thirteen items with seven-Likert point measuring to what extent healthcare workers embrace and accept their profession and lives built upon it. Total score ranges from 13 to 91, with a higher score indicating a greater sense of professional self-identity. The last variable was named psychological support, with one multiple-choice item counting how many kinds of mental health service healthcare workers had received from the work unit during the pandemic.

Statistical Methods

Continuous variables were summarized as mean ± SD, and categorical variables as number (percentage). Independent t-test was performed to detect group differences of GAD-7 and PHQ-9 total scores after grouping the study sample based on gender, anti-epidemic participation, along with violence experience (transformed into binary variable), respectively. One-way ANOVA was performed to detect group differences of GAD-7 and PHQ-9 total scores after grouping the study sample based on age (transformed into categorical variable), marital status, educational level, after-tax income, department category, and job title, respectively. Whenever a significant main effect was found, *post-hoc* multiple testing correction was conducted using Bonferroni adjustment to evaluate between-group differences. More importantly, multiple linear regression analyses (stepwise method) were utilized in order to look for the potential associated factors of GAD-7 and PHQ-9 total scores, with sociodemographic variables and variables derived by Supplementary questions (**Supplementary Material**) as independent factors. In regression, dummy variables were set for unordered polytomous variables such as marital status (*vs.* unmarried), educational level (*vs.* junior college), and department category (*vs.* psychiatry). All statistical analyses were carried out using SPSS, version 26 (SPSS Inc., Chicago, IL, USA). A p-value < 0.05 was considered significant for statistical tests.

RESULTS

Sociodemographic Features and Survey Scores of the Whole Sample

Among the 2,139 subjects who filled in the questionnaire, the distribution was not uniform. In our study sample, 70.59% aged from 31 to 40 years, 72.70% were female, 38.34% were unmarried, 67.84% earned bachelor degree, 65.73% had annual after-tax income of 60,000 to 120,000 yuan, 45.63% were from

other departments (e.g., ultrasound, radiology, rehabilitation, laboratory, and pharmacy), and 55.68% earned primary job title. On average, participants had over 13 years of working age. See **Table 1** for details.

Among all participants, mean score of GAD-7 was 1.57 ± 2.95, with 2.48% of participants screened positive (total score ≥ 10) for generalized anxiety disorder. Approximately 86.44% had minimal anxiety, 11.08% mild, 1.59% moderate, and 0.89% severe. Mean score of PHQ-9 was 2.19 ± 3.80, with 4.58% of participants screened positive (total score ≥ 10) for depressive disorder. 81.34% had minimal depression, 14.07% mild, 2.90% moderate, 1.17% moderately severe, and 0.51% severe. In terms of supplementary questions, 75.13% experienced workplace violence during the past year. Approximately 76.81%

TABLE 1 | Sociodemographic features of the study sample (N = 2,139).

Demographic variables	N (%)
Age (years)	
20–30	554 (25.90%)
31–40	1,510 (70.59%)
41–50	69 (3.23%)
51–60	6 (0.28%)
Gender	
Male	584 (27.30%)
Female	1,555 (72.70%)
Marital status	
Unmarried	820 (38.34%)
Married	708 (33.10%)
Divorced	445 (20.80%)
Widowed	166 (7.76%)
Educational level	
Junior college	511 (23.89%)
Bachelor	1451 (67.84%)
Master	87 (4.07%)
Doctor	2 (0.93%)
Others	88 (4.11%)
Annual after-tax income (Chinese yuan)	
≤60,000	336 (15.71%)
60,000–120,000	1406 (65.73%)
120,000–200,000	381 (17.81%)
≥200,000	16 (0.75%)
Department category	
Internal medicine	615 (28.75%)
Surgery	327 (15.29%)
Gynecology and Pediatrics	164 (7.67%)
Psychiatry	57 (2.66%)
Others	976 (45.63%)
Job title	
Primary title	1191 (55.68%)
Middle title	649 (30.34%)
Vice senior title	223 (10.43%)
Senior title	76 (3.55%)
Working age (years, M ± S.D.)	13.67 ± 9.52

N, number of participants; M, mean value; S.D., standard deviation.

felt that their professional value was half reflected by their salary. Approximately 75.32% once participated in anti-epidemic frontline work. Approximately 25.53% of participants felt very comfortable with publicity for healthcare workers concerning their nobility and dedication during the pandemic. Mean score of

TABLE 2 | Results of psychological measures of the study sample ($N = 2,139$).

GAD-7 total score	**1.57 ± 2.95**
Total < 10	2086 (97.52%)
Total ≥ 10	53 (2.48%)
Minimal	1849 (86.44%)
Mild	237 (11.08%)
Moderate	34 (1.59%)
Severe	19 (0.89%)
PHQ-9 total score	2.19 ± 3.80
Total < 10	2041 (95.41%)
Total ≥ 10	98 (4.58%)
Minimal	1740 (81.34%)
Mild	301 (14.07%)
Moderate	62 (2.90%)
Moderately severe	25 (1.17%)
Severe	11 (0.51%)
Experience of workplace violence	
No	1607 (75.13%)
Yes	532 (24.87%)
Salary satisfaction	
Reflected by half, 50%	1643 (76.81%)
Completely reflected, 100%	471 (22.02%)
Beyond one's expectation, over 100%	25 (1.17%)
Anti-epidemic participation	
No	528 (24.68%)
Yes	1611 (75.32%)
Do you wish your children to practice medicine before this pandemic?	
Very reluctant	561 (26.23%)
Somewhat reluctant	303 (14.17%)
Neutral	701 (32.77%)
Somewhat willing	228 (10.66%)
Very willing	346 (16.18%)
Do you wish your children to practice medicine after this pandemic?	
Very reluctant	545 (25.48%)
Somewhat reluctant	319 (14.91%)
Neutral	679 (31.74%)
Somewhat willing	248 (11.59%)
Very willing	348 (16.27%)
Media Publicity	
Very uncomfortable	49 (2.29%)
Somewhat uncomfortable	232 (10.85%)
Neutral	463 (21.65%)
Somewhat comfortable	849 (39.69%)
Very comfortable	546 (25.53%)
Job enthusiasm	39.14 ± 9.90
Professional self-identity	64.07 ± 15.61
Psychological support	1.07 ± 0.74

Continuous variables were summarized as mean ± standard deviation (S.D.), and categorical variables as number (percentage).

TABLE 3 | Independent *t*-test of seven-item generalized anxiety disorder (GAD-7) and nine-item patient health questionnaire (PHQ-9) by binary grouping variables.

	M ± S.D.	
Subgroups	**GAD-7**	**PHQ-9**
Gender		
Male	1.36 ± 2.79	1.91 ± 3.51
Female	1.65 ± 3.00*	2.30 ± 3.90*
Experience of workplace violence		
No	0.92 ± 2.11	1.31 ± 2.75
Yes	3.55 ± 4.04***	4.86 ± 5.08***
Anti-epidemic participation		
No	1.87 ± 3.26	2.55 ± 4.06
Yes	1.47 ± 2.84*	2.08 ± 3.70*

M, mean value; S.D., standard deviation; *p < 0.05, ***p < 0.001 vs. healthy volunteers; CI, confidence interval.

job enthusiasm was 39.14 ± 9.90, mean score of professional self-identity was 64.07 ± 15.61, and score of psychological support was 1.07 ± 0.74. See **Table 2** in detail.

Independent *t*-Test of Seven-Item Generalized Anxiety Disorder and Nine-Item Patient Health Questionnaire

Female had higher score than male on GAD-7 ($t = -2.13$, $p = 0.03$) and PHQ-9 ($t = -2.21$, $p = 0.03$). Participants with experience of workplace violence scored higher than those without such experience on GAD-7 ($t = -14.39$, $p < 0.001$) and PHQ-9 ($t = -15.40$, $p < 0.001$). Participants who had not worked on the COVID-19 front line got higher scores of both GAD-7 ($t = 2.50$, $p = 0.01$) and PHQ-9 ($t = 2.39$, $p = 0.02$) than those had. See **Table 3** for details.

One-Way ANOVA of Seven-Item Generalized Anxiety Disorder and Nine-Item Patient Health Questionnaire

One way ANOVA showed significant age effect of GAD-7 [$F_{(3,2138)} = 4.99$, $MSE = 43.19$, $p < 0.01$] and PHQ-9 [$F_{(3,2138)} = 6.22$, $MSE = 89.09$, $p < 0.001$]. *Post-hoc* test showed that participants aging from 31 to 40 scored higher than those aging from 20 to 30 on GAD-7 [$p = 0.001$, 95% CI (-0.97, -0.18)] and PHQ-9 [$p < 0.001$, 95% CI (-1.3, -0.27)] (**Table 4**).

Education effect of GAD-7 [$F_{(4,2138)} = 3.75$, $MSE = 32.47$, $p < 0.01$] or PHQ-9 [$F_{(4,2138)} = 4.38$, $MSE = 62.73$, $p < 0.01$] was significant. *Post-hoc* test showed that participants with master degree scored higher than those with other degree on GAD-7 [$p = 0.01$, 95% CI (0.22, 2.72)]. Participants with bachelor degree scored higher than those with junior college degree [$p = 0.02$, 95% CI (-1.14, -0.05)] or with other degree [$p = 0.04$, 95% CI (0.04, 2.38)] on PHQ-9 (**Table 4**).

Income effect of GAD-7 [$F_{(3,2138)} = 4.82$, $MSE = 41.71$, $p < 0.01$] or PHQ-9 [$F_{(3,2138)} = 3.49$, $MSE = 50.12$, $p = 0.02$] was significant. *Post-hoc* test showed that participants with income between 60,000 and 120,000 scored higher than those with income less than 60,000 on GAD-7 [$p = 0.01$, 95% CI (-1.03,

TABLE 4 | One-way ANOVA of seven-item generalized anxiety disorder (GAD-7) and nine-item patient health questionnaire (PHQ-9) by polytomous grouping variables.

Subgroups	M ± S.D.	
	GAD-7	**PHQ-9**
Age		
20–30	1.29 ± 2.60b	1.82 ± 3.41b
31–40	1.86 ± 3.15a	2.60 ± 4.16a
41–50	1.66 ± 3.11	2.36 ± 3.94
51–60	1.52 ± 3.21	1.83 ± 3.41
Marital status		
Unmarried	1.29 ± 2.54	1.96 ± 3.44
Married	1.66 ± 3.06	2.26 ± 3.92
Divorced	1.81 ± 3.40	2.41 ± 3.76
Widowed	3.33 ± 3.08	4.00 ± 3.74
Educational level		
Junior college	1.36 ± 3.00	1.78 ± 3.62b
Bachelor	1.65 ± 2.93	2.38 ± 3.91a,e
Master	2.31 ± 3.57e	2.59 ± 3.81
Doctor	0 ± 0	0 ± 0
Other	0.84 ± 2.02c	1.17 ± 2.38b
Annual after-tax income		
≤60,000	1.09 ± 2.39b,c	1.64 ± 3.22b
60,000–120,000	1.65 ± 3.04a	2.29 ± 3.91a
120,000–200,000	1.78 ± 3.08a	2.36 ± 3.88
≥200,000	0.38 ± 0.89	1.00 ± 2.22
Department category		
Internal medicine	1.86 ± 2.92e	2.61 ± 4.04e
Surgery	1.89 ± 3.32e	2.56 ± 4.17e
Gynecology and Pediatrics	1.84 ± 3.02	2.39 ± 3.88
Psychiatry	1.77 ± 4.25	2.26 ± 5.30
Others	1.22 ± 2.55a,b	1.78 ± 3.28a,b
Title level		
Primary title	1.21 ± 2.57b,c	1.69 ± 3.26b,c
Middle title	2.13 ± 3.50a	2.96 ± 4.52a
Vice senior title	1.84 ± 2.88a	2.55 ± 3.79a
Senior title	1.74 ± 2.79	2.54 ± 3.69

M, mean value; S.D., standard deviation; In each group comparison, a, b, c, d, and e (if any) respectively denote significant difference from the first, second, third, fourth, or fifth group.

−0.08)] and PHQ-9 [$p = 0.03$, 95% CI (−1.26, −0.04)]. Besides, participants with income between 120,000 and 200,000 scored higher than those with income less than 60,000 on GAD-7 [$p = 0.01$, 95% CI (−1.27, −0.11)] (**Table 4**).

Department category effect of GAD-7 [$F_{(4,2138)} = 6.44$, $MSE = 55.49$, $p < 0.001$] or PHQ-9 [$F_{(4,2138)} = 5.39$, $MSE = 77.12$, $p < 0.001$] was significant. *Post-hoc* test showed that participants from department of internal medicine scored higher than those from other department on GAD-7 [$p < 0.001$, 95% CI (0.24, 1.09)] and PHQ-9 [$p = 0.001$, 95% CI (0.22, 1.32)]. Participants from department of surgery scored higher than those from other department on GAD-7 [$p < 0.01$, 95% CI (0.11, 1.16)] and PHQ-9 [$p < 0.01$, 95% CI (0.15, 1.51)] (**Table 4**).

Title level effect of GAD-7 [$F_{(3,2138)} = 14.94$, $MSE = 127.58$, $p < 0.001$] or PHQ-9 [$F_{(3,2138)} = 17.14$, $MSE = 241.66$, $p < 0.001$] was significant. *Post-hoc* test showed that participants with

middle title scored higher than those with primary title on GAD-7 [$p < 0.001$, 95% CI (−1.3, −0.55)] and PHQ-9 [$p < 0.001$, 95% CI (−1.76, −0.79)]. Participants with vice senior title scored higher than those with primary title on GAD-7 [$p = 0.02$, 95% CI (−1.20, −0.07)] and PHQ-9 [$p = 0.01$, 95% CI (−1.58, −0.14)] (**Table 4**).

However, marital status effect of GAD-7 or PHQ-9 score was insignificant according to one-way ANOVA (all ps > 0.05) (**Table 4**).

Multiple Linear Regression Analyses of Seven-Item Generalized Anxiety Disorder and Nine-Item Patient Health Questionnaire

In regression, GAD-7 and PHQ-9 total scores served as dependent variables, respectively, and independent variables were age, gender, marital status, educational level, annual after-tax income, department category, job title, working age, experience of violence, salary satisfaction, anti-epidemic participation, media publicity, job enthusiasm, professional self-identity, and psychological support. See **Table 5** in detail.

According to the regression model of GAD-7 [$F_{(7,2138)} = 75.76$, $MSE = 529.78$, $p < 0.001$, adjusted R square = 0.20], the results showed that experience of violence ($t = 16.13$, $p < 0.001$), job title ($t = 2.95$, $p < 0.01$), and gender ($t = 2.83$, $p < 0.01$) was positively associated with GAD-7 score, while professional self-identity ($t = −4.61$, $p < 0.001$), job enthusiasm ($t = −4.02$, $p < 0.001$), department category (others *vs.* psychiatry) ($t = −3.04$, $p < 0.01$), and educational level (junior college *vs.* doctor) ($t = −3.10$, $p < 0.01$) were

TABLE 5 | Multiple linear regression (stepwise method) of seven-item generalized anxiety disorder (GAD-7) and nine-item patient health questionnaire (PHQ-9) by sociodemographic and supplementary variables.

	Healthcare workers (n = 2,139)			
	Associated factors	**B**	**SE**	**β**	**P-value**
GAD-7	Gender (Female)	0.37	0.13	0.06	<0.01
	Educational level (doctor)	−5.86	1.89	−0.06	<0.01
	Department category (Others)	−0.35	0.12	−0.06	<0.001
	Job title	0.22	0.07	0.06	<0.01
	Experience of workplace violence	2.23	0.14	0.33	<0.001
	Job enthusiasm	−0.03	0.01	−0.10	<0.001
	Professional self−identity	−0.02	0.01	−0.12	<0.001
PHQ−9	Gender (Female)	0.49	0.17	0.06	<0.01
	Educational level (doctor)	−8.07	2.39	−0.07	<0.01
	Department category (Others)	−0.37	0.15	−0.05	<0.05
	Job title	0.33	0.09	0.07	<0.001
	Experience of workplace violence	2.91	0.18	0.33	<0.001
	Job enthusiasm	−0.03	0.01	−0.07	<0.01
	Professional self−identity	−0.04	0.01	−0.16	<0.001
	Psychological support	−0.31	0.10	−0.06	<0.01

β, standardized coefficients beta; B, unstandardized B; SE, coefficients standard error.

negatively associated with GAD-7 score. However, age ($t = 0.94$, $p = 0.35$), marital status (all $ps > 0.05$), annual after-tax income ($t = 1.20$, $p = 0.23$), working age ($t = 1.15$, $p = 0.25$), salary satisfaction ($t = -1.10$, $p = 0.27$), anti-epidemic participation ($t = -0.99$, $p = 0.32$), media publicity ($t = -1.79$, $p = 0.07$), and psychological support ($t = -1.15$, $p = 0.25$) were not associated with GAD-7 score.

Besides, according to the regression model of PHQ-9 [$F_{(8,2138)} = 79.05$, $MSE = 882.16$, $p < 0.001$, adjusted R square $= 0.23$], the results showed that gender ($t = 2.98$, $p < 0.01$), job title ($t = 3.54$, $p < 0.001$), and experience of violence ($t = 16.57$, $p < 0.001$) were positively associated with PHQ-9 score, while professional self-identity ($t = -6.40$, $p < 0.001$), psychological support ($t = -3.01$, $p = 0.003$), educational level (junior college $vs.$ doctor) ($t = -3.38$, $p = 0.001$), job enthusiasm ($t = -2.88$, $p < 0.01$), and department category (others $vs.$ psychiatry) ($t = -2.52$, $p = 0.01$) were negatively associated with the PHQ-9 scores. However, age ($t < 0.01$, $p = 1.00$), marital status (all $ps > 0.10$), annual after-tax income ($t = 0.67$, $p = 0.51$), working age ($t = 0.61$, $p = 0.54$), job enthusiasm ($t = 0.50$, $p = 0.62$), anti-epidemic participation ($t = -0.64$, $p = 0.52$), and media publicity ($t = -1.89$, $p = 0.06$) were not associated with the PHQ-9 scores.

DISCUSSION

In the current study, we found that participants with female gender, with experience of workplace violence, without participation in anti-epidemic front-line work during pandemic, aging from 31 to 40, with higher educational level, with middle level of annual after-tax income, from department of internal medicine or surgery, or with middle level of job title scored higher on both GAD-7 and PHQ-9, which was partly in line with our first hypothesis. Regression analysis showed that female gender, high job title, and experience of workplace violence were positively associated with anxiety or depression. Doctoral education, other department, job enthusiasm, and professional self-identity were negatively associated with anxiety or depression. Additionally, psychological support was negatively associated with depression. Thus, our second hypothesis was confirmed.

Based on univariate analysis, participants aged 31–40 scored higher on GAD-7 and PHQ-9. We speculated that healthcare workers of such age usually had young children and living parents in their families, thus they had the greatest concern regarding viral transmission to their families (Cai et al., 2020). Participants with middle-income level scored higher on anxiety or depression, probably because people of medium income level were in a period of rising careers, hence subjectively feeling more pressured and more prone to emotional problems. Previous research mainly focused on the connection between income reduction and emotional state (Xing et al., 2020; Peng et al., 2021). Therefore, the impact of income level needs to be further verified by follow-up research. Participants who had not joined in anti-epidemic front-line work scored higher on GAD-7 and PHQ-9. We speculated that participants

once joining in front-line work were experienced in and accustomed to the virus. In turn, participants without such experience might go to the front-line in the future, and they might feel fear, anxious, and depressed about the unknown. However, age, income, and anti-epidemic participation were not significant in the regression analysis, so these factors might be less important.

Combining univariate and multivariate analysis, female gender and middle-job title were positively associated with both anxiety and depression, which was consistent with previous result (Lai et al., 2020). As to education, group analysis showed that participants with bachelor or master degrees had higher anxiety or depression, while regression analysis showed that doctoral education was negatively associated with anxiety or depression. Considering a number of people with doctorate degrees in our sample were negligible, this regression result might not be stable. Therefore, our study generally supported high educational level contributed to emotional problems, which accorded with previous findings (Mo et al., 2020; Wang et al., 2021). Participants from the department of internal medicine or surgery scored higher on anxiety and depression, which was consistent with the regression result that other department was a negative associated factor of emotional issues. These results were similar to a previous study in the United States (Sonis et al., 2021), and that surgical department had significantly higher rates of self-reported depression and anxiety (Louie et al., 2020; Jemal et al., 2021).

In terms of psychosocial factors, the experience of workplace violence was positively associated with both anxiety and depression, which was explained by that healthcare workers who experienced physical and non-physical violence were more likely to suffer from depression and anxiety symptoms than those not (Shi et al., 2020).

We also found that both job enthusiasm and professional self-identity were negatively associated with anxiety and depression, which is poorly studied at present. Instead, previous research generally demonstrated emotional problems could lead to poor vocational dedication and job enthusiasm. For example, concurrent depression and anxiety, along with uncertainty and burden in the workplace, pre-disposed individuals to professional burnout, and perception of reduced accomplishment (Albott et al., 2020). And professional burnout was accompanied by negative attitudes and disengagement from work (Demerouti et al., 2003; Malach-Pines, 2005), sign of reduced job enthusiasm. Therefore, our study showed that vocational evaluation could in turn influence the emotional problems.

Moreover, psychological support was negatively associated with depression, which means depressive symptoms of healthcare workers could be relieved by mental health service offered by the work unit. Previous literature has called for early assessment of healthcare workers' mental health and appropriate psychological interventions (Li et al., 2020; Xiang et al., 2020), and our result supported the necessity of this proposal.

Another two psychosocial factors, salary satisfaction and media publicity, were insignificant in regression analysis, which means healthcare workers' expectation of reward and social media exposure might make no difference to psychological

health, at least during this pandemic. Comparatively, the experience of medical violence, job enthusiasm, professional self-identity, and psychological support are far more critical to healthcare workers' mental health.

However, this study has several limitations. First, all participants were recruited from Jiande City, thus limiting the generalization of our findings to other regions. Second, this was a cross-sectional self-report study. With the normalization of anti-epidemic work, the mental health symptoms of healthcare workers could vary. Therefore, a longitudinal follow-up study could have offered a temporal change of the emotional state of healthcare workers. Third, this study did not distinguish preexisting emotional symptoms from new symptoms resulting from the COVID-19 pandemic, and this might be a confounding factor. Fourth, PHQ-9 and GAD-7 are simple screening tools and the standard diagnostic tools would have offered more accurate results. Last, an alpha error might be inflated in our study since many statistical analyses were conducted.

Nevertheless, we have found the emotional state of healthcare workers is influenced by multiple sociodemographic variables and vocational evaluation. Our study revealed that female gender, high educational level, medium job title, and experience of workplace violence were risk factors of anxiety or depression. Non-mainstream department, job enthusiasm, professional self-identity, and psychological support were protective factors of anxiety or depression. Self-tailored psychological intervention should be based on the predisposing factors above to mentally prepare healthcare workers for this long-lasting battle against COVID-19.

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 Ethics Committee of the Fourth People's Hospital of Jiande City. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MJ, XS, WC, and JT conceived the study. MJ, XS, SR, YL, ZP, YS, SZ, LY, and HW contributed to the study design and collected the data. MJ, XS, and YL analyzed the data. MJ, XS, YL, WC, and JT drafted the manuscript. All authors have read and approved the final manuscript.

FUNDING

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.854815/full#supplementary-material

REFERENCES

Albott, C. S., Wozniak, J. R., McGlinch, B. P., Wall, M. H., Gold, B. S., and Vinogradov, S. (2020). Battle buddies: rapid deployment of a psychological resilience intervention for health care workers during the coronavirus disease 2019 pandemic. *Anesth. Analg.* 131, 43–54. doi: 10.1213/ANE.0000000000004912

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR (Text Revision)*, 4th Edn. Washington, DC: American Psychiatric Association.

Banna, M. H. A., Sayeed, A., Kundu, S., Christopher, E., Hasan, M. T., Begum, M. R., et al. (2020). The impact of the COVID-19 pandemic on the mental health of the adult population in Bangladesh: a nationwide cross-sectional study. *Int. J. Environ. Health Res.* 32, 1–12. doi: 10.1080/09603123.2020.1802409

Bao, Y., Sun, Y., Meng, S., Shi, J., and Lu, L. (2020). 2019-nCoV epidemic: address mental health care to empower society. *Lancet* 395, e37–e38. doi: 10.1016/S0140-6736(20)30309-3

Cai, H., Tu, B., Ma, J., Chen, L., Fu, L., Jiang, Y., et al. (2020). Psychological impact and coping strategies of frontline medical staff in Hunan between January and March 2020 during the outbreak of coronavirus disease 2019 (COVID-19) in Hubei, China. *Med. Sci. Monit.* 26:e924171. doi: 10.12659/MSM.924171

Chen, Q., Liang, M., Li, Y., Guo, J., Fei, D., Wang, L., et al. (2020). Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry* 7, e15–e16. doi: 10.1016/S2215-0366(20)30078-X

Chen, S., Chiu, H., Xu, B., Ma, Y., Jin, T., Wu, M., et al. (2010). Reliability and validity of the PHQ-9 for screening late-life depression in Chinese primary care. *Int. J. Geriatr. Psychiatry* 25, 1127–1133. doi: 10.1002/gps.2442

Chen, S., Fang, Y., Chiu, H., Fan, H., Jin, T., and Conwell, Y. (2013). Validation of the nine-item Patient Health Questionnaire to screen for major depression in a Chinese primary care population. *Asia Pac. Psychiatry* 5, 61–68. doi: 10.1111/appy.12063

Corrigan, P. W., Watson, A. C., and Barr, L. (2006). The self–stigma of mental illness: implications for self–esteem and self–efficacy. *J. Soc. Clin. Psychol.* 25, 875–884.

Demerouti, E., Bakker, A. B., Vardakou, I., and Kantas, A. (2003). The convergent validity of two burnout instruments: a multitrait-multimethod analysis. *Eur. J. Psychol. Assess.* 19, 12–23.

Elliott, T. R., Perrin, P. B., Bell, A. S., Powers, M. B., and Warren, A. M. (2021). Resilience, coping, and distress among healthcare service personnel during the COVID-19 pandemic. *BMC Psychiatry* 21:489. doi: 10.1186/s12888-021-03506-6

González-Sanguino, C., Ausín, B., Castellanos, M. Á, Saiz, J., López-Gómez, A., Ugidos, C., et al. (2020). Mental health consequences during the initial stage of

the 2020 coronavirus pandemic (COVID-19) in Spain. *Brain Behav. Immun.* 87, 172–176. doi: 10.1016/j.bbi.2020.05.040

He, X. Y., Li, C. B., Qian, J., Cui, H. S., and Wu, W. Y. (2010). Reliability and validity of a generalized anxiety disorder scale in general hospital outpatients. *Shanghai Arch. Psychiatry* 22, 200–203.

Hui, D. S., Azhar, E. I., Madani, T. A., Ntoumi, F., Kock, R., Dar, O., et al. (2020). The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health—the latest 2019 novel coronavirus outbreak in Wuhan, China. *Int. J. Infect. Dis.* 91, 264–266. doi: 10.1016/j.ijid.2020.01.009

Islam, M. S., Sujan, M. S. H., Tasnim, R., Sikder, M. T., Potenza, M. N., and Van Os, J. (2020). Psychological responses during the COVID-19 outbreak among university students in Bangladesh. *PLoS One* 15:e0245083. doi: 10.1371/journal.pone.0245083

Islam, M. S., Tasnim, R., Sujan, M. S. H., Ferdous, M. Z., Sikder, M. T., Masud, J. H. B., et al. (2021). Depressive symptoms associated with COVID-19 preventive practice measures, daily activities in home quarantine and suicidal behaviors: findings from a large-scale online survey in Bangladesh. *BMC Psychiatry* 21:273. doi: 10.1186/s12888-021-03246-7

Jagiasi, B. G., Chanchalani, G., Nasa, P., and Tekwani, S. (2021). Impact of COVID-19 pandemic on the emotional well-being of healthcare workers: a multinational cross-sectional survey. *Indian J. Crit. Care Med.* 25, 499–506. doi: 10.5005/jp-journals-10071-23806

Jemal, K., Deriba, B. S., Geleta, T. A., Tesema, M., Awol, M., Mengistu, E., et al. (2021). Self-reported symptoms of depression, anxiety, and stress among healthcare workers in Ethiopia during the COVID-19 pandemic: a cross-sectional study. *Neuropsychiatr. Dis. Treat.* 17, 1363–1373. doi: 10.2147/NDT.S306240

Kang, L., Ma, S., Chen, M., Yang, J., Wang, Y., Li, R., et al. (2020). Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: a cross-sectional study. *Brain Behav. Immun.* 87, 11–17. doi: 10.1016/j.bbi.2020.03.028

Khalid, I., Khalid, T. J., Qabajah, M. R., Barnard, A. G., and Qushmaq, I. A. (2016). Healthcare workers emotions, perceived stressors and coping strategies during a MERS-CoV outbreak. *Clin. Med. Res.* 14, 7–14. doi: 10.3121/cmr.2016.1303

Koh, D., Lim, M. K., Chia, S. E., Ko, S. M., Qian, F., Ng, V., et al. (2005). Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare workers in Singapore: what can we Learn? *Med. Care* 43, 676–682. doi: 10.1097/01.mlr.0000167181.36730.cc

Kroenke, K., Spitzer, R. L., and Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *J. Gen. Intern. Med.* 16, 606–613. doi: 10.1046/j.1525-1497.2001.016009606.x

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., et al. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw. Open* 3:e203976. doi: 10.1001/jamanetworkopen.2020.3976

Li, Z., Ge, J., Yang, M., Feng, J., Qiao, M., Jiang, R., et al. (2020). Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. *Brain Behav. Immun.* 88, 916–919.

Liu, C. Y., Yang, Y. Z., Zhang, X. M., Xu, X., Dou, Q. L., Zhang, W. W., et al. (2020). The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. *Epidemiol. Infect.* 148:e98. doi: 10.1017/S0950268820001107

Liu, Q., Luo, D., Haase, J. E., Guo, Q., Wang, X. Q., Liu, S., et al. (2020). The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. *Lancet Glob. Health* 8, e790–e798. doi: 10.1016/S2214-109X(20)30204-7

Liu, S. I., Yeh, Z. T., Huang, H. C., Sun, F. J., Tjung, J. J., Hwang, L. C., et al. (2011). Validation of Patient Health Questionnaire for depression screening among primary care patients in Taiwan. *Compr. Psychiatry* 52, 96–101. doi: 10.1016/j.comppsych.2010.04.013

Liu, Y., Chen, H., Zhang, N., Wang, X., Fan, Q., Zhang, Y., et al. (2021). Anxiety and depression symptoms of medical staff under COVID-19 epidemic in China. *J. Affect. Disord.* 278, 144–148. doi: 10.1016/j.jad.2020.09.004

Louie, P. K., Harada, G. K., McCarthy, M. H., Germscheid, N., Cheung, J. P., Neva, M. H., et al. (2020). The impact of COVID-19 pandemic on spine surgeons worldwide. *Glob. Spine J.* 10, 534–552.

Lu, W., Wang, H., Lin, Y., and Li, L. (2020). Psychological status of medical workforce during the COVID-19 pandemic: a cross-sectional study. *Psychiatry Res.* 288:112936. doi: 10.1016/j.psychres.2020.112936

Ma, J., Chen, X., Zheng, Q., Zhang, Y., Ming, Z., Wang, D., et al. (2021). Serious workplace violence against healthcare providers in China between 2004 and 2018. *Front. Public Health* 8:574765. doi: 10.3389/fpubh.2020.574765

Malach-Pines, A. (2005). The burnout measure, short version. *Int. J. Stress Manage.* 12, 78–88. doi: 10.1037/1072-5245.12.1.78

Mo, Y., Deng, L., Zhang, L., Lang, Q., Liao, C., Wang, N., et al. (2020). Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic. *J. Nurs. Manag.* 28, 1002–1009. doi: 10.1111/jonm.13014

Peng, X., Meng, X., Li, L., Hu, C., Liu, W., Liu, Z., et al. (2021). Depressive and anxiety symptoms of healthcare workers in intensive care unit under the COVID-19 epidemic: an online cross-sectional study in China. *Front. Public Health* 9:603273. doi: 10.3389/fpubh.2021.603273

Sang, L., Liu, H., Yan, H., Rong, J., Cheng, J., Wang, L., et al. (2022). Incentive preferences and its related factors among primary medical staff in Anhui Province, China: a cross-sectional study. *Front Public Health* 9:778104. doi: 10.3389/fpubh.2021.778104

Santarone, K., McKenney, M., and Elkbuli, A. (2020). Preserving mental health and resilience in frontline healthcare workers during COVID-19. *Am. J. Emerg. Med.* 38, 1530–1531. doi: 10.1016/j.ajem.2020.04.030

Schubert, M., Ludwig, J., Freiberg, A., Hahne, T. M., and Seidler, A. (2021). Stigmatization from work-related covid-19 exposure: a systematic review with meta-analysis. *Int. J. Environ. Res. Public Health* 18:6183. doi: 10.3390/ijerph18126183

Shanafelt, T., Ripp, J., and Trockel, M. (2020). Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 323, 2133–2134. doi: 10.1001/jama.2020.5893

Shi, L., Li, G., Hao, J., Wang, W., Chen, W., Liu, S., et al. (2020). Psychological depletion in physicians and nurses exposed to workplace violence: a cross-sectional study using propensity score analysis. *Int. J. Nurs. Stud.* 103:103493. doi: 10.1016/j.ijnurstu.2019.103493

Sonis, J., Pathman, D. E., Read, S., Gaynes, B. N., Canter, C., Curran, P., et al. (2021). Generalized anxiety, depression and posttraumatic stress disorder in a national sample of U.S. internal medicine physicians during the COVID-19 pandemic. *Gen. Hosp. Psychiatry* 71, 142–144. doi: 10.1016/j.genhosppsych.2021.05.004

Spitzer, R. L., Kroenke, K., and Williams, J. B. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary care evaluation of mental disorders. Patient Health Questionnaire. *JAMA* 282, 1737–1744. doi: 10.1001/jama.282.18.1737

Spitzer, R. L., Kroenke, K., Williams, J. B., and Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch. Intern. Med.* 166, 1092–1097. doi: 10.1001/archinte.166.10.1092

Sudha, K., Siddhardha, D., Prakash, T. A., Anushka, P., and Maulik, P. K. (2018). Common mental disorders and risk factors in rural India: baseline data from the smart mental health project. *Bjpsych Open* 4, 192–198. doi: 10.1192/bjo.2018.28

United Nations (2020). *Policy Brief: COVID-19 and the Need for Action on Mental Health*. New York, NY: United Nations.

Wang, Y., Di, Y., Ye, J., and Wei, W. (2021). Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China. *Psychol. Health Med.* 26, 13–22. doi: 10.1080/13548506.2020.1746817

WHO (2020). *WHO Director-General's Opening Remarks at the Media Briefing on COVID-19- 11 March 2020*. Geneva: World Health Organization.

Xiang, Y. T., Yang, Y., Li, W., Zhang, L., Zhang, Q., Cheung, T., et al. (2020). Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry* 7, 228–229. doi: 10.1016/S2215-0366(20)30046-8

Xiao, H., Zhang, Y., Kong, D., Li, S., and Yang, N. (2020). The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Med. Sci. Monit.* 26:e923549. doi: 10.12659/MSM.923549

Xing, L. Q., Xu, M. L., Sun, J., Wang, Q. X., Ge, D. D., Jiang, M. M., et al. (2020). Anxiety and depression in frontline health care workers during the outbreak of Covid-19. *Int. J. Soc. Psychiatry* 67, 656–663. doi: 10.1177/0020764020968119

Yin, Q., Sun, Z., Liu, T., Ni, X., Deng, X., Jia, Y., et al. (2020). Posttraumatic stress symptoms of health care workers during the corona virus disease 2019. *Clin. Psychol. Psychother.* 27, 384–395. doi: 10.1002/cpp.2477

Yu, X., Tam, W. W., Wong, P. T., Lam, T. H., and Stewart, S. M. (2012). The Patient Health Questionnaire-9 for measuring depressive symptoms among the

general population in Hong Kong. *Compr. Psychiatry* 53, 95–102. doi: 10.1016/j.comppsych.2010.11.002

Zhang, Y., Ting, R., Lam, M., Lam, J., Nan, H., Yeung, R., et al. (2013). Measuring depressive symptoms using the Patient Health Questionnaire-9 in Hong Kong Chinese subjects with type 2 diabetes. *J. Affect. Disord.* 151, 660–666. doi: 10.1016/j.jad.2013.07.014

Zhu, J., Sun, L., Zhang, L., Wang, H., Fan, A., Yang, B., et al. (2020). Prevalence and influencing factors of anxiety and depression symptoms in the first-line medical staff fighting against COVID-19 in Gansu. *Front. Psychiatry* 11:386.

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.

Psychotherapist Trainees' Quality of Life: Patterns and Correlates

Erkki Heinonen[1,2]*, David E. Orlinsky[3], Ulrike Willutzki[4], Michael Helge Rønnestad[1], Thomas Schröder[5], Irene Messina[6], Henriette Löffler-Stastka[7] and Armin Hartmann[8]

[1]Department of Psychology, University of Oslo, Oslo, Norway, [2]Finnish Institute for Health and Welfare, Helsinki, Finland, [3]Department of Comparative Human Development, University of Chicago, Chicago, IL, United States, [4]Department of Psychology and Psychotherapy, University of Witten/Herdecke, Witten, Germany, [5]Division of Psychiatry and Applied Psychology, University of Nottingham, Nottingham, United Kingdom, [6]Universitas Mercatorum, Rome, Italy, [7]Department of Psychoanalysis and Psychotherapy, Medical University of Vienna, Vienna, Austria, [8]Department of Psychosomatic Medicine and Psychotherapy, Faculty of Medicine, Medical Center – University of Freiburg, Freiburg im Breisgau, Germany

While psychotherapists are trained to improve their clients' quality of life, little work has examined the quality of life experienced by psychotherapist trainees themselves. Yet their life satisfactions and stresses would plausibly affect both their ability to learn new skills and conduct psychotherapy. Therefore, in the Society for Psychotherapy Research Interest Section on Psychotherapist Development and Training study, we investigated the patterns of self-reported life quality and their correlates in a multinational sample of 1,214 psychotherapist trainees. A comprehensive questionnaire was used at the outset of trainings to assess trainees' professional background, current life situation, personal characteristics, family background, and social and national origin. The findings indicated 54.3% of trainees' lives could be characterized as fortunate or happy (i.e., experiencing great life satisfaction and not much stress), whereas 14.3% could be characterized as clearly distressed or troubled (i.e., experiencing great life stress and not much satisfaction). The strongest correlates of high life stress, a contributor to poor life quality, were economic insecurity, self-protectiveness, and attachment-related anxiety in relationships, and economic or psychological hardship in childhood. In turn, greater wellbeing was most strongly associated with a warm and open interpersonal style, being married, having sufficient economic means, and material and emotional security in childhood. While the results indicate the majority of therapists experience a relatively good quality of life, the findings also suggest potential targets for increasing trainees' life quality when it may be deficient, such as those on a societal level (e.g., availability of low-cost student loans), training program level (e.g., promoting supportive supervision, positive between-trainee relationships and group collaboration), and individual level (e.g., personal therapy and learning self-care), in order to promote effective learning and therapy practice.

Keywords: psychotherapist training, psychotherapists, life quality, life satisfaction, life stress, relationships

INTRODUCTION

The work that psychotherapists do with clients generally aims to improve their clients` quality of life, and researchers have invested decades of work to understand the circumstances in which, and processes though which, such improvement occurs (e.g., Garfield and Bergin, 1971; Barkham et al., 2021). Until recently, much less interest has focused on the quality of life experienced by psychotherapists themselves, although it may be one of the factors that contribute to their influence on clients (e.g., Guy et al., 1989; Schröder et al., 2009; Nissen-Lie et al., 2013; Heinonen and Nissen-Lie, 2019; Brugnera et al., 2020). Even less studied has been the life quality of psychotherapist trainees, despite the fact that many are young adults who in general have been found vulnerable to mental health issues (Kessler et al., 2005). Other studies suggest that stress may be a particular problem for students in the caring professions, such as medicine (Dahlin et al., 2005) and nursing (Nerdrum et al., 2009). The present study examines these issues by exploring the patterns and correlates of life quality among individuals who are currently in training to become psychotherapists.

Generally, life satisfaction (or subjective wellbeing) has been shown to correlate positively with work performance and negatively with absenteeism (Tenney et al., 2016). Among psychotherapists, practitioners with greater life satisfaction experience themselves as more effective (Beutler et al., 2004; Orlinsky, 2022). By contrast, therapist burnout, which is likely associated with a lower overall quality of life, has been linked to worse treatment outcomes for patients (Beutler et al., 2004; Steel et al., 2015; Delgadillo et al., 2018). As for psychotherapy trainees, the quality of their personal lives would likely affect their ability both to learn new skills and to perform well in clinical settings (e.g., Beaumont et al., 2016; Bücker et al., 2018; Messina et al., 2019; Chattu et al., 2020).

Previous studies have solidly established one source for therapists' decreased life satisfaction, i.e., work-related stresses contributing to professional burnout. A recent meta-analysis of relatively experienced therapists identified such expectable risk factors for burnout as longer working hours, role overload and role conflict, high caseload, and negative clientele (Lee et al., 2020). Another review identified major burnout risk factors plausibly affecting especially early career therapists, i.e., younger age, less work experience, and being overinvolved in client problems (Simionato and Simpson, 2018). Of note, a few studies in the review also identified dispositional risk factors for burnout, such as neuroticism, perfectionism, low agreeableness, and low extraversion. A third critical review underlined the particular needs of newly qualified counselors and psychotherapists, such as adequate mentoring and supervision, to counter work-related stresses like professional self-doubt and vicarious traumatization which may predispose to burnout (Davies et al., 2021).

While there is substantial knowledge of work-related correlates of professional distress (many plausibly affecting especially younger or less experienced therapists), little research to date has focused on future therapists' wellbeing overall—i.e.,

comprising both the satisfactions and the stresses they experience in their lives—as well as their circumstances. Prior literature suggests that life satisfaction varies considerably and that important correlates comprise relatively stable individual characteristics, such as personality and its temperamental and genetic determinants (Schimmack et al., 2004; Steel et al., 2008), early life experiences (Frijters et al., 2014); current life circumstances, such as financial situation (Lucas and Schimmack, 2009) and social support (Myers, 2000); sociodemographic variables, such as age (Diener et al., 2018) or minority vs. majority status (Veenhoven and Hagerty, 2006); and some broader cultural and environmental factors, like those related to nationality (e.g., Oishi et al., 1999; Delle Fave et al., 2016).

Conceptually, overall quality of life reflects a balance between the levels of satisfactions and stresses in a person's current life. Satisfaction and stress are far from polar opposites, although extremes of both are unlikely to coexist. Low or even relatively high levels of satisfaction can co-occur with low or even relatively high levels of stress, and the levels of each relative to the other will define *qualitatively different patterns* of life quality. Such patterns will constitute the criterion variable in our study, and various factors in the lives of a large multinational sample of trainees will be explored as potential predictors of those patterns (and/or the ratings of life satisfaction and stress levels that constitute the patterns). Knowledge of the impact of such characteristics in therapist trainees could serve: (1) to illuminate the general status of future therapists' wellbeing, and both the protective and risk factors associated with it; (2) to help identify trainees for whom a supportive work environment might be especially helpful, or a challenging environment especially burdening; and (3) to identify protective or risk factors that could be modified to support psychotherapy trainees' wellbeing, learning, and effective practice.

Research Question

Based on the prior literature reviewed above, the research question of our study was: How is the quality of life of psychotherapist trainees associated with their (1) current life situation; (2) personal characteristics; (3) family background; and (4) national and social origins?

MATERIALS AND METHODS

Design

This study reports on one aspect of a broader collaborative international longitudinal study of psychotherapy training that has been conducted by members of the Society for Psychotherapy Research Interest Section on Psychotherapist Development and Training (SPRISTAD; Orlinsky et al., 2019). From 2016 to the present, the SPRISTAD collaborative has collected information about psychotherapy training programs and trainees from different professions and theoretical orientations in many countries, in a conceptually organized exploratory and inductive study of the features of training programs, and the corresponding formative experiences,

practices, and development of trainees. The study instruments focus mainly on trainees' professional characteristics, activities, and development but also solicit information on aspects of their personal lives. Overall, the principal goals of the SPRISTAD study are: (1) identifying common and divergent features of psychotherapy training programs; (2) tracking progressive changes over time in trainees as therapists; (3) identifying factors that tend to facilitate or impede trainee development; (4) using quantitative and qualitative data gathered from a large number of psychotherapy trainees of varied types in a wide range of training programs.

Training centers and trainees collaborating in the study have been recruited through professional publications, workshops and conferences, professional societies and individual collegial networks. Training centers that participate in the SPRISTAD study have a local research coordinator who is a SPRISTAD member and must offer training programs of at least 12 months' duration. Assessments with various instruments are made at the start of the trainee's program, after 6 months, and after 12 months. Therapist trainees in the present study were informed about the study by their local research coordinators at the beginning of their training, and those who gave informed consent were provided online with the SPRISTAD questionnaires at the start of their training from the data collection center at Witten/Herdecke University in Germany; or, in the case of Finland, through the Finnish research coordinator; or, in the case of a subset of Italian participants, *via* a paper-and-pencil measure through the local research coordinator. The present study is based on data collected to date from countries that had at least 10 trainees who responded to the first SPRISTAD research measure.

Measures

Trainee Background Information Form

Data for the present study were collected with the *Trainee Background Information Form* (TBIF), which is a survey of trainees' demographic, professional, and familial backgrounds, and some personal psychological characteristics, that trainees complete when starting on their training program. Most items are structured-response scales or checklists, but space is provided for textual response to open-ended questions. The TBIF draws on items from the *Development of Psychotherapists Common Core Questionnaire* (DPCCQ), which has a current worldwide data base of about 12,000 psychotherapists (Orlinsky and Rønnestad, 2005; Orlinsky, 2022).

The domains of the TBIF relevant to present study include trainees' *demographic* information (age, gender, country of residence, immigration status, and minority vs. majority status); their *training level* (years of prior therapy practice, if any); their *current life situation* (marital status, parental status, and financial status); and their *family background* (family size, trainee birth order, family material wellbeing, and family emotional/psychological functioning). For the latter two, trainees are asked to report on the material and economic circumstances of their family-of-origin, on a 5-point scale from "Very comfortable" to "Marginal"; and to rate how well their childhood family functioned psychologically and

emotionally, rated on a 6-point scale (anchored as 0 = "not at all," 1 = "little," 2 = "some," 3 = "moderately," 4 = "greatly," 5 = "very greatly").

Adult Attachment

Adult attachment was operationalized using an adaptation of Wei et al. (2007) short version of the *Experiences in Close Relationships* questionnaire (ECR-S). The questionnaire yields scores on two dimensions of insecure (*vs* secure) insecure (*vs* secure) attachment: Avoidant Attachment (six items, e.g., "I prefer not to show a partner how I feel deep down") and Anxious Attachment (six items, e.g., "I worry about being abandoned"). Items are rated on a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). These subscales have shown good test–retest reliability (Wei et al., 2007), between 0.80 and 0.89 in different sub studies, and sufficient to good internal consistency: $\alpha = 0.78$ (Anxiety); $\alpha = 0.84$ (Avoidance). Comparable internal consistency of dimensions was found for the current trainee sample: $\alpha = 0.74$ (Anxiety); $\alpha = 0.80$ (Avoidance).

Personal Identity

Trainees' personal identity, defined as their self-experience in close personal relationships, was assessed in the TBIF using 35 7-point self-descriptive adjectival items (anchored at 0 = "not at all," 2 = "some," 4 = "much," 6 = "very much"), presented following the question: "How would you describe yourself as you really are in your close personal relationships?" Interpersonal aspects of self were assessed with items based on Leary's (1957) circumplex model of interpersonal behavior. Temperament aspects of self were assessed with items reflecting amplitude vs. restraint in individual's cognitive-instrumental and emotional-expressive functioning. Exploratory factor analysis of these items (principal components extraction, Varimax rotation) yielded four dimensions that essentially replicated prior similar factor analyses on a sample of over 10,000 graduated and practicing therapists (Orlinsky et al., 2019; Orlinsky, 2022). Reliable multiple-item scales were constructed for the following four dimensions: (1) *Genial/Caring*, consisting of seven adjective items (warm, friendly, tolerant, receptive, nurturant, optimistic, accepting; $\alpha = 0.76$) viewed as *self-bestowal*; (2) *Forceful/Exacting*, consisting of five adjective items (directive, demanding, authoritative, challenging, critical; $\alpha = 0.76$), viewed as *self-assertion*; (3) *Reclusive/Remote*, consisting of four adjectives (reserved, guarded, private, skeptical; $\alpha = 0.72$), viewed as *self-protection*; and *Practical/Determined,* also consisting of four adjectives (organized, pragmatic, determined, energetic, $\alpha = 0.66$), viewed as *self-efficacy*. Alpha coefficients for these multi-item scales were considered adequate in light of the number of items used in each and their highly significant correlations with other therapist characteristics.

Life Satisfaction and Stress

The criterion variable for this study was derived from two questions in the TBIF: "How satisfying is your life at present?" and "How stressful is your life at present?" Response alternatives

for each used a 6-point scale (rated 0 = "not at all," 1 = "little," 2 = "some," 3 = "moderately," 4 = "greatly," 5 = "very greatly").

Sample

The sample for this study comprises 1,214 psychotherapist trainees, whose demographic and professional characteristics are summarized in **Table 1**. Approximately three quarters of the total come from five European countries (Finland, Austria, Italy, Germany, and United Kingdom). About 85% are female. The average age of the group was 36 (*M* = 35.8, SD = 9.3) but the age range was substantial (19–71, with most between 27 and 45 years of age). About one in 10 identified with either a minority or immigrant status. Over four out of five trainees viewed themselves as training professionally in the field of psychotherapy, two-thirds at the initial level of professional training (0 to <2 years of practice) and one-third at an advanced level of training. All major therapy orientations were represented in the trainings.

Trainees' current life status and family backgrounds are summarized in **Table 2**. About three fifths were in a committed adult relationship, with just over one-third married, another one-fourth living with their partner, and with the remainder as single, either unattached (17.7%) or in a relationship (17.9%). In terms of family background, 83.9% had siblings (mostly just one or two). Approximately a quarter of the trainees reported experiencing serious financial difficulty, but a majority had either no or only slight economic difficulties. A majority grew up in economically comfortable families, but over 1 in 7 experienced economic hardships in their childhood families.

Ethics

Upon participating in the study, the local training centers addressed their respective research ethics committees and received ethical approval. All trainees were given written information about the study and signed an informed consent document.

Statistical Analysis

Chi-square tests were used to determine the association between categorical variables. Non-parametric Pearson correlations (ρ) were calculated to determine the association between continuous measures for Personal Self and Adult Attachment and the Life Quality component variables (Life Satisfaction and Life Stress). This first exploratory investigation has assessed relationships with multiple independent variables, without an alpha-level adjustment, since detecting potential factors related to trainee life quality is the principal task, rather than hypothesis testing. Analyses were conducted using SPSS for Mac version 28.0.0.

RESULTS

Trainees' Life Satisfaction and Stress and Their Patterns

With regard to the criterion variable, **Table 3** shows that almost two-thirds of the trainees reported experiencing "great" or "very great" current life satisfaction, whereas just under one-fourth reported experiencing "great" or "very great" life stress. However,

50.3% of the trainees reported "some" or "moderate" stress in their lives, indicating that meaningful levels of stress were present for about three-fourths of them.

For most of the subsequent analyses, high and low levels of life satisfaction and stress were combined to define four distinct life quality patterns (**Table 3**). A majority (54.3%) of the trainees evidently had *Fortunate/Happy* lives [great or very great satisfaction with no more than moderate stress. By contrast, just over one-fifth (21.7%) of the trainees' seemed to be leading rather *Low-Key/Subdued* lives (no great satisfaction, and no great stress]. The remaining one-fourth of the sample was divided between two smaller patterns: Currently the lives of about one in 11 (8.7%) of the trainees could be described as *Intense/Impassioned* (having both great satisfaction and great stress), while even more (14.3%) of the trainees appeared to be living a *Distressed/Troubled* life (experiencing great stress and no great satisfaction). The next step was to determine which if any personal and life characteristics are associated with the trainees' varied quality of life.

Current Life Situation and Current Life Quality
Gender and Age

Table 4 shows there were no significant differences in life quality patterns between women and men, but that Older trainees (ages 40–70) tended to experience a *Fortunate/Happy* life quality significantly more often than Mature trainees (ages 30–39) and especially more than Younger trainees (ages 19–29): 62.0% vs. 55.4% and 49.4%, respectively.

Marital and Parental Status

Table 5 shows that currently Married trainees experienced a *Fortunate/Happy* quality of life most often, and significantly more often than Single Unattached trainees (66.3% vs. 40.6%), while Single Unattached trainees were most likely of all groups to have a *Low-key/Subdued* life quality, and Married trainees were least likely to (36.1% vs. 14.1%). No differences were found between parents vs. non-parents within marital status categories.

Current Economic/Financial Circumstances

Table 6 shows that trainees' current economic and financial circumstances are significantly associated with their current life quality. Nearly three-fourths (73.8%) of those with no economic difficulties report a *Fortunate/Happy* quality of life, as compared with only 37.5% of those with moderately difficult or very difficult circumstances. At worst, more than one-fourth (27.5%) of the latter had a *Distressed/Troubled* life quality (about 7 times more often than those with no financial difficulties), and at best another one-fourth (23.8%) had a *Low-key/Subdued* life quality.

Personal Characteristics and Current Life Quality
Personal Self

The upper tier of **Table 7** shows a number of significant correlations between trainees' Personal Self dimensions and the components

TABLE 1 | Trainees' demographic and professional training characteristics (*N* = 1,214).[1]

	N	%		*N*	%
Nation			**Gender**		
Argentina	44	3.6%	Female	1,055	84.5%
Austria	270	22.2%	Male	194	15.5%
Canada	11	0.9%	**Age** (years)		
Chile	60	4.9%	*M* = 35.8	Med = 33.3	
Finland	242	19.9%	SD = 9.3	Range 19.6–70.4	
Germany	141	11.6%	**Age group**	*N*	%
Italy	231	19.0%	19–29	424	35.3%
Lithuania	31	2.6%	30–39	417	34.7%
Romania	12	1.0%	40–71	361	30.0%
Switzerland	35	2.9%	**Social marginality**		
United Kingdom	123	10.1%	Minority	88	7.5%
United States of America	14	1.2%	Immigrant	123	10.2%
Perceived professional field[2]	*N*	%	**Perceived program orientation**[3]	*N*	%
Psychotherapist	796	83.0%	Analytic/Psychodynamic	444	36.9%
Psychologist	58	6.1%	Behavioral	300	25.0%
Counselor	35	3.7%	Cognitive	379	31.5%
Psychoanalyst	36	3.8%	Cognitive-Behavioral[5]	310	25.8%
Marital therapist/counselor	33	3.4%	Humanistic	390	32.4%
			Interpersonal	410	34.1%
Prior therapy practice[4]			Systemic	263	21.9%
None	609	60.5%	Integrative	436	36.3%
>0 to 1 year	33	3.2%	No salient orientation	39	3.2%
>1 to 2 years	37	3.7%	**Professional training level**		
>2 to 5 years	128	12.7%	Initial Training (0–2 years)	679	67.5%
>5 years	200	19.8%	Advanced Training (>2 years)	328	32.5%

[1]*Ns vary slightly due to occasional missing data.*
[2]*Multiple ratings allowed; N = 958.*
[3]*"Salient" program orientation rated ≥ 8 on 0–10 scale of influence; multiple ratings allowed; Med = 2.*
[4]*N = 1,006.*
[5]*Computed as: Cog + Behav/2.*

measures of Life Quality. (1) There was a moderate positive correlation (ρ = 0.26) of *Genial/Caring* (self-bestowal) with Current Life Satisfaction, and a small but significant inverse correlation (ρ = −0.12) with Current Life Stress. *Practical/Determined* (self-efficacy) also had a small but significant positive correlation (ρ = 0.13) with Current Life Satisfaction. (2) By contrast, *Reclusive/Remote* (self-protection) was modestly but significantly correlated (ρ = 0.19) with Current Life Stress, and negatively correlated (ρ = −0.16) with Current Life Satisfaction. *Forceful/Exacting* (self-assertion) also had a small but significant positive correlation (ρ = 0.11) with Current Life Stress.

Adult Attachment

The lower tier of **Table 7** shows that both Anxious Attachment and Avoidant Attachment were significantly correlated with the component Life Quality dimensions, positively with Current Life Stress (ρ = 0.25 and ρ = 0.13, respectively), and negatively with Current Life Satisfactions (ρ = −0.26 and ρ = −0.18, respectively).

Family Backgrounds and Current Life Quality
Childhood Family Size

No significant associations were found between trainees' current Life Quality and the size of their family of origin (i.e., number of sibs) or their birth order.

Family Backgrounds

Table 8 shows some significant associations between the trainees' current Life Quality and the material/economic level of their childhood families. Nearly three-fourths (72.5%) of the trainees who grew up in materially very comfortable circumstances were experiencing a *Fortunate/Happy* quality of life as adults, and very few (6.4%) had a *Distressed/Troubled* life. By contrast, nearly four times as many (23.4%) of the trainees who grew up in materially insecure/marginal circumstances had a *Distressed/Troubled* quality of life as adults, and less than half (43.3%) were enjoying a *Fortunate/Happy* quality of life.

Family Emotional/Psychological Functioning

The TBIF explored trainee's experiences of their childhood family's emotional atmosphere by asking: "Did the family you grew up in function well emotionally and psychologically?" The response alternatives (0 = Not at all, 1 = Little, 2 = Some, 3 = Moderately, 4 = Greatly, 5 = Very greatly) were condensed for this analysis into three categories: Poor (0–2) for 30.7% of trainees, Moderate (3) for 31.1% of trainees, and Good (4–5) for 38.2% of trainees. In effect, a clear majority (61.8%) of trainees rated their childhood family's emotional atmosphere as poor or moderate at best.

Table 9 shows that trainees who grew up in families with good emotional/psychological functioning were significantly

TABLE 2 | Trainees' current life status and family background.

Marital status	N	%[1]	Current economic/financial situation	N	%[2]
Single (unattached)	205	17.7%			
Single (in a relationship)	207	17.9%	Not at all difficult	288	24.1%
Living with partner	321	27.7%	Slightly difficult	361	30.2%
Married/remarried	391	33.8%	Somewhat difficult	222	18.6%
Divorced/separated	33	2.9%	Moderately difficult	225	18.8%
Parental status			Very difficult	81	6.8%
Have children:	439	36.4%	Extremely difficult	19	1.6%
Family of origin	**N**	**%[3]**	**Family economic level**	**N**	**%[4]**
Only child	159	16.1%	Very comfortable: we had all that we wanted	173	14.4%
2 child family	403	40.7%			
3 child family	241	24.4%	Comfortable: we had all we needed and some extra	508	42.3%
4+ child family	186	18.8%			
Oldest of 2+ children	330	33.4%[5]	Sufficient: had all we needed	342	28.5%
Middle of 3+ children	210	21.28%	Insecure: occasional stress	148	12.3%
Youngest of 2+ children	292	29.5%	Marginal: real hardship	29	2.4%

[1]Based on N = 1,178.
[2]Based on N = 1,214.
[3]Based on N = 989.
[4]Based on N = 1,200.
[5]Based on N = 989 (N = 832, excluding only children).

TABLE 3 | Trainees' current life satisfaction, life stress, and life quality patterns.

How satisfying is your life at present?	N	%	How stressful is your life at present?	N	%
0—Not at all	3	0.3%	0—Not at all	43	3.6%
1—Little	29	2.4%	1—Little	275	23.1%
2—Some	74	6.2%	2—Some	274	23.0%
3—Moderately	325	27.1%	3—Moderately	325	27.3%
4—Greatly	604	50.3%	4—Greatly	235	19.7%
5—Very greatly	165	13.8%	5—Very greatly	39	3.3%
Total	1,200	100.0%	Total	1,191	100.0%

Life quality patterns (N = 1,191)

Current life satisfaction	Current life stress	
	Less than great (0–3)	Great/Very great (4–5)
Great/Very great (4–5)	**Fortunate/Happy** 54.3% (n = 659)	**Intense/Impassioned** 8.7% (n = 104)
Less than great (0–3)	**Low-key/Subdued** 21.7% (n = 258)	**Distressed/Troubled** 14.3% (n = 170)

more likely (63.4%) to have a *Fortunate/Happy* quality of life as adults, especially in contrast to those from psychologically poorly functioning families (46.2%). On the other hand, one-fifth (20.9%) of the trainees who grew up in families with poor emotional/psychological functioning were experiencing a *Distressed/Troubled* life quality, which was more than twice the proportion (9.3%) of those from well-functioning families.

Social and National Aspects of Current Life Quality
Social Marginality
Table 10 presents two measures of social marginality and their relationship to trainees' Current Quality of Life. Being

an immigrant vs. native-born had no relationship to trainees' life quality. However, perceiving oneself as having a minority vs. mainstream status did. Trainees who had a mainstream social identity were significantly more likely than those with a minority identity to be experiencing a *Fortunate/Happy* life quality (56.2% vs. 38.1%). By contrast, trainees with a minority identity were significantly more likely than mainstream trainees to have an *Intense/Impassioned* quality of life (20.2% vs. 8.0%).

National Origins
As research on life quality generally reveals significant differences between countries, we also compared trainees from the six countries with the largest representations in our sample. **Table 11** shows a *Fortunate/Happy* quality of life was enjoyed by significantly large majorities of the trainees from Finland (73.1%) and Austria (65.9%), and by a significantly very much smaller proportion of trainees from Italy (27.2%). The Italian trainees were significantly more likely to be experiencing a *Distressed/Troubled* life at worst (29.5%), or a *Low-key/Subdued* life quality at best (31.7%). There was a significant tendency for one-fifth (20.0%) of the smaller group of trainees from Chile to experience an *Intense/Impassioned* life, even though the majority (56.7%) of those from Chile had a *Fortunate/Happy* quality of life.

DISCUSSION

Using a large multinational sample, the findings illuminate both therapist trainees' variable patterns of life quality and factors meaningfully associated with them. While not involving data on trainees' educational attainments or treatment outcomes of their clients, important clinical questions and possible implications are raised by the findings.

TABLE 4 | Trainees' current life quality by gender and age.[1]

Life quality pattern		Gender[2]			Age group[3,4]			
		Female	Male	Total	Younger (19–29)	Mature (30–39)	Older (40–70)	Total
Fortunate/Happy	n	555	103	658	206	227	219	652
	%	46.7%	8.7%	55.3%	(49.4%)	55.4%	(62.0%)	55.3%
Low-key/	n	215	42	257	105	76	74	255
Subdued	%	18.1%	3.5%	21.6%	25.2%	18.5%	21.0%	21.6%
Intense/	n	88	15	103	42	38	24	104
Impassioned	%	7.4%	1.3%	8.7%	10.1%	9.3%	6.8%	8.8%
Distressed/	n	144	26	170	64	69	36	169
Troubled	%	12.1%	2.2%	14.3%	15.3%	16.8%	10.2%	14.3%
Total	N	1,002	186	1,188	417	410	353	1,180
	%	84.3%	15.6%	100.0%	35.3%	34.5%	29.9%	100.0%

[1]% in bold type indicates cell significantly high at p=0.01 (if in parentheses, at p=0.05); % in underlined italics indicates cell significantly low at p=0.01 (if in parentheses, at p=0.05).
[2]χ^2 = 0.20, df=3, p=ns.
[3]χ^2 = 18.6, df=6, p=0.005 ("Older" more, "Younger" less Fortunate/Happy, p=0.05).
[4]Correlations: age×life satisfaction, ρ=0.09 (p=0.002); age×life stress, ρ=−0.09 (p=0.002).

TABLE 5 | Trainees' current life quality by marital/relationship status.[1,2]

Life quality pattern		Single unattached	Single in a relationship	Living w. partner	Married/ Remarried	Divorced/ Separated	Total
Fortunate/Happy	n	82	100	190	258	16	646
	%	40.6%	48.5%	59.6%	66.3%	48.5%	56.2%
Low-key/Subdued	n	73	57	54	55	10	249
	%	36.1%	27.7%	16.9%	14.1%	30.3%	21.7%
Intense/	n	16	14	29	36	2	97
Impassioned	%	7.9%	6.8%	9.1%	9.3%	6.1%	8.4%
Distressed/Troubled	n	31	35	46	40	5	157
	%	15.3%	17.0%	14.4%	10.3%	15.2%	13.7%
Total	N	202	206	319	389	33	1,149
	%	17.6%	17.9%	27.8%	33.9%	2.9%	100.0%

[1]χ^2 = 63.5, df=12, p<0.001. % in bold type indicates cell significantly high at p=0.01 (if in parentheses, at p=0.05); % in underlined italics indicates cell significantly low at p=0.01 (if in parentheses, at p=0.05).
[2]Differences between parent vs. non-parent within marital status categories, all are p=ns.

Life Quality Patterns

First, happily, it should be observed that more trainees than not experienced their lives as *Fortunate/Happy*, characterized by great or very great life satisfaction and less than great life stress. While little previous research exists on therapist trainees' life satisfaction, the findings fit broadly with a recent study that included measures of life satisfaction and distress, investigating relatively experienced therapists (practice experience level M=13 years), and finding 52% characterizable as well-adapted or high functioning (Laverdière et al., 2018). The most worrisome group in the present study, the 14.3% of trainees in the *Distressed/Troubled* group, also broadly fit with the 10% of experienced therapists in the cited study who were characterized by significant psychological distress. The educationally and clinically relevant concern is obviously how such distress may affect trainees' learning outcomes (Bücker et al., 2018) or therapy practice, in case they currently provide therapy (Beaumont et al., 2016).

Notably, a much higher prevalence has recently been reported for professional burnout, in both experienced therapists (Westwood et al., 2017) and trainees (Kaeding et al., 2017): in fact, in approximately every other professional. Given the divergence in constructs and measures, it is difficult to evaluate whether some degree of burnout—originally operationalized as involving experiences of emotional exhaustion, depersonalization, and low personal accomplishment (Maslach and Jackson, 1981)—may have been experienced by the 14.3% of Distressed/Troubled trainees (i.e., currently experiencing little satisfaction and much stress), who seem the likeliest to suffer work-related distress. Similar questions might be asked about the 8.7% *Intense/Impassioned* trainees (i.e., experiencing both notable life satisfaction and life stress) or the 21.7% *Low-key/Subdued* trainees (i.e., experiencing both little satisfaction and little stress). How may the greater stress experienced by the *Intense/Impassioned* trainees may affect their capacity for learning or focusing on their clients' matters; and likewise, how might the little satisfaction experienced by *Low-key/Subdued* trainees affect their capacity to convey optimism, confidence, and hope to their clients (Orlinsky, 2022)? Indeed,

TABLE 6 | Trainees' current life quality by economic/financial circumstances.[1]

Life quality pattern		Current economic/Financial circumstances			Total
		Not at all difficult	Slightly/ Somewhat difficult	Moderately/ Very difficult	
Fortunate/	n	211	325	120	656
Happy	%	**73.8%**	56.3%	_37.5%_	55.5%
Low-key/	n	41	141	76	258
Subdued	%	_14.3%_	24.4%	23.8%	21.8%
Intense/	n	22	44	36	102
Impassioned	%	7.7%	7.6%	11.3%	8.6%
Distressed/	n	12	67	88	167
Troubled	%	_4.2%_	11.6%	**27.5%**	14.1%
Total	N	286	577	320	1183
	%	24.2%	48.8%	27.0%	100.0%

[1]$\chi^2 = 112.3$, $df = 6$, $p = <0.001$. % in bold type indicates cell significantly high at $p = 0.01$ (if in parentheses, at $p = 0.05$); % in underlined italics indicates cell significantly low at $p = 0.01$ (if in parentheses, at $p = 0.05$).

TABLE 7 | Trainees' current life quality by personal self and attachment style.

Self in close personal relationships		How satisfying is your life?[1]	How stressful is your life?[2]
Genial/Caring ($\alpha = 0.74$)	ρ	0.26**	−0.12**
Forceful/Exacting ($\alpha = 0.76$)	ρ	−0.04	0.11**
Reclusive/Remote ($\alpha = 0.72$)	ρ	−0.16**	0.19**
Practical/ Determined ($\alpha = 0.66$)	ρ	0.13**	0.03
Adult attachment style		How satisfying is your life?[3]	How stressful is your life?[4]
Anxious Attachment ($\alpha = 0.74$)	ρ	−0.26**	0.25**
Avoidant Attachment ($\alpha = 0.80$)	ρ	−0.18**	0.13**

**$p < 0.001$.
[1]$N = 1,190$.
[2]$N = 1,181$.
[3]$N = 1,189$.
[4]$N = 1,180$.

this last question gives reason for looking more closely at what were shown to be the correlates of trainees' life satisfaction and stress.

Correlates of Life Quality Patterns

First, gender differences were essentially non-existent for life satisfaction, in line with prior literature (Diener et al., 1999; Geerling and Diener, 2020). Previous research has also found life satisfaction to often follow a U-shaped curve with age, with happiness levels reaching a low sometime in the 40s (Diener et al., 2018). Our results supported that partially, in that older therapists were most often *Fortunate/Happy*; and perhaps mirroring also cross-cultural studies on personality

development, indicating that people tend to become lower in neuroticism (or negative affectivity) as they age (McCrae et al., 1999, 2000).

In line with early meta-analyses (Haring-Hidore et al., 1985; Wood et al., 1989), the findings also showed married trainees to be happier, although some research suggests that as people adapt to marriage, long-term life satisfaction may be little different than before it (Luhmann et al., 2012). At any rate, however, the freedom of single or unattached trainees did not seem to add to their life quality but rather vice versa, in line with prior studies (Myers, 2000). Another finding in line with prior literature (Diener et al., 2018) was that trainees' current economic circumstances were an unequivocal correlate of life satisfaction. Of the trainees experiencing moderately to very difficult finances, one of two were either *Distressed/Troubled* or *Low-key/Subdued*. These findings are important from a policy perspective, as they underline how societal factors such as availability of affordable student loans and employment situation contribute to life satisfaction and stress (Diener et al., 2018).

Aspects of personality, as expressed in close personal relationships, also correlated significantly, and in expectable ways, with trainee life quality. The strongest correlate was for Genial/Caring style ($\rho = 0.26$), which corresponded in size with the second-strongest Big 5 personality trait correlate of life satisfaction from meta-analyses, *Extraversion* ($r = 0.28$; Steel et al., 2008). Indeed, a Genial/Caring or *self-bestowing* self-experience may overlap (1) with Extraversion in terms of a generally friendly and open disposition toward others, and (2) with another Big 5 personality correlate of life satisfaction, i.e., *Agreeableness* ($r = 0.14$), a warm, kind, and cooperative disposition (Steel et al., 2008). The capacity for trusting relationships emerged as significant but somewhat less important correlates both life satisfaction and stress, as Life Satisfaction was associated negatively ($\rho = -0.16$) and Life Stress positively ($\rho = 0.19$) with being Reclusive/Remote or *self-protective* in close personal relationships. Greater Anxious attachment and Avoidant attachment were also linked to greater Life Stress ($\rho = 0.25$ and 0.13) and lower Life Satisfaction ($\rho = -0.26$ and -0.18). Recalling that Secure attachment is the opposite of anxious and avoidant attachment, these correlations show how much a capacity for more Secure attachment (e.g., as reflected in marital status) may help individuals attain a positive quality of life.

While the findings above are in line with studies indicating the contribution of (perceived) social relationships and support for life satisfaction (Geerling and Diener, 2020), it should be noted that the mechanisms linking personality and life satisfaction are still not well understood (Diener et al., 2018). For instance, given that self-report measures are often used for assessing both constructs, as also in the present study, it is not clear whether more open, sociable, or trusting people are better able to form relationships and that increases their life satisfaction; or, whether certain people have an overall tendency to see their life, personality, and relationships in more positive terms (Steel et al., 2008; Diener et al., 2018). The observed associations in the present and prior studies

TABLE 8 | Trainees' current life quality by family economic background.[1,2]

Life quality pattern		Family economic background				Total
		Very comfortable: had all we wanted	Comfortable: had all we needed + some extra	Sufficient: had all we needed but just that	Insecure/Marginal: serious want and worries	
Fortunate/Happy	n	124	291	167	74	656
	%	**72.5%**	57.7%	49.6%	*43.3%*	55.5%
Low-key/Subdued	n	25	111	78	43	257
	%	14.6%	22.0%	23.1%	25.1%	21.7%
Intense/Impassioned	n	11	45	32	14	102
	%	6.4%	8.9%	9.5%	8.2%	8.6%
Distressed/Troubled	n	11	57	60	40	168
	%	*(6.4%)*	11.3%	17.8%	**23.4%**	14.2%
Total	N	171	504	337	171	1183
	%	14.5%	42.6%	28.5%	14.5%	100.0%

[1]$\chi^2 = 46.2$, $df = 9$, $p < 0.001$. % in bold type indicates cell significantly high at $p = 0.01$ (if in parentheses, at $p = 0.05$); % in underlined italics indicates cell significantly low at $p = 0.01$ (if in parentheses, at $p = 0.05$).
[2]Correlation of family economic background X current life satisfaction, $\rho = 0.18$ ($p < 0.001$); family economic background X current life stress, $\rho = -0.14$ ($p < 0.001$).

TABLE 9 | Trainees' current life quality by family of origin emotional function.[1,2]

Life quality pattern		Family emotional and psychological functioning			Total
		Poor (0–2)	Moderate (3)	Good (4–5)	
Fortunate/ Happy	n	168	200	288	656
	%	*46.2%*	54.2%	**63.4%**	55.3%
Low-key/ Subdued	n	95	87	76	258
	%	26.1%	23.6%	*16.7%*	21.7%
Intense/ Impassioned	n	25	31	48	104
	%	6.9%	8.4%	10.6%	8.8%
Distressed/ Troubled	n	76	51	42	169
	%	**20.9%**	13.8%	*9.3%*	14.2%
Total	N	364	369	454	1187
	%	30.7%	31.1%	38.2%	100.0%

[1]$\chi^2 = 42.5$, $df = 6$, $p < 0.001$. % in bold type indicates cell significantly high at $p = 0.01$ (if in parentheses, at $p = 0.05$); % in underlined italics indicates cell significantly low at $p = 0.01$ (if in parentheses, at $p = 0.05$).
[2]Correlation of family emotional functioning X current life satisfaction, $\rho = 0.22$ ($p < 0.001$); family emotional functioning X current life stress, $\rho = -0.14$ ($p < 0.001$).

nevertheless suggest that creating a trusting and positive group atmosphere in therapist training might benefit both trainees' life satisfaction but also their learning outcomes (Clément et al., 1994; Bücker et al., 2018; Reschke et al., 2021).

It is important to recognize how current adult life quality may also be influenced by earlier life circumstances. In the present study, trainees' poorer life quality was notably associated with poorer family economic background as well as poorer family psychological and emotional functioning. This fits well with large-scale longitudinal studies showing adverse childhood experiences—including both financial strain as well as psychological and emotional dysfunction—predict severely reduced life quality (Nurius et al., 2015; Mosley-Johnson et al., 2019). From an intervention perspective, the important question then is which resilience resources may counteract these risks—such as having a sense of community, social integration, and emotional and social support, which have been found to beneficially moderate the effects of early adverse experiences in adulthood (Nurius et al., 2015). Indeed, an obvious further resource which may offer these social and emotional benefits are supervisory support and personal therapy, an often though not always required feature of training programs. Given the remarkable prevalence of early adversities and trauma in therapists (Pope and Feldman-Summers, 1992; Feldman-Summers and Pope, 1994; Orlinsky, 2022), this part of training may well be valuable and is also frequently rated by therapists as being so (Orlinsky and Rønnestad, 2005).

Lastly, in terms of social, cultural, and national origins of life quality, we also found that trainees who recognize they would be viewed in their society as a minority person are less often *Fortunate/Happy* and more often experiencing great stress (although also life satisfaction), tending to have a more *Intense/Impassioned* life. This finding was also in line with prior literature, which has found both ethnic and sexual minorities to experience greater stress (Cochran et al., 2003; Ramirez and Paz Galupo, 2019). Apart from its general policy making implications on a societal level, therapist training programs would also do well to attend to their trainees' minority experience, and thus promote inclusiveness in both training and conduct of therapy (Davis et al., 2018).

In the same domain, we saw life quality to be notably associated with nationality itself. The most striking observation was the exceptionally frequent distress of Italian trainees. Although the direction of the findings fits with prior findings in comparison to some of other Western European countries, such as Austria, Germany, and Finland (Abdallah et al., 2008; Park et al., 2009), the size of the effect was nevertheless surprisingly large. As within-nation changes in happiness are typically also relatively small (Veenhoven and Hagerty, 2006), this finding may be partly attributable to confounding factors, e.g., greater financial distress among Italian trainees, which need further clarification.

TABLE 10 | Trainees' current life quality by social marginality.

Life quality pattern		Minority status[1]			Immigrant status[2]		
		Minority	Mainstream	Total	Immigrant	Native	Total
Fortunate/Happy	n	32	604	636	68	590	658
	%	*38.1%*	**56.2%**	54.9%	57.1%	55.2%	55.4%
Low-key/Subdued	n	21	233	254	26	231	257
	%	25.0%	21.7%	21.9%	21.8%	21.6%	21.7%
Intense/	n	17	86	103	11	93	104
Impassioned	%	**20.2%**	*8.0%*	8.9%	9.2%	8.7%	8.8%
Distressed/Troubled	n	14	152	166	14	154	168
	%	16.7%	14.1%	14.3%	11.8%	14.4%	14.2%
Total	N	84	1,075	1,159	119	1,068	1,187
	%	7.2%	92.8%	100.0%	10.0%	90.0%	100.0%

[1]$\chi^2 = 18.5$, $df = 3$, $p < 0.001$. % in bold type indicates cell significantly high at $p = 0.01$ (if in parentheses, at $p = 0.05$); % in underlined italics indicates cell significantly low at $p = 0.01$ (if in parentheses, at $p = 0.05$).
[2]$\chi^2 = 0.64$, $df = 3$, $p = ns$.

TABLE 11 | Trainees' current life quality by nation.[1]

Life quality pattern		Austria	Chile	Finland	Germany	Italy	United Kingdom	Total
Fortunate/Happy	n	178	34	171	77	61	61	582
	%	**65.9%**	56.7%	**73.1%**	54.6%	*27.2%*	49.6%	55.3%
Low-key/	n	53	6	38	36	71	32	236
Subdued	%	19.6%	10.0%	16.2%	25.5%	**31.7%**	26.0%	22.4%
Intense/	n	18	12	10	10	26	12	88
Impassioned	%	6.7%	**20.0%**	4.3%	7.1%	11.6%	9.8%	8.4%
Distressed/	n	21	8	15	18	66	18	146
Troubled	%	*(7.8%)*	13.3%	*6.4%*	12.8%	**29.5%**	14.6%	13.9%
Total	N	270	60	234	141	224	123	1,052
	%	25.7%	5.7%	22.2%	13.4%	21.3%	11.7%	100.0%

[1]$\chi^2 = 145.2$, $df = 15$, $p = <0.001$. % in bold type indicates cell significantly high at $p = 0.01$ (if in parentheses, at $p = 0.05$); % in underlined italics indicates cell significantly low at $p = 0.01$ (if in parentheses, at $p = 0.05$).

Methodological Limitations

The study involved a few major strengths. First, a comprehensive self-report instrument enabled covering a multitude of plausible determinants of life quality. Second, the large, multinational sample allowed identifying relatively subtle associations which, even if small, shed light on the nuances of trainees' quality of life. Third, assessing both life satisfaction and stress allowed for a more balanced picture of life quality than assessing either one alone.

The study also involved some limitations common to life satisfaction research. First, the generalizability of the findings is unknown, since the sample was mostly based on convenience samples, representing ongoing training programs during the study years only in a few mostly European countries (e.g., Austria, Finland, and Italy), and even in these countries, percentages and data of non-responders are not available. However, the associations between life satisfactions and its correlates reflected largely findings of prior literature, supporting the validity and reliability of the present findings. Second, both life satisfaction and life stress were assessed as unidimensional measures, which might result in different answers in different contexts. However, studies have shown that even single-item measures in this area have moderately high reliability and validity, in addition to being most feasible for use in large-scale studies (Diener et al., 2018). Third, the cross-sectional design cannot establish temporal precedence on whether life satisfaction is preceded by some factors (e.g., marriage status), or vice versa, or if a third underlying variable is responsible for both of them. On the other hand, many of the variables in the present study reflect "objective" trainee characteristics (e.g., nationality, minority status, age) that would not be influenced by subjective life quality or reflect past situations (e.g., childhood economic background) that would not be influenced by current life quality, even if the mechanisms that link them to life satisfaction call for closer study. Fourth, relatedly, measurement issues have been raised regarding the common practice of assessing life satisfaction and its determinants retrospectively and by the same person (Nivison et al., 2021). While daily experience-sampling and day-reconstruction procedures have been suggested for achieving a more refined picture of experienced life satisfaction, these solutions remain labor-intensive and not feasible to implement in all research contexts (Diener et al., 2018).

General Implications and Future Perspectives

There is sometimes a popular if implicit assumption that as the professionals of mental health, therapists must have the secret

to the "good life" and thus also possess it. Equally, there may sometimes be a moralistic assumption that therapists *should* have it—for if one is not capable of living well oneself, how can one help others to do so? Yet the present study on therapist trainees indicates that even if they are a highly self-selected group of people by virtue of their preferred profession—and this self-selection may also be evidenced in some of their personality-related or relational qualities (Peter et al., 2017; Peter and Wolf, 2021)—therapist trainees appear subject to the same sources of life satisfaction and stress as people in general, just as good physicians can themselves be well or fall ill.

Given the findings that life satisfaction can substantially affect learning outcomes (Bücker et al., 2018), and more specifically in the case of therapists can affect their therapeutic relationships (Nissen-Lie et al., 2013), our results call for serious thinking about how to protect trainees' life quality when it is good and how to raise it when it is deficient. As suggested in this study, some interventions may be targeted on a societal level (e.g., availability of low-cost student loans); some on a training program level (e.g., promoting supportive supervision and positive between-trainee relationships); and some on an individual level (e.g., providing personal therapy and learning positive self-care). Clearly further research is warranted to investigate how such interventions or even training curricula may promote a favorable balance trainees' levels of life satisfaction and stress, and how both directly influence their learning and treatment outcomes.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

REFERENCES

Abdallah, S., Thompson, S., and Marks, N. (2008). Estimating worldwide life satisfaction. *Ecol. Econ.* 65, 35–47.

Barkham, M., Lutz, W., and Castonguay, L. (eds.) (2021). *Bergin and Garfield's Handbook of Psychotherapy and Behavior Change. 7th Edn.* New York: Wiley.

Beaumont, E., Durkin, M., Hollins Martin, C. J., and Carson, J. (2016). Measuring relationships between self-compassion, compassion fatigue, burnout and well-being in student counsellors and student cognitive behavioural psychotherapists: a quantitative survey. *Couns. Psychother. Res.* 16, 15–23. doi: 10.1002/capr.12054

Beutler, L. E., Malik, M., Alimohamed, S., Harwood, T. M., Talebi, H., Noble, S., et al. (2004). "Therapist variables," in *Handbook of Psychotherapy and Behavior Change. 5th Edn.* ed. M. J. Lambert (New York: Wiley), 227–305.

Brugnera, A., Zarbo, C., Compare, A., Talia, A., Tasca, G. A., De Jong, K., et al. (2020). Self-reported reflective functioning mediates the association between attachment insecurity and well-being among psychotherapists. *Psychother. Res.* 31, 247–257. doi: 10.1080/10503307.2020.1762946

Bücker, S., Nuraydin, S., Simonsmeier, B. A., Schneider, M., and Luhmann, M. (2018). Subjective well-being and academic achievement: a meta-analysis. *J. Res. Pers.* 74, 83–94. doi: 10.1016/j.jrp.2018.02.007

Chattu, V. K., Sahu, P. K., Seedial, N., Seecharan, G., Seepersad, A., and Seunarine, M., and Singh, A. (2020). Subjective well-being and its relation to academic performance among students in medicine, dentistry, and other health professions. *Educ. Sci.* 10, 224, doi: 10.3390/educsci10090224.

Clément, R., Dörnyei, Z., and Noels, K. A. (1994). Motivation, self-confidence, and group cohesion in the foreign language classroom. *Lang. Learn.* 44, 417–448. doi: 10.1111/j.1467-1770.1994.tb01113.x

Cochran, S. D., Sullivan, J. G., and Mays, V. M. (2003). Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *J. Consult. Clin. Psychol.* 71, 53–61. doi: 10.1037/0022-006X.71.1.53

Coster, J., and Schwebel, M. (1997). Well-functioning in professional psychologists. *Prof. Psychol. Res. Pr.* 28, 5–13. doi: 10.1037/0735-7028.28.1.5

Dahlin, M., Joneborg, N., and Runeson, B. (2005). Stress and depression among medical students: a cross-sectional study. *Med. Educ.* 39, 594–604. doi: 10.1111/j.1365-2929.2005.02176.x

Davies, S. M., Sriskandarajah, S., Staneva, A. S., Boulton, H. C., Roberts, C., Shaw, S. H., et al. (2021). Factors influencing 'burn-out' in newly qualified counsellors and psychotherapists: a cross-cultural, critical review of the literature. *Couns. Psychother. Res.* 1, 64–73. doi: 10.1002/capr.12485

Davis, D. E., DeBlaere, C., Owen, J., Hook, J. N., Rivera, D. P., and Choe, E., et al. (2018). The multicultural orientation framework: a narrative review. *Psychotherapy* 55, 89, 100, doi: 10.1037/pst0000160.

Delgadillo, J., Saxon, D., and Barkham, M. (2018). Associations between therapists' occupational burnout and their patients' depression and anxiety treatment outcomes. *Depress. Anxiety* 35, 844–850. doi: 10.1002/da.22766

Delle Fave, A., Brdar, I., Wissing, M. P., Araujo, U., Castro Solano, A., Freire, T., et al. (2016). Lay definitions of happiness across nations: the primacy of inner harmony and relational connectedness. *Front. Psychol.* 7, 30. doi: 10.3389/fpsyg.2016.00030

Diener, E., Lucas, R. E., Oishi, S., Hall, N., and Donnellan, M. B. (2018). Advances and open questions in the science of subjective well-being. *Psychol.* 4:15. doi: 10.1525/collabra.115

Diener, E., Suh, E. M., Lucas, R. E., and Smith, H. L. (1999). Subjective well-being: three decades of progress. *Psychol. Bull.* 125, 276–302. doi: 10.1037/0033-2909.125.2.276

Feldman-Summers, S., and Pope, K. S. (1994). The experience of" forgetting" childhood abuse: a national survey of psychologists. *J. Consult. Clin. Psychol.* 62, 636–639. doi: 10.1037/0022-006X.62.3.636

Frijters, P., Johnston, D. W., and Shields, M. A. (2014). Does childhood predict adult life satisfaction? Evidence from British cohort surveys. *Econ. J.* 124, F688–F719. doi: 10.1111/ecoj.12085

Garfield, S. L., and Bergin, A. E. (eds.) (1971). *Handbook of Psychotherapy and Behavior Change. 3rd Edn.* New York: Wiley.

Geerling, D. M., and Diener, E. (2020). Effect size strengths in subjective well-being research. *Appl. Res. Qual. Life* 15, 167–185. doi: 10.1007/s11482-018-9670-8

Guy, J. D., Poelstra, P. L., and Stark, M. J. (1989). Personal distress and therapeutic effectiveness: national survey of psychologists practicing psychotherapy. *Prof. Psychol. Res. Pr.* 20, 48–50. doi: 10.1037/0735-7028.20.1.48

Hackney, C. H., and Sanders, G. S. (2003). Religiosity and mental health: a meta–analysis of recent studies. *J. Sci. Study Relig.* 42, 43–55. doi: 10.1111/1468-5906.t01-1-00160

Haring-Hidore, M., Stock, W. A., Okun, M. A., and Witter, R. A. (1985). Marital status and subjective well-being: a research synthesis. *J. Marriage Fam.* 47, 947–953. doi: 10.2307/352338

Heinonen, E., and Nissen-Lie, H. A. (2019). The professional and personal characteristics of effective psychotherapists: a systematic review. *Psychother. Res.* 30, 417–432. doi: 10.1080/10503307.2019.1620366

Kaeding, A., Sougleris, C., Reid, C., van Vreeswijk, M. F., Hayes, C., Dorrian, J., et al. (2017). Professional burnout, early maladaptive schemas, and physical health in clinical and counselling psychology trainees. *J. Clin. Psychol.* 73, 1782–1796. doi: 10.1002/jclp.22485

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., and Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch. Gen. Psychiatry* 62, 593–602. doi: 10.1001/archpsyc.62.6.593

Lambert, M. (ed.) (2004). *Bergin and Garfield's Handbook of Psychotherapy and Behavior Change. 5th Edn.* New York: Wiley.

Laverdière, O., Kealy, D., Ogrodniczuk, J. S., and Morin, A. J. (2018). Psychological health profiles of Canadian psychotherapists: a wake up call on psychotherapists' mental health. *Can. Psychol.* 59, 315–322. doi: 10.1037/cap0000159

Leary, T. (1957). Interpersonal diagnosis of personality. New York: Ronald Press.

Lee, M. K., Kim, E., Paik, I. S., Chung, J., and Lee, S. M. (2020). Relationship between environmental factors and burnout of psychotherapists: meta-analytic approach. *Couns. Psychother. Res.* 20, 164–172. doi: 10.1002/capr.12245

Lucas, R. E., and Schimmack, U. (2009). Income and well-being: how big is the gap between the rich and the poor? *J. Res. Pers.* 43, 75–78. doi: 10.1016/j.jrp.2008.09.004

Luhmann, M., Hofmann, W., Eid, M., and Lucas, R. E. (2012). Subjective well-being and adaptation to life events: a meta-analysis. *J. Pers. Soc. Psychol.* 102, 592–615. doi: 10.1037/a0025948

Maslach, C., and Jackson, S. E. (1981). The measurement of experienced burnout. *J. Organ. Behav.* 2, 99–113.

McCrae, R. R., Costa, P. T., de Lima, M. P., Simões, A., Ostendorf, F., Angleitner, A., et al. (1999). Age differences in personality across the adult life span: parallels in five cultures. *Dev. Psychol.* 35, 466–477. doi: 10.1037/0012-1649.35.2.466

McCrae, R. R., Costa, P. T. Jr., Ostendorf, F., Angleitner, A., Hřebíčková, M., Avia, M. D., et al. (2000). Nature over nurture: temperament, personality, and life span development. *J. Pers. Soc. Psychol.* 78, 173–186. doi: 10.1037/0022-3514.78.1.173

Messina, I., Gullo, S., Gelo, O. C. G., Giordano, C., and Salcuni, S. (2019). An overview of the Italian contribution to the international multisite SPRISTAD study on psychotherapy training. *Res. Psychother.* 22:418. doi: 10.4081/ripppo.2019.418

Mosley-Johnson, E., Garacci, E., Wagner, N., Mendez, C., Williams, J. S., and Egede, L. E. (2019). Assessing the relationship between adverse childhood experiences and life satisfaction, psychological well-being, and social well-being: United States longitudinal cohort 1995–2014. *Qual. Life Res.* 28, 907–914. doi: 10.1007/s11136-018-2054-6

Myers, D. G. (2000). The funds, friends, and faith of happy people. *Am. Psychol.* 55, 56–67. doi: 10.1037/0003-066X.55.1.56

Nerdrum, P., Rustøen, T., and Helge Rønnestad, M. (2009). Psychological distress among nursing, physiotherapy and occupational therapy students: a longitudinal and predictive study. *Scand. J. Educ. Res.* 53, 363–378. doi: 10.1080/00313830903043133

Nissen-Lie, H. A., Havik, O. E., Høglend, P. A., Monsen, J. T., and Rønnestad, M. H. (2013). The contribution of the quality of therapists' personal lives to the development of the working alliance. *J. Couns. Psychol.* 60, 483–495. doi: 10.1037/a0033643

Nissen-Lie, H. A., Orlinsky, D. E., and Rønnestad, M. H. (2021). The emotionally burdened psychotherapist: personal and situational risk factors. *Prof. Psychol.* 52, 429–438. doi: 10.1037/pro0000387

Nivison, M. D., Lowe Vandell, D., Booth-LaForce, C., and Roisman, G. I. (2021). Convergent and discriminant validity of retrospective assessments of the quality of childhood parenting: prospective evidence from infancy to age 26 years. *Psychol. Sci.* 32, 721–734. doi: 10.1177/0956797620975775

Nurius, P. S., Green, S., Logan-Greene, P., and Borja, S. (2015). Life course pathways of adverse childhood experiences toward adult psychological well-being: a stress process analysis. *Child Abuse Negl.* 45, 143–153. doi: 10.1016/j.chiabu.2015.03.008

Oishi, S., Diener, E., Suh, E., and Lucas, R. E. (1999). Value as a moderator in subjective well-being. *J. Pers.* 67, 157–184. doi: 10.1111/1467-6494.00051

Orlinsky, D.E., (2022). *How Psychotherapists Live: The Personal Self and Private Life of Professional Healers.* New York: Routledge.

Orlinsky, D. E., and Rønnestad, M. H. (2005). *How Psychotherapists Develop: A Study of Therapeutic Work and Professional Growth.* Washington, DC: APA Books.

Orlinsky, D. E., Rønnestad, M. H., Hartmann, A., Heinonen, E., and Willutzki, U. (2019). The personal self of psychotherapists: dimensions, correlates, and relations with clients. *J. Clin. Psychol.* 76, 461–475. doi: 10.1002/jclp.22876

Park, N., Peterson, C., and Ruch, W. (2009). Orientations to happiness and life satisfaction in twenty-seven nations. *J. Posit. Psychol.* 4, 273–279.

Peter, B., Böbel, E., Hagl, M., Richter, M., and Kazén, M. (2017). Personality styles of German-speaking psychotherapists differ from a norm, and male psychotherapists differ from their female colleagues. *Front. Psychol.* 8:840. doi: 10.3389/fpsyg.2017.00840

Peter, B., and Wolf, T. G. (2021). Replication studies on significant differences in personality profiles of securely and insecurely attached psychotherapists and dentists. *Front. Psychol.* 12:662828. doi: 10.3389/fpsyg.2021.662828

Pope, K. S., and Feldman-Summers, S. (1992). National survey of psychologists' sexual and physical abuse history and their evaluation of training and competence in these areas. *Prof. Psychol. Res. Pr.* 23, 353–361. doi: 10.1037/0735-7028.23.5.353

Ramirez, J. L., and Paz Galupo, M. (2019). Multiple minority stress: the role of proximal and distal stress on mental health outcomes among lesbian, gay, and bisexual people of color. *J. Gay Lesbian Ment. Health* 23, 145–167. doi: 10.1080/19359705.2019.1568946

Reschke, D. J., Dawber, C., Millear, P. M., and Medoro, L. (2021). Group clinical supervision for nurses: process, group cohesion and facilitator effect. *Aust. J. Adv. Nurs.* 38. doi: 10.37464/2020.383.221

Schimmack, U., Oishi, S., Furr, R. M., and Funder, D. C. (2004). Personality and life satisfaction: a facet-level analysis. *Personal. Soc. Psychol. Bull.* 30, 1062–1075. doi: 10.1177/0146167204264292

Schröder, T., Wiseman, H., and Orlinsky, D. (2009). "You were always on my mind": therapists' intersession experiences in relation to their therapeutic practice, professional characteristics, and quality of life. *Psychother. Res.* 19, 42–53. doi: 10.1080/10503300802326053

Simionato, G. K., and Simpson, S. (2018). Personal risk factors associated with burnout among psychotherapists: a systematic review of the literature. *J. Clin. Psychol.* 74, 1431–1456. doi: 10.1002/jclp.22615

Steel, K., Macdonald, J., Schröder, T., and Mellor-Clark, J. (2015). Exhausted but not cynical: burnout in therapists working within improving access to psychological therapy services. *J. Ment. Health* 24, 33–37. doi: 10.3109/09638237.2014.971145

Steel, P., Schmidt, J., and Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychol. Bull.* 134, 138–161. doi: 10.1037/0033-2909.134.1.138

Tenney, E. R., Poole, J. M., and Diener, E. (2016). Does positivity enhance work performance? Why, when, and what we don't know. *Res. Organ. Behav.* 36, 27–46. doi: 10.1016/j.riob.2016.11.002

Veenhoven, R., and Hagerty, M. (2006). Rising happiness in nations 1946–2004: a reply to Easterlin. *Soc. Indic. Res.* 79, 421–436. doi: 10.1007/s11205-005-5074-x

Wei, M., Russell, D. W., Mallinckrodt, B., and Vogel, D. L. (2007). The Experiences in Close Relationship Scale (ECR)-short form: Reliability, validity, and factor structure. *J. Pers. Assess.* 88, 187–204.

Westwood, S., Morison, L., Allt, J., and Holmes, N. (2017). Predictors of emotional exhaustion, disengagement and burnout among improving access to psychological therapies (IAPT) practitioners. *J. Ment. Health* 26, 172–179. doi: 10.1080/09638237.2016.1276540

Wood, W., Rhodes, N., and Whelan, M. (1989). Sex differences in positive well-being: a consideration of emotional style and marital status. *Psychol. Bull.* 106, 249–264. doi: 10.1037/0033-2909.106.2.249

Neural Effects of Cognitive Behavioral Therapy in Psychiatric Disorders: A Systematic Review and Activation Likelihood Estimation Meta-Analysis

Shiting Yuan[1], Huiqin Wu[1], Yun Wu[2], Huazhen Xu[1], Jianping Yu[1], Yuan Zhong[2], Ning Zhang[1,3,4], Jinyang Li[1], Qianwen Xu[2] and Chun Wang[1,2,3,4]*

[1] Nanjing Brain Hospital Affiliated to Nanjing Medical University, Nanjing, China, [2] School of Psychology, Nanjing Normal University, Nanjing, China, [3] Functional Brain Imaging Institute of Nanjing Medical University, Nanjing, China, [4] Cognitive Behavioral Therapy Institute of Nanjing Medical University, Nanjing, China

Background: Cognitive behavioral therapy (CBT) is a first-line psychotherapeutic treatment that has been recommended for psychiatric disorders. Prior neuroimaging studies have provided preliminary evidence suggesting that CBT can have an impact on the activity of brain regions and functional integration between regions. However, the results are far from conclusive. The present article aimed to detect characteristic changes in brain activation following CBT across psychiatric disorders.

Method: Web of Science, Cochrane Library, Scopus, and PubMed databases were searched to identify whole-brain functional neuroimaging studies of CBT through 4 August 2021. To be included in the meta-analysis, studies were required to examine functional activation changes between pre-and post-CBT. The included studies were then divided into subgroups according to different task paradigms. Then, an activation likelihood estimation algorithm (ALE) was performed in the different meta-analyses to identify whether brain regions showed consistent effects. Finally, brain regions identified from the meta-analysis were categorized into eight functional networks according to the spatial correlation values between independent components and the template.

Results: In total, 13 studies met inclusion criteria. Three different meta-analyses were performed separately for total tasks, emotion tasks, and cognition tasks. In the total task ALE meta-analysis, the left precuneus was found to have decreased activation. For the cognition task ALE meta-analysis, left anterior cingulate (ACC) and left middle frontal gyrus (MFG) were found to have decreased activation following CBT. However, the emotion task ALE meta-analysis did not find any specific brain regions showing

consistent effects. A review of included studies revealed default mode network (DMN), executive control network (ECN), and salience network (SN) were the most relevant among the eight functional networks.

Conclusion: The results revealed that the altered activation in the prefrontal cortex and precuneus were key regions related to the effects of CBT. Therefore, CBT may modulate the neural circuitry of emotion regulation. This finding provides recommendations for the rapidly developing literature.

Keywords: cognitive behavioral therapy (CBT), psychiatric disorder, neuroimaging, meta-analysis, brain network

INTRODUCTION

Cognitive-behavioral therapy (CBT) is a first-line psychotherapeutic treatment that has been proven effective in treating a variety of psychiatric disorders such as major depressive disorder (MDD), anxiety disorder (AD), and obsessive-compulsive disorder (OCD) (Butler et al., 2006; Beck and Dozois, 2011; Hofmann et al., 2012; McMain et al., 2015). This psychotherapy, pioneered by Ellis (1962) and Beck (1970), focuses on identifying maladaptive cognitions and modifying behavioral patterns to alleviate clinical symptoms and improve function (Beck and Dozois, 2011; Hofmann et al., 2012). Moreover, CBT may promote change in conflict and inflexible appraisals of emotional, cognitive, physiological, and social states by reducing avoidance in experience and behavior (McMain et al., 2015).

Many studies have demonstrated the efficacy of CBT in psychiatric disorders (Butler et al., 2006; Hofmann et al., 2012; Van Dis et al., 2020; Matsumoto et al., 2021). 269 quantitative meta-analyses were identified in a review to verify the effectiveness of CBT for psychiatric disorders. And a subsample of 11 meta-analyses was compared response rates between CBT and other treatments. The result showed CBT was highly effective for depression, anxiety disorders, cannabis, and nicotine dependence. And CBT demonstrated superior efficacy as compared to other forms of psychotherapies in personality disorders, bulimia, positive symptoms in schizophrenia (Hofmann et al., 2012). A study showed that a pooled effect size (Hedge g) post-treatment of −0.49 (95% CI −0.68 to −0.29), which indicated CBT had a significant effect on psychiatric disorders (Matsumoto et al., 2021). Moreover, much evidence addressed that CBT produced long-term persistence of therapeutic effects following the termination of treatment (Butler et al., 2006; Van Dis et al., 2020). A meta-analysis suggested CBT was related to symptom improvement in social anxiety disorder (Hedges g, 0.42; k = 3), generalized anxiety disorder [Hedges g, 0.22; the number of studies (k) = 10], posttraumatic

stress disorder (Hedges g, 0.84; k = 5), after 2-month follow-up (Van Dis et al., 2020). Similar findings were observed in depression. A meta-analysis found that there was the same effect between antidepressant medication and CBT at follow-up (Cuijpers et al., 2013).

With the development of neuroimaging technology, many non-invasive techniques such as magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), functional magnetic resonance imaging (fMRI), single-photon emission computed tomography (SPECT), and positron emission tomography (PET) are being utilized to identify structural and functional brain alterations in psychiatric disorders. Whether the subject was in the resting state or in performing a specific task, changes in blood oxygenation level-dependent can be monitored through fMRI (Chen and Glover, 2015). Thus, task-based fMRI was employed to identify functional neuroanatomical networks associated with specific task states (Baggio and Junqué, 2019).

Previous neuroimaging studies have reported abnormalities in brain regions and networks in psychiatric disorders (Goodkind et al., 2015; McTeague et al., 2020). However, most studies focused on structural and functional brain alterations of a specific diagnosis. Although different psychiatric disorders had characteristic clinical presentations, there have common functional impairments in cognition, emotion, behavior, and socio-occupational impairment. Previous transdiagnostic studies had evidenced that the abnormalities in the insula, the dorsal anterior cingulate (dACC), the dorsolateral prefrontal cortex (dlPFC) were associated with cognitive dysfunction (Goodkind et al., 2015). And hyperconnectivity was identified between the salience network (SN), the default mode network (DMN), and the frontoparietal network (FPN). These network alterations were related to cognitive deficits (Sha et al., 2019). Furthermore, the disrupted emotional processing was associated with abnormal activation in the prefrontal regions, the amygdala, the hippocampal/parahippocampal gyri, the thalamus, and the fusiform gyrus (McTeague et al., 2020).

Neuroimaging of CBT has increased enormously over the past several decades and increasing evidence has already documented the relationship between neural changes and symptomatic improvement following CBT for psychiatric disorders.

There exists fairly robust evidence documenting alterations in prefrontal cortical regions and functionally related structures following CBT. A systematic review showed that the most

---

Abbreviations: CBT, cognitive training; ALE, activation likelihood estimation; DMN, default mode network; ECN, executive control network; SN, salience network; ACC, anterior cingulate; MFG, middle frontal gyrus; DMN, default mode network; ECN, executive control network; SN, salience network; MDD, major depressive disorder; AD, anxiety disorder; OCD, obsessive-compulsive disorder; FAR, Facial Affect Recognition; MRI, magnetic resonance imaging; fMRI, functional magnetic resonance imaging; PET, positron emission tomography; PCC, posterior cingulate cortex; OFC/VLPFC, orbitofrontal cortex/dorsomedial prefrontal cortex; PTSD, post-traumatic stress disorder.

common regions altered by CBT included ACC, posterior cingulate cortex (PCC), and orbitofrontal cortex/dorsomedial prefrontal cortex (OFC/VLPFC). Furthermore, the decreased activity in dorsal anterior cingulate (dACC) following CBT was in line with a model of information processing that described a ventral affective circuit and a dorsal cognitive circuit (Franklin et al., 2016). Another review identified that CBT was related to bilateral deactivation of ACC for specific phobia (Ipser et al., 2013). In addition, a meta-analysis found that compared with healthy controls, activation of ACC/PFC was significantly decreased in negative valence disorders, though activity was normalized in patients following CBT (La Buissonniere-Ariza et al., 2021). Furthermore, a study identified that activation of PFC and posterior cingulate cortex (PCC) were decreased after CBT in insomnia. This study suggested that PFC and PCC were associated with sleep-related attention (Kim et al., 2017). Perhaps CBT affects cognitive and emotional processes through ACC (La Buissonniere-Ariza et al., 2021).

Similarly, altered activation was also reported in the insula and amygdala. For example, a meta-analysis identified that the insula and amygdala were consistently responsive to phobic stimuli, but insula activity normalized following CBT (Ipser et al., 2013). This suggests that CBT could improve threat-safety discrimination (La Buissonniere-Ariza et al., 2021). In the same line, post-treatment reductions in the insula and amygdala response to emotion perception were related to greater clinical improvement in adults with anxiety and/or depression (Gorka et al., 2019). It appears that reductions in insula and amygdala activity are a sign of successful CBT intervention in MDD (Zhou et al., 2021). In anxiety disorders, deactivation of the amygdala has also been observed following CBT. In other negative valence disorders, greater pre-treatment activation to emotional stimuli predicted greater reductions in clinical symptoms at post-treatment (La Buissonniere-Ariza et al., 2021).

In addition to the aforementioned brain regions, there are other cortical regions (hippocampus, thalamus, precentral and postcentral gyri) that may potentially be associated with treatment response (Ipser et al., 2013; La Buissonniere-Ariza et al., 2021). However, studies involving these regions are inconsistent.

As evidence mounts, it is clear that information related to affective and cognitive processes is integrated between brain regions. CBT responses have been linked to functional connectivity in the default mode, cognitive control, salience, and frontoparietal networks in psychiatric disorders (Mason et al., 2016; La Buissonniere-Ariza et al., 2021). Besides, previous studies have shown that the dysfunctional connectivity in prefrontal-limbic regions led to conflicts in cognitive processes during the experience of negative affect (Mason et al., 2016). Thus, not only does CBT alter the activity of individual brain regions, but it can also have an effect on functional integration between regions.

Despite the increased interest sparked by neuroimaging studies that assessed brain modifications after CBT, most of them focused on specific disorders or populations with common symptom characteristics. Few neuroimaging studies directly explored neural mechanisms underlying CBT across psychiatric disorders. The impact of CBT on the brains of patients with psychiatric disorders is not clear. The present study aimed to use systematic reviews and meta-analyses to identify neural changes associated with CBT that are common across psychiatric disorders. Furthermore, we selected studies that used task paradigms that focused on the relationship between cognition, emotion, and behavior since disrupted emotional processing and cognitive deficits are common features of multiple psychiatric disorders. In the present study, two coordinate-based ALE meta-analyses were conducted to investigate the changes in cognitive or emotion-related brain regions following CBT. The present systematic review and meta-analysis will provide a clearer view of the current state of research and will identify areas for further investigation.

METHODS

Search and Inclusion of Studies

A comprehensive and systematic search was conducted using the Pubmed, Cochrane Library, Scopus, and Web of Science electronic databases before 4 August 2021. This search was based on the following keywords and combinations: ("cognitive behavior* OR cognitive therapy OR behavior therapy OR CBT") AND ("MRI or magnetic resonance imaging or fMRI or functional magnetic resonance imaging or PET or positron emission tomography or SPECT or single photon emission computed/tomography").

Inclusion criteria required studies to (1) be part of a clinical trial examining cognitive behavioral therapy in psychiatric disorders; (2) compare the neural changes between pre-treatment and post-treatment using fMRI during a task; (3) conduct whole-brain voxel-wise analyses; (4) report results as coordinates in standard Talairach or MNI space; (4) publish in English. Some studies were excluded due to: (1) presenting only baseline coordinates; (2) reporting resting-state fMRI, functional connectivity, voxel-based morphometry, or region-of-interest analyses. If different studies or tasks used the same subjects, we included the study or task which had the largest sample. And Studies that found no significant differences were excluded. The entire search process is shown in the flowchart below (**Figure 1**).

Activation Likelihood Estimation Methodology

For the resulting articles, all eligible experiments were entered into the BrainMap database according to paradigm and direction of effect. Eligible coordinates were entered into the database in MNI (Montreal Neuroimaging Institute) space. Coordinates presented in Talairach space were transformed to MNI space using GingerALE. The meta-analysis was performed in GingerALE 3.0.2 software downloaded from the BrainMap website to examine whether there was a significant overlap across multiple studies. The ALE algorithm converted the reported foci into spatial centers of 3-dimensional Gaussian probability

FIGURE 1 | Flowchart of the searching strategy and study selection process, based on PRISMA template (Liberati et al., 2009; Moher et al., 2009).
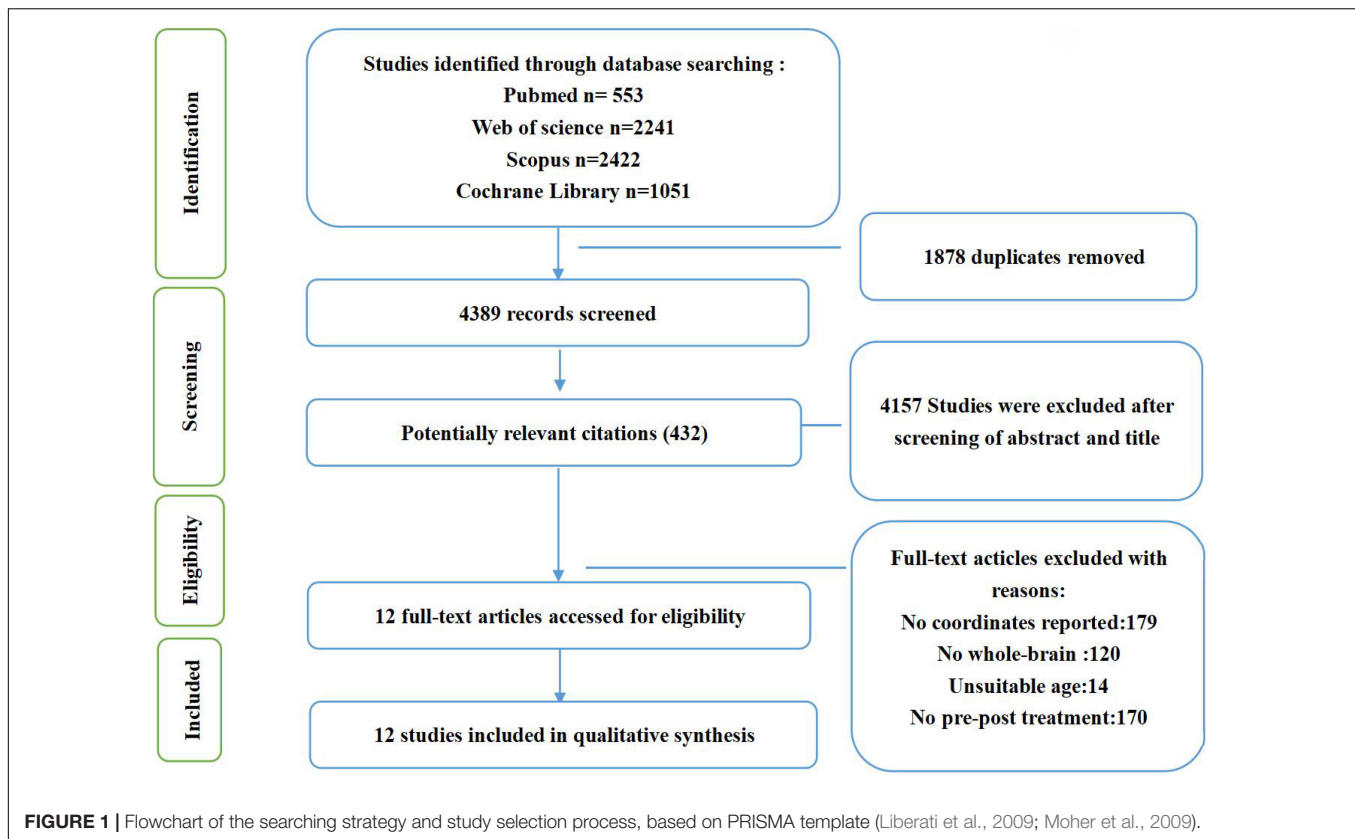
distributions to model a modeled activation (MA) map (Eickhoff et al., 2009, 2012). The union of activation probabilities for each focus in the MA map was calculated to obtain ALE scores. And the included studies had been weighted by ALE algorithms. ALE algorithms weighted the localizing power of individual studies by building the proposed uncertainty model.

The 13 studies identified in the literature search included emotion or cognition task paradigms. According to the differences of paradigms, three coordinate-based ALE meta-analyses were separately performed to determine consistency across neuroimaging studies. The ALE meta-analyses were performed on brain areas displaying altered activation with P-value = 0.05, cluster-level = 0.05 and threshold permutations = 1,000.

Then, brain regions displaying alterations were categorized into eight functional networks according to the spatial correlation values between independent components and the template. These eight brain networks were defined mainly according to Shirer's definition of 90 ROI functions (Shirer et al., 2012).

RESULTS

Studies Included

According to searching procedures, thirteen studies were assessed for eligibility. In these retained studies, 9 used paradigms classified as emotion, and 4 used paradigms classified as cognition, as shown in **Table 1**. The 13 articles included 1 study

for patients with psychosis, 1 for the cocaine-dependent disorder, 1 for eating disorder, 4 for major depressive disorder, and 6 for anxiety disorder. Patients in these studies were aged from 11 to 60, including patient groups and control groups.

Activation Likelihood Estimation Analysis
Activation Likelihood Estimation Meta-Analysis of Cognition Task Following Cognitive Behavioral Therapy
The ALE meta-analysis was performed on brain areas displaying altered activation during cognition tasks from pre to post-CBT with P-value = 0.05, cluster-level = 0.05 and threshold permutations = 1,000. The results showed that the left anterior cingulate (L ACC) and left middle frontal gyrus (L MFG) demonstrated significantly decreased activation (**Figure 2** and **Table 2**).

Activation Likelihood Estimation Meta-Analysis of Emotion Task Following Cognitive Behavioral Therapy
For emotion tasks, we performed the same procedure. No clusters showed significant overlap in ALE maps.

Activation Likelihood Estimation Meta-Analysis of All Tasks Following Cognitive Behavioral Therapy
The ALE meta-analysis was performed on brain areas displaying altered activation during all tasks from pre to post-CBT with P-value = 0.05, cluster-level = 0.05 and threshold

TABLE 1 | Characteristics of 13 included studies.

Author	Disorder	Patients/n	Control patients/n	Healthy/n	Mean age	Gender (male/female)	Task		Sessions	Contrasts
							Cognition	Emotion		
Rubin-Falcone et al., 2020	MDD	32	–	19	34.8	15/16	–	Emotional reactivity and emotion regulation	14 sessions over 12 weeks	Pre > Post
Hauner et al., 2012	SP	12	–	–	22.3	3/9	–	Emotion photogenic image	2 h	Pre < Post Pre > Post
Fonzo et al., 2014	GAD	21	–	11	34.29	16/5	–	Facial emotion processing	10 weeks	Pre > Post
Fu et al., 2008	MDD	16	–	16	40	6/2	–	Affect recognition	16 weeks	Pre < Post Pre > Post
Sankar et al., 2015	MDD	16	–	16	39.9	13/3	–	Dysfunctional attitudes	16 weeks	Pre > Post
Månsson et al., 2013	SAD	13	13	–	32.46	2/11	–	Affective face processing	12 weeks	Pre < Post Pre > Post
Reinecke et al., 2018	AD	14	14	–	34.8	5/9	–	Emotion regulation	4 weeks	Pre > Post
Kumari et al., 2011	Psychosis	28	28	–	35.68	9/11	–	affect processing	6–8 months	Pre > Post
Kircher et al., 2013	PD	21	21	42	35.42	29/42	–	Fear conditioning	12 weeks	Pre > Post
Yoshimura et al., 2014	MDD	23		15	30.5	6/2	Self-referential	–	12 weeks	Pre > Post
Devito et al., 2012	SUD	12	–	12	37.2	7/5	Stroop	–	8 weeks	Pre > Post
Vocks et al., 2011	ED	32	–	17	26.12	9/8	Body image	–	10 weeks	Pre > Post
Bomyea et al., 2020	AD	30	–	–	36.6	11/15	Reappraisal-based emotion regulation	–	10 sessions over 12 weeks	Pre > Post

FIGURE 2 | In the cognition paradigm, significantly decreased activations across the left anterior cingulate (L ACC) and left middle frontal gyrus (L MFG) were found in patients with psychiatric disorders after CBT ($p < 0.05$).
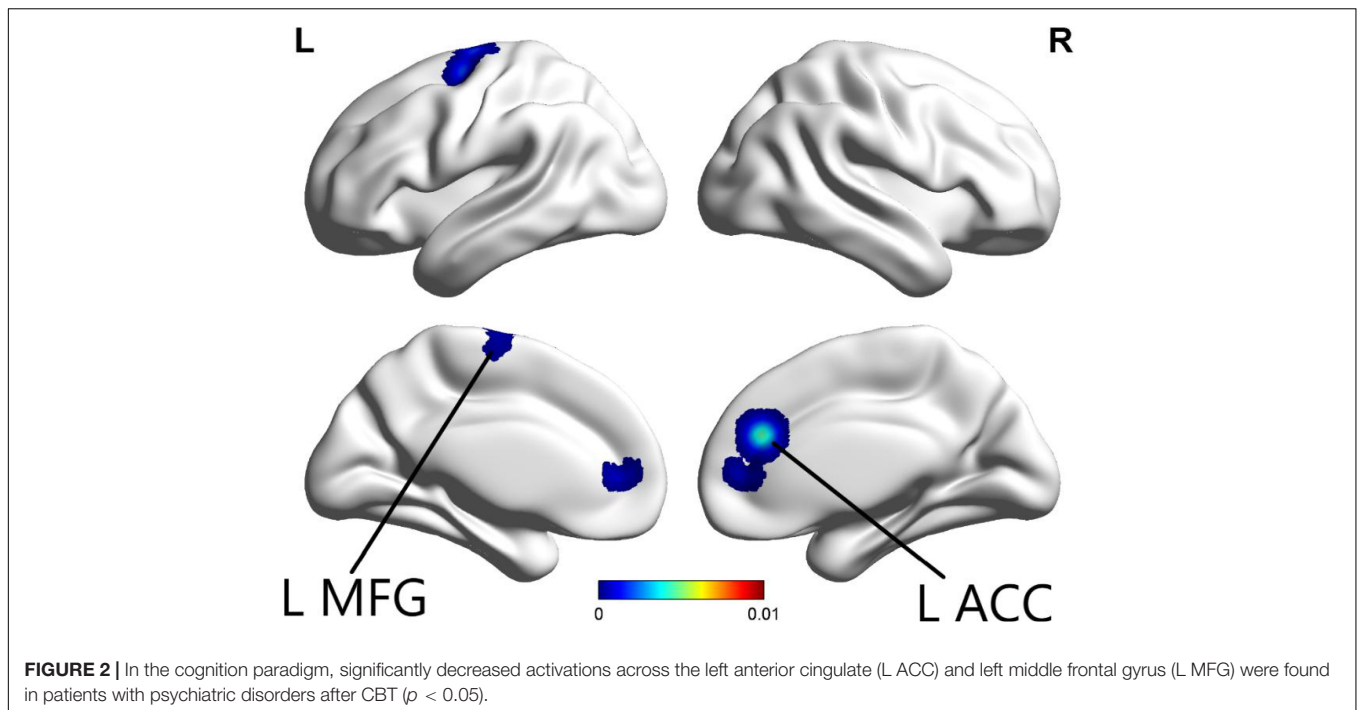
permutations = 1,000. The results revealed that the left cuneus displayed significantly decreased activation (**Figure 3** and **Table 2**).

Brain Functional Alterations and Related Brain Networks Following Cognitive Behavioral Therapy

Based on the 13 studies reviewed, the most consistent findings were altered activation between the prefrontal cortex and other limbic regions following CBT. To better understand the effects of CBT on psychiatric patients, brain regions from included studies were categorized into eight functional networks according to the spatial correlation values between independent components and the template. The results showed that 9 brain areas reported reduced activation in DMN including the medial prefrontal cortex (mPFC), ACC, precuneus, PCC, left angular gyrus (AG), left middle occipital gyrus (MOG), right superior frontal gyrus (SFG), right parahippocampal gyrus, and right angular gyrus. 11 brain areas reported reduced activation in ECN including mPFC, ACC, PCC, L AG, precuneus, R SFG, L SPG, L IPG, left inferior temporal gyrus (L ITG), and middle temporal gyrus (MTG). 6 brain areas reported reduced activation in SN including mPFC, precuneus, left insula, ACC, IPG, and right midcingulate gyrus (MGC). The most common outcome across studies was decreased activation in mPFC, ACC, and precuneus (**Figure 4**).

DISCUSSION

In the present study, a systematic review and meta-analysis were conducted to identify brain regions and related brain networks associated with the effects of CBT in patients with psychiatric

disorders. And to our knowledge, this review is the first to discover altered brain activation associated with CBT in task-fMRI. First, the most commonly reported finding was decreased activation in mPFC, ACC, and precuneus from pre to post-treatment. After reviewing all included studies, connectivity within DMN, ECN, and SN was connected with the effects of CBT. Second, the ALE meta-analysis of cognition fMRI studies revealed that the left ACC and left MFG showed significant overlap across studies. Third, the ALE meta-analysis of all fMRI studies revealed that left precuneus showed significant overlap across studies.

For the ALE-meta-analysis of cognition tasks, significantly decreased activation across left ACC and left MFG was found. After referencing previous studies and reviewing the literature, this was an expected finding following CBT. The mPFC is a region that consists ACC, MFG, prelimbic cortex (PL), infralimbic cortex, and medial precentral area. It plays a critical role in emotion regulation, cognitive processing, motivation, and social interaction (Riga et al., 2014; Xu et al., 2019). The dysfunction of mPFC found in psychiatric disorders is related to loss of social skills, motivation deficiency, and dysregulation of cognition and emotion (Xu et al., 2019). Moreover, ACC, as one of the core regions of mPFC, is also involved in emotional processing, higher cognition, motivation, and motor control (Monosov et al., 2020). There was a multitude of evidence in functional imaging studies reporting altered activation of mPFC/ACC following CBT. In one study, from pre- to post-treatment, decreased activation in ACC during fear/angry faces was observed in generalized anxiety disorder (Fonzo et al., 2014). In another study, compared with control groups, depressive patients displayed increased activation in the MPFC during the self/negative condition. In a third study, MPFC and ventral

TABLE 2 | Activation areas resulting from meta-analysis, peak voxels, ALE values, and cluster sizes are included.

Cluster size (mm³)	ALE	MNI-coordinates			Brain region
		X	V	z	
Cognition task					
1,549	0.008694564	0	46	6	Left anterior cingulate
1,066	0.005506158	−18	−12	61	Left middle frontal gyrus
All task					
1,393	0.009742522	−16	−72	12	Left cuneus
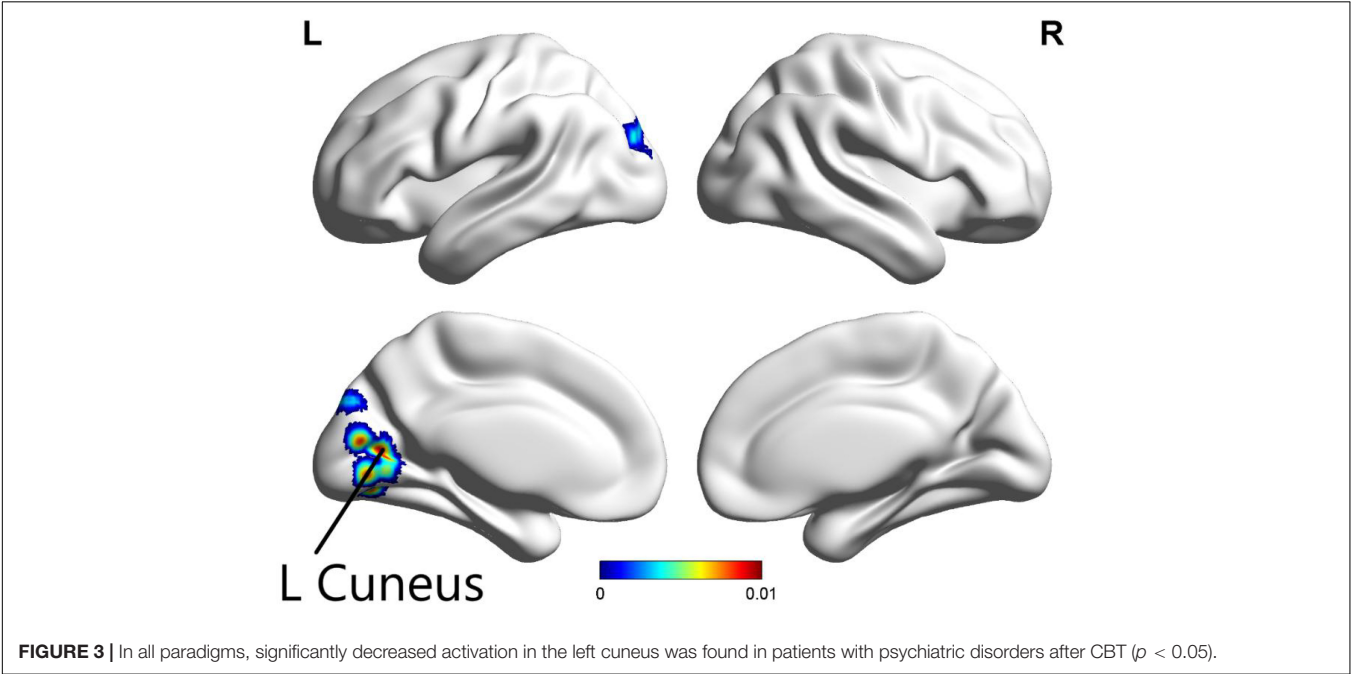
FIGURE 3 | In all paradigms, significantly decreased activation in the left cuneus was found in patients with psychiatric disorders after CBT ($p < 0.05$).

anterior cingulate cortex (vACC) displayed attenuated activation during self-referential processing of negatively valenced words after 12 sessions of CBT (Yoshimura et al., 2014). A recent review examined the involvement of ACC and mPFC in appraisal and expression of negative emotion and found that ACC/mPFC exhibited a modulating effect on limbic regions involved in producing emotional responses (Etkin et al., 2011). The evidence suggests that CBT may participate in emotional processing by acting on mPFC and ACC (Fonzo et al., 2014; Yoshimura et al., 2014).

In the present systematic review and meta-analysis, we also found altered activation of the precuneus. According to the ALE meta-analysis results for all tasks, significantly reduced activation was found in the left cuneus. The precuneus and mPFC are identified as core parts of DMN, which is implicated in various psychiatric disorders (Whitfield-Gabrieli and Ford, 2012). Previous studies have shown that the precuneus performs an important role in a wide range of higher-order cognitive functions including visuospatial imagery, episodic memory retrieval, self-processing, and consciousness (Cavanna and Trimble, 2006). One study reported that greater BOLD deactivation during emotion regulation from pre- to

post-treatment in the precuneus was associated with better treatment outcomes (Rubin-Falcone et al., 2020). Similarly, post-treatment increases in precuneus activity were also observed in specific phobia, suggesting that CBT may effectively improve threat-safety discrimination. The abnormal increases in this parietal region suggest a compensatory mechanism of cognitive function. It may be that the precuneus reorganizes the process of emotion stimuli (Álvarez-Pérez et al., 2021). On the other hand, a previous study has shown that self-referential processing is regulated by emotion (Qian et al., 2020). Given the role of the precuneus in self-referential processing, this may reflect greater disengagement in self-referential processing as a function of successful CBT (Herold et al., 2016). Furthermore, effects of CBT were reported across several other brain regions including parietal, occipital, temporal, and limbic regions, suggesting that many brain regions are important for cognition and emotion and may be sensitive to the effects of CBT. However, studies involving these regions are inconsistent.

In the present study, DMN, ECN, and SN were the most relevant networks after reviewing eligible neuroimaging data. The DMN is involved in emotional processing, self-referential processing, and the recollection of prior experiences

FIGURE 4 | This figure shows regions that have been reported to show CBT-related changes and the overlap between regions involved in different brain networks. The subscript number next to the brain region represents the number of articles related to that brain region.
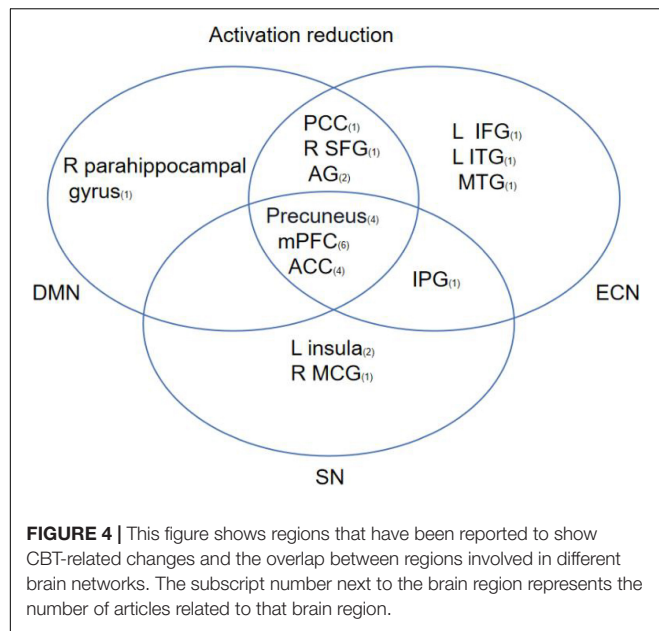
(Whitfield-Gabrieli and Ford, 2012; Mohan et al., 2016; Zhang and Volkow, 2019; Yeshurun et al., 2021). DMN exhibits hyperactivity during resting states and deactivation during the performance of cognitive tasks when attention is directed externally (Broyd et al., 2009; Whitfield-Gabrieli and Ford, 2012; Andrews-Hanna et al., 2014; Simon and Engström, 2015). Additionally, previous studies showed that abnormal intra-network connectivity of the DMN was associated with abnormalities in cognitive function including self-referential and introspective mental activity, attention, and working memory across psychiatric disorders (Broyd et al., 2009; Vuper et al., 2021). From pre- to post-CBT, normalization of intra-functional connectivity in DMN was positively correlated with clinical improvement in OCD. The evidence suggests that CBT affects the intra-functional connectivity in DMN to modulate cognitive function. In addition, connectivity changes in ECN and SN have also been observed following CBT. The ECN is engaged in a broad spectrum of high-level cognitive functions including planning, decision making, attention regulation, and working memory (Menon, 2011; Xu et al., 2020). SN is associated with regulating emotional and sensory stimuli, adjusting cognitive directivity, and allocating attention (Seeley, 2019). Previous studies have shown that the connectivity between the DMN, the SN, and the CEN impacts cognitive functions and dysfunction of intrinsic wiring, and connectivity in the three core neurocognitive networks has been evidenced in psychiatric disorders (Menon, 2011; Vuper et al., 2021). For instance, in post-traumatic stress disorder (PTSD), altered DMN and SN connectivity was related to the reduction of clinical symptoms following CBT (La Buissonniere-Ariza et al., 2021; Vuper et al., 2021). This result suggests that CBT improves cognitive function by affecting the internal connection of the brain network and the interaction among brain networks. In the present meta-analysis, we chose to include all available studies due to the lack of available CBT

fMRI studies in the literature. Although emotion-task ALE meta-analysis did not find any specific brain regions showing consistent effects, the results indicated that CBT had broad rather than specific effects on task-evoked BOLD response across the brain.

Limitations

The present study has several limitations. First, the number of studies in the present ALE meta-analysis was small. It limited our ability to detect more accurate ALE results. To meet the challenges of research heterogeneity and ALE methods, a comprehensive literature search with relatively strict inclusion criteria and strict correction procedures was used to improve the internal effectiveness of the study, which is consistent with previous ale studies. Second, due to the scant amount of literature and uneven types of diseases, our data is not representative of psychiatric disorders as a whole. Third, confounding factors, such as age and gender, are unavoidable limitations.

CONCLUSION

The present systematic review and ALE meta-analysis was the first summary of the available literature on core neural regions that are related to CBT in task-fMRI. Findings from the present study indicated that CBT was associated with significantly decreased activity in mPFC/ACC and precuneus. Significant changes in neural activity were also identified in intrinsic wiring and connectivity in DMN, ECN, and SN, suggesting that these effects may mediate cognitive improvements and emotion regulation.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

CW, SY, HW, NZ, and YW contributed to initiating, designing the study, and collecting the data. SY, QX, JY, HX, and JL made substantial contributions in writing the manuscript. YZ provided editing and writing assistance. All authors reviewed and approved the final manuscript.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Álvarez-Pérez, Y., Rivero, F., Herrero, M., Viña, C., Fumero, A., Betancort, M., et al. (2021). Changes in brain activation through cognitive-behavioral therapy with exposure to virtual reality: a neuroimaging study of specific phobia. *J. Clin. Med.* 10. doi: 10.3390/jcm10163505

Andrews-Hanna, J. R., Smallwood, J., and Spreng, R. N. (2014). The default network and self-generated thought: component processes, dynamic control, and clinical relevance. *Ann. N.Y. Acad. Sci.* 1316, 29–52. doi: 10.1111/nyas. 12360

Baggio, H. C., and Junqué, C. (2019). Functional MRI in parkinson's disease cognitive impairment. *Int. Rev. Neurobiol.* 144, 29–58. doi: 10.1016/bs.irn.2018. 09.010

Beck, A. T., and Dozois, D. J. (2011). Cognitive therapy: current status and future directions. *Annu. Rev. Med.* 62, 397–409. doi: 10.1146/annurev-med-052209-100032

Bomyea, J., Ball, T. M., Simmons, A. N., Campbell-Sills, L., Paulus, M. P., and Stein, M. B. (2020). Change in neural response during emotion regulation is associated with symptom reduction in cognitive behavioral therapy for anxiety disorders. *J. Affect. Dis.* 271, 207–214. doi: 10.1016/j.jad.2020.04.001

Broyd, S. J., Demanuele, C., Debener, S., Helps, S. K., James, C. J., and Sonuga-Barke, E. J. (2009). Default-mode brain dysfunction in mental disorders: a systematic review. *Neurosci. Biobehav. Rev.* 33, 279–296. doi: 10.1016/j. neubiorev.2008.09.002

Butler, A. C., Chapman, J. E., Forman, E. M., and Beck, A. T. (2006). The empirical status of cognitive-behavioral therapy: a review of meta-analyses. *Clin. Psychol. Rev.* 26, 17–31. doi: 10.1016/j.cpr.2005.07.003

Cavanna, A. E., and Trimble, M. R. (2006). The precuneus: a review of its functional anatomy and behavioural correlates. *Brain* 129, 564–583. doi: 10.1093/brain/awl004

Chen, J. E., and Glover, G. H. (2015). Functional magnetic resonance imaging methods. *Neuropsychol. Rev.* 25, 289–313. doi: 10.1007/s11065-015-9294-9

Cuijpers, P., Hollon, S. D., Van Straten, A., Bockting, C., Berking, M., and Andersson, G. (2013). Does cognitive behavior therapy have an enduring effect that is superior to keeping patients on continuation pharmacotherapy? A meta-analysis. *BMJ Open* 3:e002542. doi: 10.1136/bmjopen-2012-002542

Devito, E. E., Worhunsky, P. D., Carroll, K. M., Rounsaville, B. J., Kober, H., and Potenza, M. N. (2012). A preliminary study of the neural effects of behavioral therapy for substance use disorders. *Drug Alcohol Depend* 122, 228–235. doi: 10.1016/j.drugalcdep.2011.10.002

Eickhoff, S. B., Bzdok, D., Laird, A. R., Kurth, F., and Fox, P. T. (2012). Activation likelihood estimation meta-analysis revisited. *Neuroimage* 59, 2349–2361. doi: 10.1016/j.neuroimage.2011.09.017

Eickhoff, S. B., Laird, A. R., Grefkes, C., Wang, L. E., Zilles, K., and Fox, P. T. (2009). Coordinate-based activation likelihood estimation meta-analysis of neuroimaging data: a random-effects approach based on empirical estimates of spatial uncertainty. *Hum. Brain Mapp.* 30, 2907–2926. doi: 10.1002/hbm.20718

Etkin, A., Egner, T., and Kalisch, R. (2011). Emotional processing in anterior cingulate and medial prefrontal cortex. *Trends Cogn. Sci.* 15, 85–93. doi: 10. 1016/j.tics.2010.11.004

Fonzo, G. A., Ramsawh, H. J., Flagan, T. M., Sullivan, S. G., Simmons, A. N., Paulus, M. P., et al. (2014). Cognitive-behavioral therapy for generalized anxiety disorder is associated with attenuation of limbic activation to threat-related facial emotions. *J. Affect. Dis.* 169, 76–85. doi: 10.1016/j.jad.2014.07.031

Franklin, G., Carson, A. J., and Welch, K. A. (2016). Cognitive behavioural therapy for depression: systematic review of imaging studies. *Acta Neuropsychiatr.* 28, 61–74. doi: 10.1017/neu.2015.41

Fu, C. H., Williams, S. C., Cleare, A. J., Scott, J., Mitterschiffthaler, M. T., Walsh, N. D., et al. (2008). Neural responses to sad facial expressions in major depression following cognitive behavioral therapy. *Biol. Psychiatr.* 64, 505–512. doi: 10.1016/j.biopsych.2008.04.033

Goodkind, M., Eickhoff, S. B., Oathes, D. J., Jiang, Y., Chang, A., Jones-Hagata, L. B., et al. (2015). Identification of a common neurobiological substrate for mental illness. *JAMA Psychiatr.* 72, 305–315. doi: 10.1001/jamapsychiatry.2014. 2206

Gorka, S. M., Young, C. B., Klumpp, H., Kennedy, A. E., Francis, J., Ajilore, O., et al. (2019). Emotion-based brain mechanisms and predictors for SSRI and CBT treatment of anxiety and depression: a randomized trial. *Neuropsychopharmacology* 44, 1639–1648. doi: 10.1038/s41386-019-0407-7

Hauner, K. K., Mineka, S., Voss, J. L., and Paller, K. A. (2012). Exposure therapy triggers lasting reorganization of neural fear processing. *Proc. Natl. Acad. Sci. U.S.A.* 109, 9203–9208. doi: 10.1073/pnas.1205242109

Herold, D., Spengler, S., Sajonz, B., Usnich, T., and Bermpohl, F. (2016). Common and distinct networks for self-referential and social stimulus processing in the human brain. *Brain Struct. Funct.* 221, 3475–3485. doi: 10.1007/s00429-015-1113-9

Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., and Fang, A. (2012). The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-analyses. *Cognit. Ther. Res.* 36, 427–440. doi: 10.1007/s10608-012-9476-1

Ipser, J. C., Singh, L., and Stein, D. J. (2013). Meta-analysis of functional brain imaging in specific phobia. *Psychiatry Clin. Neurosci.* 67, 311–322. doi: 10.1111/pcn.12055

Kim, S. J., Lee, Y. J., Kim, N., Kim, S., Choi, J. W., Park, J., et al. (2017). Exploration of changes in the brain response to sleep-related pictures after cognitive-behavioral therapy for psychophysiological insomnia. *Sci. Rep.* 7:12528. doi: 10.1038/s41598-017-13065-0

Kircher, T., Arolt, V., Jansen, A., Pyka, M., Reinhardt, I., Kellermann, T., et al. (2013). Effect of cognitive-behavioral therapy on neural correlates of fear conditioning in panic disorder. *Biol. Psychiatr.* 73, 93–101. doi: 10.1016/j. biopsych.2012.07.026

Kumari, V., Fannon, D., Peters, E. R., Ffytche, D. H., Sumich, A. L., Premkumar, P., et al. (2011). Neural changes following cognitive behaviour therapy for psychosis: a longitudinal study. *Brain* 134, 2396–2407. doi: 10.1093/brain/awr154

La Buissonniere-Ariza, V., Fitzgerald, K., Meoded, A., Williams, L. L., Liu, G., Goodman, W. K., et al. (2021). Neural correlates of cognitive behavioral therapy response in youth with negative valence disorders: A systematic review of the literature. *J. Affect. Dis.* 282, 1288–1307. doi: 10.1016/j.jad.2020.12.182

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., et al. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med.* 6:e1000100. doi: 10.1371/journal.pmed.1000100

Månsson, K. N., Carlbring, P., Frick, A., Engman, J., Olsson, C. J., Bodlund, O., et al. (2013). Altered neural correlates of affective processing after internet-delivered cognitive behavior therapy for social anxiety disorder. *Psychiatry Res.* 214, 229–237. doi: 10.1016/j.pscychresns.2013.08.012

Mason, L., Peters, E., and Kumari, V. (2016). Functional connectivity predictors and mechanisms of cognitive behavioural therapies: A systematic review with recommendations. *Aust. N.Z. J. Psychiatr.* 50, 311–321. doi: 10.1177/0004867415624970

Matsumoto, K., Hamatani, S., and Shimizu, E. (2021). Effectiveness of videoconference-delivered cognitive behavioral therapy for adults with psychiatric disorders: systematic and meta-analytic review. *J. Med. Internet Res.* 23:e31293. doi: 10.2196/31293

McMain, S., Newman, M. G., Segal, Z. V., and Derubeis, R. J. (2015). Cognitive behavioral therapy: current status and future research directions. *Psychother. Res.* 25, 321–329. doi: 10.1080/10503307.2014.100 2440

McTeague, L. M., Rosenberg, B. M., Lopez, J. W., Carreon, D. M., Huemer, J., Jiang, Y., et al. (2020). Identification of Common Neural Circuit Disruptions in Emotional Processing Across Psychiatric Disorders. *Am. J. Psychiatr.* 177, 411–421. doi: 10.1176/appi.ajp.2019.18111271

Menon, V. (2011). Large-scale brain networks and psychopathology: a unifying triple network model. *Trends Cogn. Sci.* 15, 483–506. doi: 10.1016/j.tics.2011.08.003

Mohan, A., Roberto, A. J., Mohan, A., Lorenzo, A., Jones, K., Carney, M. J., et al. (2016). The Significance of the Default Mode Network (DMN) in Neurological and Neuropsychiatric Disorders: A Review. *Yale J. Biol. Med.* 89, 49–57.

Moher, D., Liberati, A., Tetzlaff, J., and Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 339:b2535.

Monosov, I. E., Haber, S. N., Leuthardt, E. C., and Jezzini, A. (2020). Anterior Cingulate Cortex and the Control of Dynamic Behavior in Primates. *Curr. Biol.* 30, R1442–R1454. doi: 10.1016/j.cub.2020.10.009

Qian, H., Wang, Z., Li, C., and Gao, X. (2020). Prioritised self-referential processing is modulated by emotional arousal. *Q. J. Exp. Psychol.* 73, 688–697. doi: 10.1177/1747021819892158

Reinecke, A., Thilo, K. V., Croft, A., and Harmer, C. J. (2018). Early effects of exposure-based cognitive behaviour therapy on the neural correlates of anxiety. *Transl. Psychiatr.* 8:225. doi: 10.1038/s41398-018-0277-5

Riga, D., Matos, M. R., Glas, A., Smit, A. B., Spijker, S., and Van Den Oever, M. C. (2014). Optogenetic dissection of medial prefrontal cortex circuitry. *Front. Syst. Neurosci.* 8:230. doi: 10.3389/fnsys.2014.00230

Rubin-Falcone, H., Weber, J., Kishon, R., Ochsner, K., Delaparte, L., Doré, B., et al. (2020). Neural predictors and effects of cognitive behavioral therapy for depression: the role of emotional reactivity and regulation. *Psychol. Med.* 50, 146–160. doi: 10.1017/s0033291718004154

Sankar, A., Scott, J., Paszkiewicz, A., Giampietro, V. P., Steiner, H., and Fu, C. H. (2015). Neural effects of cognitive-behavioural therapy on dysfunctional attitudes in depression. *Psychol. Med.* 45, 1425–1433. doi: 10.1017/S0033291714002529

Seeley, W. W. (2019). The Salience Network: A Neural System for Perceiving and Responding to Homeostatic Demands. *J. Neurosci.* 39, 9878–9882. doi: 10.1523/JNEUROSCI.1138-17.2019

Sha, Z., Wager, T. D., Mechelli, A., and He, Y. (2019). Common Dysfunction of Large-Scale Neurocognitive Networks Across Psychiatric Disorders. *Biol. Psychiatr.* 85, 379–388. doi: 10.1016/j.biopsych.2018.11.011

Shirer, W. R., Ryali, S., Rykhlevskaia, E., Menon, V., and Greicius, M. D. (2012). Decoding subject-driven cognitive states with whole-brain connectivity patterns. *Cereb. Cortex* 22, 158–165. doi: 10.1093/cercor/bhr099

Simon, R., and Engström, M. (2015). The default mode network as a biomarker for monitoring the therapeutic effects of meditation. *Front. Psychol.* 6:776. doi: 10.3389/fpsyg.2015.00776

Van Dis, E. A. M., Van Veen, S. C., Hagenaars, M. A., Batelaan, N. M., Bockting, C. L. H., Van Den Heuvel, R. M., et al. (2020). Long-term Outcomes of Cognitive Behavioral Therapy for Anxiety-Related Disorders: A Systematic Review and Meta-analysis. *JAMA Psychiatry* 77, 265–273. doi: 10.1001/jamapsychiatry.2019.3986

Vocks, S., Schulte, D., Busch, M., Grönemeyer, D., Herpertz, S., and Suchan, B. (2011). Changes in neuronal correlates of body image processing by means of cognitive-behavioural body image therapy for eating disorders: a randomized controlled fMRI study. *Psychol. Med.* 41, 1651–1663. doi: 10.1017/S0033291710002382

Vuper, T. C., Philippi, C. L., and Bruce, S. E. (2021). Altered resting-state functional connectivity of the default mode and central executive networks following cognitive processing therapy for PTSD. *Behav. Brain Res.* 409:113312. doi: 10.1016/j.bbr.2021.113312

Whitfield-Gabrieli, S., and Ford, J. M. (2012). Default mode network activity and connectivity in psychopathology. *Annu. Rev. Clin. Psychol.* 8, 49–76. doi: 10.1146/annurev-clinpsy-032511-143049

Xu, P., Chen, A., Li, Y., Xing, X., and Lu, H. (2019). Medial prefrontal cortex in neurological diseases. *Physiol. Genom.* 51, 432–442. doi: 10.1152/physiolgenomics.00006.2019

Xu, W., Chen, S., Xue, C., Hu, G., Ma, W., Qi, W., et al. (2020). Functional MRI-Specific Alterations in Executive Control Network in Mild Cognitive Impairment: An ALE Meta-Analysis. *Front. Aging Neurosci.* 12:578863. doi: 10.3389/fnagi.2020.578863

Yeshurun, Y., Nguyen, M., and Hasson, U. (2021). The default mode network: where the idiosyncratic self meets the shared social world. *Nat. Rev. Neurosci.* 22, 181–192. doi: 10.1038/s41583-020-00420-w

Yoshimura, S., Okamoto, Y., Onoda, K., Matsunaga, M., Okada, G., Kunisato, Y., et al. (2014). Cognitive behavioral therapy for depression changes medial prefrontal and ventral anterior cingulate cortex activity associated with self-referential processing. *Soc. Cogn. Affect. Neurosci.* 9, 487–493. doi: 10.1093/scan/nst009

Zhang, R., and Volkow, N. D. (2019). Brain default-mode network dysfunction in addiction. *Neuroimage* 200, 313–331. doi: 10.1016/j.neuroimage.2019.06.036

Zhou, W., Yuan, Z., Yingliang, D., Chaoyong, X., Ning, Z., and Chun, W. (2021). Differential patterns of dynamic functional connectivity variability in major depressive disorder treated with cognitive behavioral therapy. *J. Affect. Dis.* 291, 322–328. doi: 10.1016/j.jad.2021.05.017

Did Artificial Intelligence Invade Humans? The Study on the Mechanism of Patients' Willingness to Accept Artificial Intelligence Medical Care: From the Perspective of Intergroup Threat Theory

Yuwei Zhou[1], Yichuan Shi[1]*, Wei Lu[1] and Fang Wan[2,3]

[1] Antai College of Economics and Management, Shanghai Jiao Tong University, Shanghai, China, [2] Fudan University Sports Medicine Institute, Shanghai, China, [3] Department of Sports Medicine and Arthroscopy Surgery, Huashan Hospital, Fudan University, Shanghai, China

Artificial intelligence (AI) has become one of the core driving forces for the future development of the medical industry, but patients are skeptical about the use of AI in medical care. Based on the intergroup threat theory (ITT), this study verified that patients would regard AI as an external group, triggering the perceived threat of the external group, which results in avoidance behaviors in the treatment (experiment 1: $n = 446$) and diagnosis (experiment 2: $n = 330$) scenarios. The results show that despite AI can provide expert-level accuracy in medical care, patients are still more likely to rely on human doctors and experience more negative emotions as AI is more involved in medical care (experiment 1). Furthermore, patients pay more attention to threats at the individual level related to themselves, such as realistic threats related to privacy issues and symbolic threats related to the neglect of personal characteristics. In contrast, realistic threats and symbolic threats at the group level had less effect on patients in the medical scenario (experiment 2).

Keywords: artificial intelligence medical care, intergroup threat theory, realistic threats, symbolic threats, willingness to accept (WTA), treatment, diagnosis

INTRODUCTION

Artificial intelligence (AI) has been widely used in various medical scenarios such as prevention, diagnosis, and treatment, such as diagnosing heart disease (Feshki and Shijani, 2016), providing medical advice (Nov et al., 2020), detecting skin cancer (Takiddin et al., 2021), identifying layout lesions (Yamashita et al., 2021), and reading CT image of suspected COVID-19 cases (Mei et al., 2020), etc.

The application of AI in the medical field has become a trend. Patients are the end-users of AI health care, and their resistance will directly affect its adoption efficiency (Agarwal et al., 2020). The existing studies show that although the algorithm can be more accurate than doctors (Grove et al., 2000; Eastwood et al., 2012), patients still believe that AI health care cannot provide the same quality of medical care as human doctors (Promberger and Baron, 2006) and cannot be held responsible for errors (Eastwood et al., 2012).

Psychological studies have shown that people are motivated to see their group as distinct from others (Tajfel, 1974). Human-centered attitudes generate negative perceptions of other entities, which include animals, technologies, etc. (Kaplan, 2004; Haslam et al., 2008); that is, people often view other groups as threats (Alexander, 1974; Dunbar, 2013). According to the intergroup threat theory (ITT), by default, humans tend to perceive threats from other groups and show hostility toward them (Stephan and Stephan, 1985). Therefore, we have a reason to believe that people tend to regard AI that does not belong to human groups as a threat, thus causing negative emotions and resistance behaviors(H1).

Furthermore, intergroup anxiety refers to negative emotions generated by interactions with external groups, such as fear, anger, disgust, and hatred. These activated negative emotions will lead to negative behaviors that include avoidance, evasion, resistance, and aggressive (Stephan and Stephan, 2000). In medical services, with the increase in AI involvement, patients will have more contact or interaction with AI that is regarded as outgroup by humans, thus leading to more intergroup anxiety and lower willingness to accept (WTA) it (H2).

Although intergroup anxiety is an important factor in explaining outgroup attitudes. But in subsequent studies, the researchers went a step further and divided the causes of humans' negative attitudes toward outside groups into the perceived realistic and symbolic threats. Realistic threats include physical harm, loss of authority, or appropriation of resources, whereas symbolic threats refer to the potential challenge to morals, beliefs, and norms caused by groups with different value systems (Stephan et al., 2008, 2009). In addition, these threats revised theory divided into group-level and individual-level threats. The former refers to the threat to the group as a whole, and the latter refers to threats to individual members of the group (Stephan et al., 2008, 2009).

Realistic individual threats concern threats of personal safety, material safety, rights, or general welfare to an individual group member (Stephan et al., 2015). As AI becomes more deeply involved in health care, more and more patients' personal biometric information is being collected. The personal information may face many potential problems, such as disclosure, misappropriation, or abuse, which poses serious privacy threats to patients and leads to lower WTA (H3).

Symbolic individual threats include the destruction of an individual's self-identity or self-esteem (Stephan et al., 2015). People have an innate desire to know themselves (Trope, 1975; Baumeister, 2010) and have a perception of whether they have certain characteristics, attributes, abilities, or belonging groups (Kettle and Häubl, 2011). Thereby, when patients believe that AI medical care may ignore their characteristics and unique symptoms, they will be reluctant to use the medical services provided by AI (H4).

Realistic group threats refer to the threat to the rights, resources, and overall welfare of a group, which generally includes political power and economic power (Stephan et al., 2015). People generally regard machines as a threat to human work (Granulo et al., 2019). The existing research shows that there are concerns about AI medical care. People worry that

technology-driven productivity gains will lead to redundancies in some healthcare jobs (Hazarika, 2020). When people consider that the emergence of AI will pose a threat to their employment and even affect their future economic situation, they will perceive the group reality threat. As AI becomes more and more involved in medical care, people may worry that AI will replace part of the work of healthcare workers, thus resisting the use of AI health care (H5).

Symbolic group threats include threats to the value system, ideology, and belief system within the group (Stephan et al., 2015). It is predicted that the global AI healthcare market size is expected to grow from $6.9 billion in 2021 to $67.4 billion in 2027, with a CAGR of 46.2%. Key factors driving the growth of the AI healthcare market include the increase in AI tools for care, the increase in the development of AI systems for human perception, and the increasing application of AI technology such as genomics, drug discovery, imaging, and diagnostics in response to COVID-19. Therefore, the widespread use of AI technology will have a certain degree of reform on the medical system. This change will lead to patients' perception of the threat of AI medical applications and trigger resistance behaviors(H6).

In summary, we propose the research model shown in **Figures 1A,B**, which corresponds to the hypotheses shown in **Table 1**. The purpose of this study is to explore the influence of the degree of AI involvement on patients' WTA and to reveal whether the reason is caused by patients' perceived threat to outside groups. In an integrated framework of ITT, the relative influence of different levels of threat on patients' WTA AI health care is further discussed.

MATERIALS AND METHODS

Study Design and Participants

The authors tested all hypotheses in two separate experiments. We recruited participants for two experiments through the online professional research platform Credamo.[1] All participants were provided with electronic informed consent before participating in the experiment. We promise participants that the experiment survey results will only be used for academic research purposes but not for any commercial purposes, and that the answers involving personal information will be strictly confidential. Participants who agreed continued the experiment, whereas those who refused were allowed to drop out. The experiment collected demographic data of participants, which include age and gender, and personal information, which includes answering duration, IP address, longitude, latitude, province, and city, to ensure the authenticity and validity of the results. Participants in the two experiments were randomly assigned to the between-subjects design to make the groups comparable.

With the most commercially successful precision surgical robots (such as Da Vinci surgical robot) as the background, the experiment 1 explored the influence of AI involvement on patients' WTA treatment (H1) in high-involvement condition (AI-autonomous treatment), medium-involvement

[1]https://www.credamo.com/
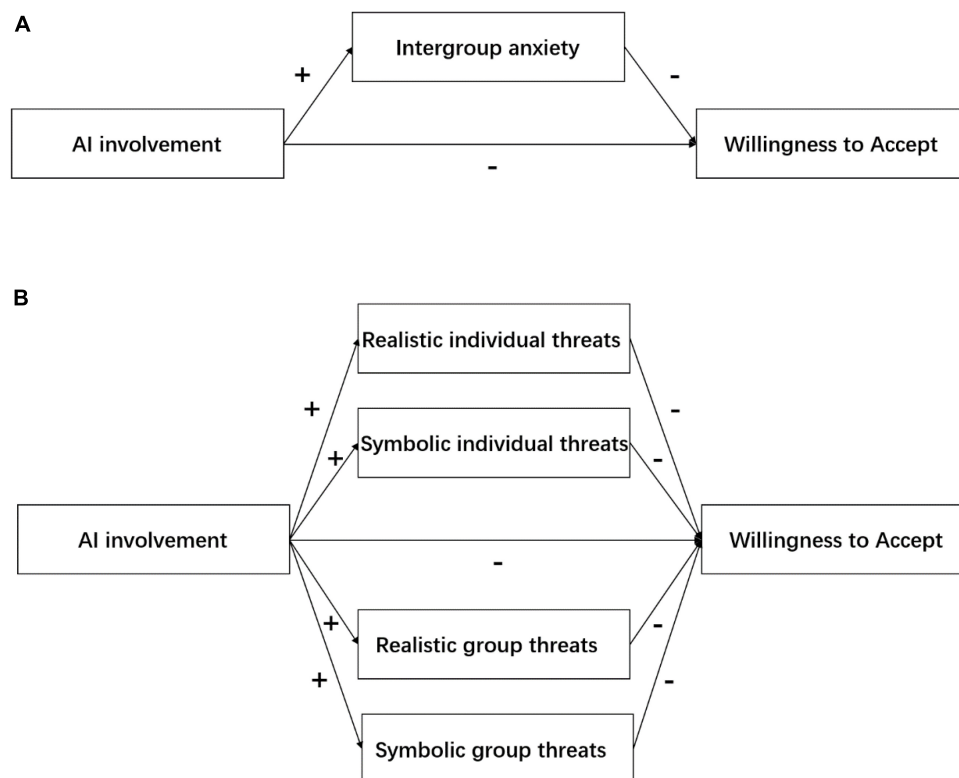
FIGURE 1 | (A) The research model of experiment 1. **(B)** The research model of experiment 2.

condition (AI-assisted treatment), and low-involvement condition (a human doctor) and examined that the potential cause of patients' resistance to AI health care is intergroup anxiety (H2).

In experiment 1,446 subjects (median age = 30.4, 65.2% women) were recruited to complete the experiment in exchange for monetary compensation. Participants were randomly assigned into three manipulation conditions and read

TABLE 1 | The hypotheses.

Hypotheses

H1: With the increasing AI involvement in medical care, the patients' WTA decreases

H2: The higher the degree of AI involvement in medical care, the higher the intergroup anxiety patients would feel, which leads to their lower WTA AI medical care

H3: The higher the degree ossf AI involvement in medical care, the higher the realistic individual threats patients would feel, which leads to their lower WTA AI medical care

H4: The higher the degree of AI involvement in medical care, the higher the symbolic individual threats patients would feel, which leads to their lower WTA AI medical care

H5: The higher the degree of AI involvement in medical care, the higher the realistic group threats patients would feel, which leads to their lower WTA AI medical care

H6: The higher the degree of involvement in medical care, the higher the symbolic group threats patients would feel, which leads to their lower WTA AI medical care

different descriptions of surgical treatment options relatively (Longoni et al., 2019). Participants in the high-involvement condition read that "surgical scheme will be evaluated by an intelligent program. Using algorithms for comparison. Using minimally invasive stereotactic high-precision surgical robots." Participants in the mid-involvement condition read that "surgical scheme will be evaluated by surgical specialists with the help of intelligent medical evaluation. Based on clinical experience. Operating highly accurate surgical robot." Participants in the low-involvement condition read that "the surgical scheme are evaluated by surgical specialists. Based on clinical experience. Cooperating with professional medical team to perform surgery." All participants were told that surgical robots were as accurate as surgical specialists.

To avoid the particularity of surgical treatment scenarios, in experiment 2, we verified the influence of AI involvement on patients' WTA in the diagnostic scenario (H1). The mediating effects of realistic individual threats (H3), symbolic individual threats (H4), realistic group threats (H5), and symbolic group threats (H6) were further discussed. The research background of experiment 2 comes from the current genetic testing project based on AI deep learning algorithm which can carry out diagnostic screening that includes genetic diseases, cancer risk, genetic defects, etc. (Longoni et al., 2019).

A total of 330 subjects (median age = 29.2, 64% women) participated in experiment 2 and received monetary compensation. Participants were randomly assigned to read

descriptions of two diagnostic screening scenarios with varying degrees of AI involvement (AI-autonomous diagnosis vs. AI-assisted diagnosis). Participants in the AI-autonomous diagnostic condition were highlighted with "analysis based on genetic big data analysis and deep learning algorithms, and assessment reports and detailed health management recommendations generated entirely by advanced AI analysis techniques." Participants in AI-assisted diagnostic conditions were emphasized that "a professional doctor will evaluate your genetic report and make recommendations based on intelligent test results."

Measures

Intergroup Anxiety

The measurement of intergroup anxiety was a modified version of the intergroup anxiety scale developed by Stephan and Stephan (1985). In the previous studies, researchers have used this measurement to examine how people feel when interacting with members of other races (Stephan et al., 2002; Tausch et al., 2007). In this study, participants read the following sentence: "I have the following emotions when I think about conducting a surgery by a highly accurate surgical robot/by a surgical specialist with the help of intelligent medical devices/by surgical specialist:" Participants rated how nervous, worried, and afraid they felt using 5-point Likert-type scales (1 = not at all, 5 = very). These items produced a reliable intergroup anxiety index (Cronbach's α = 0.90).

Realistic Individual Threats

As mentioned above, realistic individual threats include threats to an individual's rights and welfare. Therefore, we used privacy concerns to measure realistic individual threats. The measurement was used in the study of the impact of electronic medical records on patients' willingness to share personal health data (Cherif et al., 2021). Scale items include "using this medical method would collect too much personal information about me," "using this medical method would cause my personal data to be disclosed," "sharing my personal information with other health care providers without my authorization," and "using my personal data for other purposes without my authorization" (Kim et al., 2008; Ponte et al., 2015). Responses were made on 5-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree (Cronbach's α = 0.92).

Symbolic Individual Threats

The autonomy of machines has been shown to pose a threat to individual identity and uniqueness (Złotowski et al., 2017). We adopt the uniqueness neglect (Longoni et al., 2019) as a measure of symbolic individual threats. Uniqueness neglect was originally adapted from the personal sense of uniqueness scale (Şimşek and Yalınçetin, 2010). Participants indicated to what extent they agreed with the following statements "the uniqueness of my health condition cannot be recognized," "my personal special condition will not be considered," and "no treatment plan can be made based on my special condition" (Cronbach's α = 0.83). The response format consisted of a 5-point Likert-type scale ranging from strongly disagree to strongly agree.

Realistic Group Threats

The measurement method of realistic group threats is adapted from the definition of realistic group threats (Stephan et al., 2002), and the description focuses on the threat of external groups to employment resources and economic resources. This measure has been used by many researchers to examine the realistic threats posed by immigrants and ethnic minorities (Stephan et al., 2002; Tausch et al., 2007). A number of three items were used for the measurement in this study, which include "AI medical care replaced the original job opportunities of doctors," "AI medical care will lead to a higher unemployment of health care workers," and "AI medical care will make it more difficult for medical graduates to find jobs" (Cronbach's α = 0.82). Participants were also rated on a 5-point Likert-type scale, with a higher score indicating a greater perceived threat.

Symbolic Group Threats

The measurement of symbolic group threats also refers to the definition of symbolic group threats (Stephan et al., 2002), which focuses on value system and belief. We used a single item "AI medical care will threaten the health care system of our country" for participants to evaluate (1 = strongly disagree, 5 = strongly agree).

Willingness to Accept

The measurement of WTA used the methods in the study of understanding, explaining, and utilizing medical AI (Cherif et al., 2021). In experiment 1, participants were asked "How likely would you choose to perform a surgical procedure with a highly accurate surgical robot/surgical specialist using intelligent medical equipment/surgical specialist?" and rated the question on a 5-point Likert-type scale (1 = not at all likely, 5 = very likely). In experiment 2, participants were asked "how likely they are to choose to have health advice provided entirely by AI analytics/human experts with the help of intelligent testing results," with a score of 1–5 (1 = not at all likely, 5 = very likely).

Data Analysis

Main Effect

In both experiments 1 and 2, one-way ANOVA was used to verify the impact of the degree of AI involvement in medical care on patients' WTA. The independent variable, the degree of AI involvement, is a categorical variable, which was transformed to a dummy variable at the first.

Mediation Effect

To verify the mediating role of intergroup anxiety in the relationship between the degree of AI involvement and patient WTA(H2). We use SPSS (PROCESS Procedure for SPSS version 3.3 is written by Hayes, 2013) to test the mediating effect of multiple categories of independent variables based on the bootstrap (Hayes, 2013).

To verify realistic individual threats (H3), symbolic individual threats (H4), realistic group threats (H5), and symbolic group threats (H6) which mediate the

	N	M	SD	SE	95% CI		Min	Max
					Lower	Upper		
Low involvement	148	4.47	0.664	0.055	4.36	4.57	2	5
Mid involvement	150	3.85	0.893	0.073	3.71	4.00	2	5
High involvement	148	3.40	1.080	0.089	3.22	3.57	1	5
Total	446	3.91	0.994	0.047	3.81	4.00	1	5

relationship between degree of AI involvement and patient's WTA, we use SPSS PROCESS Model 4 to conduct a multiple parallel mediation effect test by bootstrap method (Preacher and Hayes, 2004).

RESULTS

The Impact of Artificial Intelligence Involvement on Patients' Willingness to Accept in the Treatment Scenario

Under the same surgical precision, patients have the highest WTA surgical experts ($M_{low} = 4.47$, $SD = 0.66$), followed by AI as an auxiliary tool ($M_{mid} = 3.85$, $SD = 0.89$). Patients had the lowest WTA fully autonomous AI health care [$M_{high} = 3.40$, $SD = 1.08$, $F(2.42) = 53.00$, $p < 0.001$, refer to **Table 2**].

The Mediating Role of Intergroup Anxiety

The omnibus test of total effect of AI involvement on patients' WTA: $F(2,443) = 53.00$ ($p < 0.001$) indicates that the two relative total effects are not all 0. The omnibus test of direct effect of AI involvement on patients' WTA: $F(2,442) = 40.23$ ($p < 0.001$) indicates that the two relative direct effects are not all 0. Therefore, it is necessary to conduct further relative mediation analysis.

The results of the relative mediation analysis were as follows: with the low involvement as the reference level, the bootstrap confidence interval of 95% of mid involvement was [−0.167, −0.095], excluding 0, which indicates significant relative mediating effect ($a_1 = 0.293$, $b = −0.285$, $a_1 b = −0.083$). That is,

patients' intergroup anxiety about AI-assisted medical care was 0.293 higher than that of human surgical experts ($a_1 = 0.293$). Therefore, the WTA AI-assisted medical care also decreased by 0.530 ($c_1' = −0.530$, $p < 0.001$). The relative total effect was significant ($c_1 = −0.613$, $p < 0.001$), and the relative mediating effect was 13.6% (−0.083/−0.613).

As above, with low involvement as the reference level, the 95% bootstrap confidence interval of high involvement was [−0.285, −0.100], excluding 0, which indicates significant relative mediating effect ($a_2 = 0.649$, $b = −0.285$, $a_2 b = −0.185$). In other words, patients' intergroup anxiety about fully autonomous AI medical was 0.649 higher than that of human surgical experts ($a_2 = 0.649$), so the WTA fully autonomous AI medical was also reduced by 0.88 ($c_2' = −0.883$, $p < 0.001$). The relative total effect was significant ($c_2 = −1.068$, $p < 0.001$), and the relative mediating effect was 17.3% (−0.185/−1.068). The results are shown in **Figure 2** and **Table 3**.

The Impact of Artificial Intelligence Involvement on Patients' Willingness to Accept in the Diagnostic Scenario

The willingness of patients to accept evaluation reports issued by human experts ($M_{low} = 4.05$, $SD = 0.66$) is higher than that of big data analysis and deep learning algorithm [$M_{high} = 3.63$, $SD = 0.98$, $F(1, 15) = 21.07$, $p < 0.001$, refer to **Table 4**].

The Mediating Role of Realistic Individual Threats, Symbolic Individual Threats, Realistic Group Threats, Symbolic Group Threats

The results of the mediation test showed that the 95% confidence interval (LLCI = −0.220, ULCI = −0.062) of the indirect effect of privacy concern representing realistic individual threats did not contain 0, which indicates the existence of the mediation effect. The 95% confidence interval of the direct effect (LLCI = −0.358, ULCI = −0.039) did not contain 0, which indicates that privacy concern was an incomplete mediator and the mediating effect was −0.132. Similarly, uniqueness neglect that represents symbolic individual threats was as an incomplete mediator (LLCI = −0.137, ULCI = −0.003), with a mediating effect of −0.061. Realistic group threats were incomplete mediation
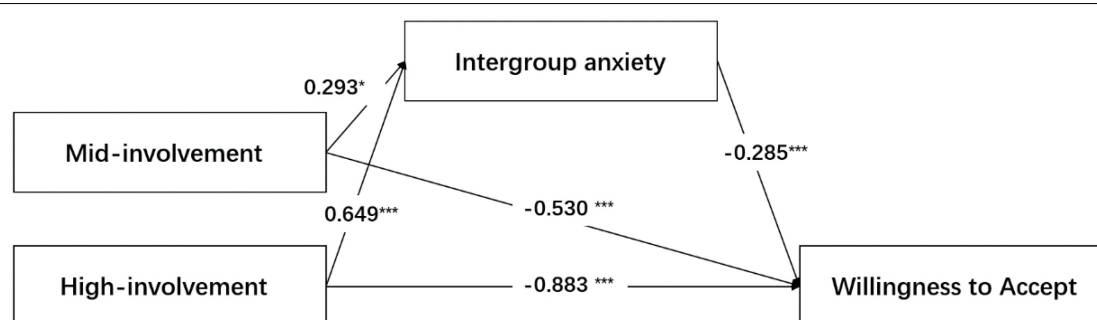
FIGURE 2 | The result of experiment 2. *$p < 0.05$, ***$p < 0.001$.

TABLE 3 | The mediating role of intergroup anxiety ($n = 330$).

Model pathways	Coefficient	Standardized estimate	p	95% CI		Ratio of effect
				Lower	Upper	
Intergroup anxiety on						
Mid involvement (a1)	0.293	0.136	0.032	0.026	0.559	
High involvement (a2)	0.649	0.136	<0.001	0.381	0.916	
Willingness to Accept on						
Intergroup anxiety (b)	−0.285	0.034	<0.001	−0.351	−0.219	
Relative total effects						
Mid involvement (c1)	−0.613	0.104	<0.001	−0.817	−0.409	
High involvement (c2)	−1.068	0.104	<0.001	−1.373	−0.863	
Relative direct effects						
Mid involvement (c1')	−0.530	0.097	<0.001	−0.720	−0.339	
High involvement (c2')	−0.883	0.099	<0.001	−0.001	−0.688	
Relative indirect effects						
Mid involvement (a1*b)	−0.083	0.040		−0.167	−0.010	13.6%
High involvement (a2*b)	−0.185	0.047		−0.286	−0.100	17.3%

(LLCI = −0.091, ULCI = −0.004), and the mediation effect was −0.040. However, the confidence interval of the indirect effect of symbolic group threats (LLCI = −0.094, ULCI = 0.034) contained 0, which indicates that the mediating effect did not exist. The result is shown in **Table 5** and **Figure 3**.

DISCUSSION

The results of this study showed that patients were reluctant to use AI for medical treatment, even though they knew that AI could provide expert-level accuracy in medical care. The willingness to choose a human doctor is higher than that of AI-assisted medical devices and far higher than that of fully autonomous intelligent medical devices. This means that while AI can provide accurate and effective services in health care, patients are still more likely to rely on human doctors.

According to ITT, people tend to anticipate threats from outside groups, which results in prejudice (Stephan et al., 2005; Morrison et al., 2009; Myers et al., 2013). The study result preliminarily confirmed that people will have intergroup threats when facing AI and resist using AI for medical treatment because of intergroup anxiety. We can see that although the application of AI technology has been all over the medical industry, patients still have a bias against AI medical care.

One of the reasons for this bias and resistance is from realistic individual threats; that is, patients worry about whether there is a privacy leakage and other issues that would harm their rights. Another reason is symbolic individual threats, which means patients generally worry about whether they can receive precise medicine tailored to their condition when using AI medical care. There is also another reason for symbolic group threats related to the wellbeing of healthcare workers. However, symbolic group threats failed to pass the mediation effect verification. From the results, the higher the degree of AI intervention, the more likely patients would perceive the threat to the existing medical system. Although patients

TABLE 5 | The mediating role of realistic individual threats, symbolic individual threats, realistic group threats, and symbolic group threats ($n = 446$).

Model pathways	Standardized effect	SE	95% CI		Ratio of effect
			Lower	Upper	
Indirect effects	−0.260	0.065	−0.390	−0.137	53.0%
AI involvement → Realistic individual threats → Willingness to Accept	−0.132	0.040	−0.220	−0.062	26.9%
AI involvement → Symbolic individual threats → Willingness to Accept	−0.061	0.034	−0.137	−0.003	12.5%
AI involvement → Realistic group threats → Willingness to Accept	−0.040	0.022	−0.091	−0.004	8.1%
AI involvement → Symbolic group threats → Willingness to Accept	−0.027	0.032	−0.094	0.034	5.6%
Direct effects	−0.231	0.081	−0.358	−0.039	
Total effects	−0.491	0.092	−0.603	−0.241	

TABLE 4 | The impact of the AI involvement on patients' WTA in the diagnostic scenario ($n = 330$).

	N	M	SD	SE	95% CI		Min	Max
					Lower	Upper		
Low involvement	164	4.05	0.658	0.051	3.95	4.16	2	5
High involvement	166	3.63	0.980	0.076	3.48	3.78	1	5
Total	330	3.84	0.861	0.047	3.75	3.94	1	5
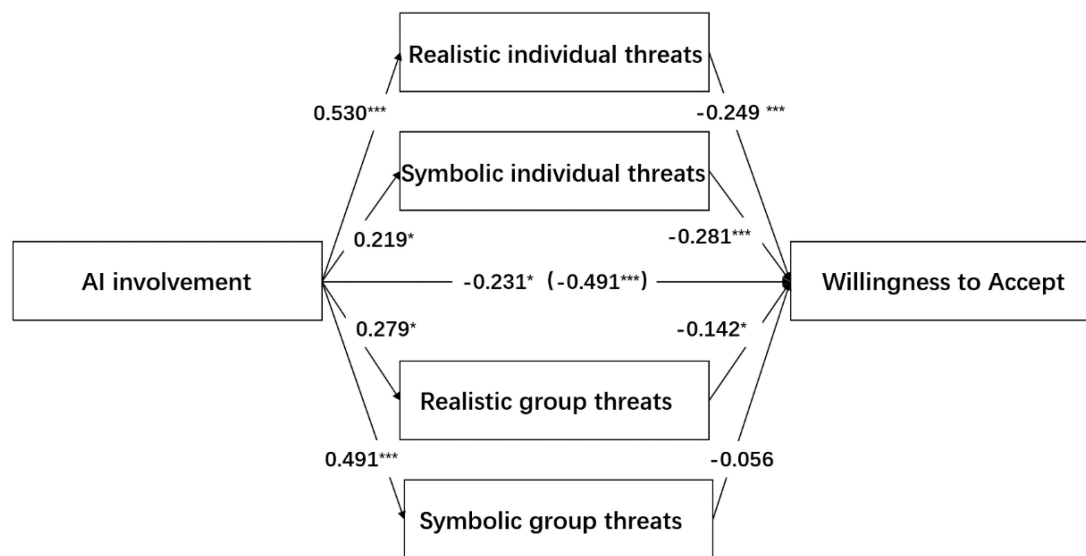
FIGURE 3 | The result of experiment 2. *$p < 0.05$, ***$p < 0.001$.

have realized that this will have a transformative impact on the healthcare system, there is no significant difference in consumers' WTA AI as it has been widely used in various healthcare scenarios.

The previous studies have confirmed that people can perceive threats from AI technology in human–computer interaction scenarios. When faced with autonomous AI technology, people experience loss of situational control (Stein et al., 2019), undermining uniqueness of human identity (Złotowski et al., 2017; Stein et al., 2019), feeling security risks (Złotowski et al., 2017), and feeling resource competition (Złotowski et al., 2017), etc.

From the perspective of theoretical contribution, this study explores where patients' concerns about AI health care come from (which includes individual level, group level, realistic level, and symbolic level) an integrated framework based on ITT. In addition, a test of multiple parallel mediating effects was used to observe the overall mediating effect of all perceived threats and observe the effect of a single threat after eliminating other mediators. Meanwhile, the relative degree of the impact of threats from different levels on patients' willingness to use AI medical services was also compared.

From the perspective of practical contribution, the research results revealed that patients would have greater realistic individual threats when facing AI health care, such as personal privacy disclosure. The second was symbolic individual threats, such as the lack of precision medical services tailored to the individual's uniqueness. The least affected were perceived realistic group threats, such as threats to the employment of healthcare workers. When emphasizing the intelligence, accuracy, and cost-effectiveness of AI health care, relevant departments and enterprises may have neglected to understand the sources of negative attitudes and irrational fears about AI health care from the

perspective of patients. The research conclusions can help government departments, institutions, and enterprises formulate targeted policies, strategies, or product plans, eliminating patients' doubts, improving the application of AI in the medical industry, and promoting the benign development of AI health care.

This study has the following limitations. First of all, many other perceived threats can lead to negative attitudes or avoidance behaviors of patients toward AI health care. In this study, only a few representative variables were selected according to the ITT theory to measure threats from different levels. Second, only a single item was used to measure symbolic group threats. These problems need to be further explored by developing more comprehensive scales in the future studies. Third, the research was only conducted in China, so whether there are significant differences in research results under different social cultures needs to be further explored.

Despite these limitations, our research reveals the psychological mechanism of patients' resistance to the use of AI health care, which deepens the understanding of the current AI medical application. The research conclusions can provide guidance for the application and development of AI in the medical field and provide a reference for policy-making of relevant departments and product promotion of relevant enterprises.

CONCLUSION

The study suggests that patients experience intergroup anxiety in the face of AI health care and will resist using AI health care because of the perceived threat. Threats from different levels have a different extent of impacts on patients. In healthcare scenarios, patients first pay attention to threats related to themselves at

the individual level, such as personal safety and personal rights. Moreover, patients are more affected by realistic threats (such as personal privacy disclosure) than symbolic threats (such as ignoring individual uniqueness). In contrast, group-level threats have less impact on patients.

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 Science and Technology, Shanghai Jiao Tong University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YZ designed the study and did the writing and analysis, while YS collected data and revised the manuscript. WL gave guidance to the research topic and critically revised the manuscript. FW gave guidance to the research framework. All authors contributed to the article and approved the submitted version.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Agarwal, R., Dugas, M., Gao, G. G., and Kannan, P. (2020). Emerging technologies and analytics for a new era of value-centered marketing in healthcare. *J. Acad. Mark. Sci.* 48, 9–23. doi: 10.1007/s11747-019-00692-4

Alexander, R. D. (1974). The evolution of social behavior. *Annu. Rev. Ecol. Systemat.* 5, 325–383.

Baumeister, R. F. (2010). *The Self.* Oxford: Oxford university press.

Cherif, E., Bezaz, N., and Mzoughi, M. (2021). Do personal health concerns and trust in healthcare providers mitigate privacy concerns? Effects on patients' intention to share personal health data on electronic health records. . *Social Sci. Med.* 283:114146. doi: 10.1016/j.socscimed.2021.114146

Dunbar, R. I. M. (2013). *Primate Social Systems.* Cham: Springer Science & Business Media.

Eastwood, J., Snook, B., and Luther, K. (2012). What people want from their professionals: attitudes toward decision-making strategies. *J. Behav. Decis. Mak.* 25, 458–468. doi: 10.1002/bdm.741

Feshki, M. G., and Shijani, O. S. (2016). "Improving the heart disease diagnosis by evolutionary algorithm of PSO and Feed Forward Neural Network," in *Proceedings of the 2016 Artificial Intelligence and Robotics (IRANOPEN)* (Qazvin: IEEE)

Granulo, A., Fuchs, C., and Puntoni, S. (2019). Psychological reactions to human versus robotic job replacement. *Nat. Hum. Behav.* 3, 1062–1069. doi: 10.1038/s41562-019-0670-y

Grove, W. M., Zald, D. H., Lebow, B. S., Snitz, B. E., and Nelson, C. (2000). Clinical versus mechanical prediction: a meta-analysis. *Psychol. Assess.* 12:19. doi: 10.1037/1040-3590.12.1.19

Haslam, N., Loughnan, S., Kashima, Y., and Bain, P. (2008). Attributing and denying humanness to others. *Eur. Rev. Soc. Psychol.* 19, 55–85. doi: 10.1080/10463280801981645

Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach.* New York, NY: Guilford Press.

Hazarika, I. (2020). Artificial intelligence: opportunities and implications for the health workforce. *Int. Health* 12, 241–245. doi: 10.1093/inthealth/ihaa007

Kaplan, F. (2004). Who is afraid of the humanoid? Investigating cultural differences in the acceptance of robots. *Int. J. Human. Robot.* 1, 465–480. doi: 10.1142/s0219843604000289

Kettle, K. L., and Häubl, G. (2011). The signature effect: signing influences consumption-related behavior by priming self-identity. *J. Consum. Res.* 38, 474–489. doi: 10.1086/659753

Kim, D. J., Ferrin, D. L., and Rao, H. R. (2008). A trust-based consumer decision-making model in electronic commerce: the role of trust, perceived risk, and their antecedents. *Decis. Support Syst.* 44, 544–564. doi: 10.1016/j.dss.2007.07.001

Longoni, C., Bonezzi, A., and Morewedge, C. K. (2019). Resistance to medical artificial intelligence. *J. Consum. Res.* 46, 629–650.

Mei, X., Lee, H.-C., Diao, K.-Y., Huang, M., Lin, B., Liu, C., et al. (2020). Artificial intelligence–enabled rapid diagnosis of patients with COVID-19. *Nat. Med.* 26, 1224–1228.

Morrison, K. R., Fast, N. J., and Ybarra, O. (2009). Group status, perceptions of threat, and support for social inequality. *J. Exp. Soc. Psychol.* 45, 204–210. doi: 10.1016/j.jesp.2008.09.004

Myers, C., Abrams, D., Rosenthal, H. E., and Christian, J. (2013). Threat, prejudice and stereotyping in the context of Japanese, North Korean, and South Korean intergroup relations. *Curr. Res. Soc. Psychol.* 20, 76–85.

Nov, O., Aphinyanaphongs, Y., Lui, Y. W., Mann, D., Porfiri, M., Riedl, M., et al. (2020). The transformation of patient-clinician relationships with ai-based medical advice: a "bring your own algorithm" Era in Healthcare. *arXiv* [Preprint] Available online at: https://doi.org/10.48550/arXiv.2008.05855 [accessed on August 13, 2020].

Ponte, E. B., Carvajal-Trujillo, E., and Escobar-Rodríguez, T. (2015). Influence of trust and perceived value on the intention to purchase travel online: integrating the effects of assurance on trust antecedents. *Tour. Manage.* 47, 286–302. doi: 10.1016/j.tourman.2014.10.009

Preacher, K. J., and Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Methods Instr. Comput.* 36, 717–731. doi: 10.3758/bf03206553

Promberger, M., and Baron, J. (2006). Do patients trust computers? *J. Behav. Decis. Mak.* 19, 455–468. doi: 10.1002/bdm.542

Şimşek, ÖF., and Yalınçetin, B. (2010). I feel unique, therefore I am: the development and preliminary validation of the personal sense of uniqueness (PSU) scale. *Pers. Individ. Differ.* 49, 576–581. doi: 10.1016/j.paid.2010.05.006

Stein, J.-P., Liebold, B., and Ohler, P. (2019). Stay back, clever thing! Linking situational control and human uniqueness concerns to the aversion against autonomous technology. *Comput. Hum. Behav.* 95, 73–82. doi: 10.1016/j.chb.2019.01.021

Stephan, W. G., Boniecki, K. A., Ybarra, O., Bettencourt, A., Ervin, K. S., Jackson, L. A., et al. (2002). The role of threats in the racial attitudes of Blacks and Whites. *Pers. Soc. Psychol. Bull.* 28, 1242–1254. doi: 10.1177/01461672022812009

Stephan, W. G., Renfro, C., and Davis, M. D. (2008). "The role of threat in intergroup relations," in *Improving intergroup relations: Building on the legacy*

of Thomas, eds F. Pettigrew, U. Wagner, L. R. Tropp, G. Finchilescu and C. Tredoux (Hoboken, NJ: Blackwell Publishing), 55–72

Stephan, W. G., Renfro, C. L., Esses, V. M., Stephan, C. W., and Martin, T. (2005). The effects of feeling threatened on attitudes toward immigrants. *Int. J. Intercult. Relat.* 29, 1–19. doi: 10.1186/s12913-016-1423-5

Stephan, W. G., and Stephan, C. W. (1985). Intergroup anxiety. *J. Soc. Issues* 41, 157–175.

Stephan, W. G., and Stephan, C. W. (2000). "An integrated threat theory of prejudice," in *Reducing Prejudice and Discrimination*, ed. S. Oskamp (Mahwah, NJ: Lawrence Erlbaum Associates Publishers), 23–45.

Stephan, W. G., Ybarra, O., and Morrison, K. R. (2009). "Intergroup threat theory," in *Handbook of Prejudice, Stereotyping, and Discrimination* ed. T. D. Nelson (Hove: Psychology Press), 43–59.

Stephan, W. G., Ybarra, O., and Rios, K. (2015). "Intergroup threat theory," in *Handbook of Prejudice, Stereotyping, and Discrimination*, ed. T. D. Nelson (Hove: Psychology Press), 255–278.

Tajfel, H. (1974). Social identity and intergroup behaviour. *Soc. Sci. Inform.* 13, 65–93. doi: 10.1177/053901847401300204

Takiddin, A., Schneider, J., Yang, Y., Abd-Alrazaq, A., and Househ, M. (2021). Artificial Intelligence for Skin Cancer Detection: scoping review. *J. Med. Internet Res.* 23:e22934. doi: 10.2196/22934

Tausch, N., Tam, T., Hewstone, M., Kenworthy, J., and Cairns, E. (2007). Individual-level and group-level mediators of contact effects in Northern Ireland: the moderating role of social identification. *Br. J. Soc. Psychol.* 46, 541–556. doi: 10.1348/014466606X155150

Trope, Y. (1975). Seeking information about one's ability as a determinant of choice among tasks. *J. Pers. Soc. Psychol.* 32:1004. doi: 10.1037/0022-3514.32.6.1004

Yamashita, R., Bird, K., Cheung, P. Y.-C., Decker, J. H., Flory, M. N., Goff, D., et al. (2021). Automated identification and measurement extraction of pancreatic cystic lesions from free-text radiology reports using natural language processing. *Radiology* 4:e210092.

Złotowski, J., Yogeeswaran, K., and Bartneck, C. (2017). Can we control it? Autonomous robots threaten human identity, uniqueness, safety, and resources. *Int. J. Hum. Comput. Stud.* 100, 48–54. doi: 10.1016/j.ijhcs.2016.12.008

Emergency Stress, Hardiness, Coping Strategies and Burnout in Health Care and Emergency Response Workers During the COVID-19 Pandemic

Monia Vagni[1]*, Tiziana Maiorano[1], Valeria Giostra[1], Daniela Pajardi[1] and Paul Bartone[2]

[1] *Department of Humanities, University of Urbino, Urbino, Italy,* [2] *Institute for National Strategic Studies, National Defense University, Washington, DC, United States*

Objective: Stress is a growing problem in the general population, but most especially for workers responding to the COVID-19 crisis. The present study examines stress and Burnout in Health Care workers and Emergency Responders during the third COVID wave in Italy. In addition, we explore the value of psychological Hardiness and positive coping strategies as protective factors against the ill-effects of stress.

Methods: Over a 5-month period in 2021, surveys were administered across all Italian regions to several groups including Health Care workers ($N = 220$), Emergency Responders (firefighters, civil protection, ambulance personnel; $N = 121$), volunteer Italian Red Cross workers ($N = 328$), and a comparison group ($N = 400$) drawn from the General Population of Italy.

Results: Results showed that among the groups, Health Care workers had the highest levels of Emergency Stress, while the Red Cross volunteers had relatively lower stress levels. Hardiness and positive coping levels were highest among Red Cross workers, and lowest in the General Population sample. The biggest impact on Burnout was seen among health care workers, especially on Emotional Exhaustion and Depersonalization. Multiple regression results showed that Hardiness operates as a moderator of the effects of Emergency Stress on Emotional Exhaustion and Depersonalization aspects of Burnout, while problem focused coping and Stopping Negative Thoughts-Emotions also showed moderating effects.

Conclusion: These results suggest that Health Care workers and Emergency Responders would benefit from additional training in hardiness and positive coping skills.

Keywords: hardiness, Emergency Stress, Burnout, COVID, health care

INTRODUCTION

The confrontation with stressful events such as the COVID pandemic poses a threat to psychological health and wellbeing for the general population, but an even greater risk for Health Care workers who face added stressors related to the health emergency. Several studies have attempted to identify factors that provide resilience for Health Care workers in the COVID

pandemic (Croghan et al., 2021; Hines et al., 2021). These studies have tended to focus on social and demographic factors that may increase resilience or vulnerability (e.g., social support, age, gender). Few studies to date have examined personality and coping dimensions that may add to resilience for Health Care and Emergency workers responding to the COVID crisis (Conversano et al., 2020; Maiorano et al., 2020).

Previous studies have identified positive coping strategies and hardiness as buffers against the negative effects of stress in general (Kobasa, 1982; Kobasa et al., 1982). Hardiness, defined by Kobasa (1979) as a personality trait consisting of three fundamental characteristics (commitment, control and challenge), is a protective factor against the negative effects of stress including burnout (White et al., 2020; Bartone et al., 2021). Several recent studies have also found that this psychological resource is a significant buffer against the adverse psychological effects of stress related to the COVID pandemic, for Health Care and Emergency workers (Maiorano et al., 2020; Vagni et al., 2020a) and also in the general population (Dymecka et al., 2021). Furthermore, hardiness is a predictor of adaptive and positive coping (Clarke, 1995; Lease, 1999; Chan, 2000; Bartone and Homish, 2020; Kamtsios and Bartone, 2021). Higher hardiness levels are also associated with less use of avoidance coping in both military and civilian groups (Thomassen et al., 2018, 2022). Vagni et al. (2020b) recently examined emergency volunteers from the Red Cross, and found that hardiness showed significant effects in reducing emergency stress levels, emotional exhaustion, and depersonalization, and maintaining a sense of personal accomplishment. Hardiness has also shown benefits among the general population, facilitating perceptions of the pandemic as a challenge (Dymecka et al., 2021).

According to recent work by Stein and Bartone (2020), a hardiness mindset can be increased in various ways, including as a function of successful coping with various threats and challenges. For example Vagni et al. (2021) studied Health Care and Emergency workers during the COVID pandemic, and found that workers' hardiness skills increased from the first to the second wave of the pandemic, while their coping strategies remained fairly stable. Similar findings were reported by Labrague (2021). These results are especially important because they show that in situations in which emergency stress is prolonged, hardiness may be an effective protective factor against the negative effects of stress such as burnout.

During stressful life events, as is happening now in the long pandemic period, hardiness may influence mental health through increasing positive, active coping approaches and decreasing the use of dysfunctional coping strategies (Thomassen et al., 2022). According to Bartone et al. (2022) people who are higher in hardiness tend to use more adaptive coping styles that prompt them to take actions to remove the sources of stress. In a meta-analytic review, Eschleman et al. (2010) also found that hardiness was linked to more active, problem solving coping styles. Therefore, it was expected that higher levels of hardiness would be related to more adaptive coping styles.

OBJECTIVES

Hardiness is a protective factor against the negative effects of the COVID pandemic stress both for the General Population and for Health Care and Emergency Responders (Maiorano et al., 2020; Dymecka et al., 2021; Manchia et al., 2022; Vagni et al., 2021). Hardiness has a strong association with positive coping strategies both in the General Population and in Health Care and Emergency Responders (Bartone and Homish, 2020; Kamtsios and Bartone, 2021; Vagni et al., 2021).

Previous studies have verified the positive effects of Hardiness and positive coping strategies on the stress associated with the COVID-19 considering only the General Population or first responders. The general objective of this study is to verify whether the coping and Hardiness skills used by the General Population to cope with COVID-19 are the same as those used by Health Care and Emergency Responders (first study). In fact, the main hypothesis is that Health Care and Emergency Responders need a greater capacity for resilience and different coping strategies. The results obtained from this first study led to consider the group of the General Population too different to continue in subsequent analyzes to keep it together with Health Care and Emergency Responders.

A second general hypothesis is that Volunteers Emergency Responders show different levels of Hardiness and positive coping from Health Care and professional Emergency Responders.

The first study examined possible differences between the General Population and Health Care Workers (HCWs), as well as both professional Emergency Responders (ERs) and Volunteer Emergency Responders (VERs) in terms of coping and resilience skills. In the second study involving HCWs, ERs and VERs, the protective effects of Hardiness and coping strategies with respect to Burnout were evaluated, as well as their potential role as moderators in the stress—illness relation. As seen in previous studies (Vagni et al., 2020b, 2021), the major stress experienced by Health Care and Emergency Response personnel is linked to specific factors in their work environment, and is not generic. This led to the choice of instruments for measuring the different stressors between HCWs, ERs, VERs and the General Population.

Main Hypotheses
Study 1
1. Health Care Workers, Professional Emergency Responders, and Volunteer Emergency Responders have different coping strategies and resilience skills compared to the General Population.
2. In the General Population, Hardiness and coping strategies play a protective role regarding perceived stress and stress reactions during the COVID-19 pandemic.

Study 2
1. Health Care Workers experience higher levels of Emergency Stress and Burnout than both professional and Volunteer Emergency Responders.

2. Hardiness and positive Coping strategies reduce the risk of developing work-related stress problems in operators involved in the management of the pandemic.
3. Hardiness and coping strategies serve as moderators lowering the impact of Emergency Stress on Burnout.

PARTICIPANTS

Subjects recruited for these studies were as follows:

- $N = 400$ participants from the General Population (GP) with a mean age of 31.95 (SD = 13.21; min–max = 18–87). The General Population group included 312 females (78%) and 88 males.
- $N = 220$ Health Care Workers (HCWs) with a mean age of 43.80 (SD = 12.13; min–max = 20–68) and included: 99 (45%) physicians and 121 (55%) nurses. Of the HCWs, 21.8% were males and 66.9% females. Of these, 60.5% were frontline workers dealing with COVID-19 patients.
- $N = 121$ Emergency Responders (ERs) included firefighters, civil protection, and ambulance personnel, with a mean age of 47.53 (SD = 11.99; min–max = 20–73). Of these, 53.7% were male and 46.3% female, and 54.5% were frontline workers with COVID-19 patients.
- $N = 328$ Volunteer Emergency Responders of the Italian Red Cross (VERs) with a mean age of 47.0 (SD = 14.52; min–max = 18–77). Of these, 40.2% were male and 59.8% female, with 50.9% of the VERs performing direct interventions on COVID-19 patients.

Any participant who treated COVID-19 patients directly was further classified as a "COVID patient."

Procedure

Both studies used an online transactional survey, and participants were recruited from May to September 2021 from all Italian regions. The survey included online informed consent, several questionnaires and basic sociodemographic information. Participants' anonymity was maintained while collecting the data. All procedures used in both studies were approved by the Ethics Committee of the University of Urbino (Comitato Etico per la Sperimentazione Umana—CESU). The research was conducted in compliance with the ethical principles of research established in the "Declaration of Helsinki" and in the "Convention on Human Rights and Biomedicine" (Oviedo Convention).

Materials

Some scales were administered to all participants of the four groups, such as those to measure Hardiness and coping strategies. Other scales were differentiated for the General Population. The HCWs, ERs and VERs received the same test battery, since both were directly involved in responding to the pandemic emergency; their measures included Emergency Stress and risk of developing Burnout from work-related stress.

- The Hardiness Resilience Gauge (HRG) is a 28-item scale that measures total hardiness as well as the three hardiness facets of commitment, control and challenge (Bartone et al., 2022). Reported Cronbach's alpha reliability coefficients are high, at 0.93 for total hardiness, and 0.85, 0.84, and 0.89 for commitment, control and challenge respectively. Sample items are "I look forward to my daily activities" (commitment), "I am responsible for my own success in life" (control), and "I find the positives in any life change" (challenge). The Italian version of the HRG was created following a simple back translation method: four Italian researchers and psychologists translated the original version into Italian and a native English speaker, professor of scientific English in psychology, re-translated the scale into English, without knowing the original version. A comparison was made between reverse translation and the original version and two items were discussed that have minimal differences from the original English version, to refine the Italian version. In the present reference sample (General Population) the HRG also showed good reliability, with Cronbach's alpha coefficients for the total scale ($\alpha = 0.91$) and for the three facets: Commitment ($\alpha = 0.86$); Challenge ($\alpha = 0.82$) and Control ($\alpha = 0.80$).
- The Coping Self-Efficacy Scale—Short Form (CSES-SF, Chesney et al., 2006) is a 13-item self-report questionnaire that evaluates perceived self-efficacy for coping with challenges and threats. The instrument is composed of three sub-scales: Problem-Focused coping (for example, "Make an action plan and follow it when faced with a problem"), Stopping Negative Thoughts-Emotions ("Keep your mind away from negative thoughts"), and Support ("Seek moral support from friends and family"). The subject was asked to rate on an 11-point scale the degree to which they believed they could adopt important behaviors for adaptive coping on an eleven-point Likert scale, with scores ranging from 0 (cannot do at all) to 10 (certain can do). It has previously been validated and found effective in measuring coping strategies in Health Care and emergency workers during the COVID-19 pandemic (Chesney et al., 2006; Vagni et al., 2020b, 2021).

The following was administered to the General Population only:

- The Perceived Stress Scale (PSS) is a 10-item measure of perceived stress in life (Cohen et al., 1983; Cohen and Williamson, 1988). The items assess to what degree a person feels his life is overloaded, unpredictable, or uncontrollable. The scale also contains a series of direct questions about reactions to stress (for example: "In the last month, how often have you been upset because of something that happened unexpectedly?" and "In the last month, how often have you felt nervous and stressed?"). The PSS was designed for use in samples of the general population with an educational level at least equal to lower middle school. The items and the alternatives for the answer are easy to understand. For each item, respondents are asked to indicate how often they felt a certain way (range 0–4). In the present study, the PSS was administered only to the General Population sample.

The following tools were administered to the Health Care, Emergency Responders, and Volunteer Emergency Responders:

- Emergency Stress Questionnaire (ESQ, Maiorano et al., 2020; Vagni et al., 2020a,b,c,d): The ESQ is a self-report instrument, already published and validated in previous research, to assess several level of Emergency Stress: organizational relational, physical, inefficacy decisional, emotional, cognitive, and COVID-19 stress. The ESQ consists of 33 items assessed on a five-point Likert scale, with scores ranging from 0 (not at all) to 4 (very much). The Cronbach reliability coefficients for the individual scales relating to this sample are all satisfactory: Total ESQ ($\alpha = 0.93$), Organizational-Relational stress ($\alpha = 0.71$), Physical stress ($\alpha = 0.87$), Inefficacy Decisional stress ($\alpha = 0.75$), Emotional stress ($\alpha = 0.78$), Cognitive stress ($\alpha = 0.67$) and COVID-19 stress ($\alpha = 0.76$).
- Maslach Burnout Inventory—Human Services survey—Italian version (MBI—HSS, Maslach and Jackson, 1986; Sirigatti and Stefanile, 1993; Loera et al., 2014): This is a self-report questionnaire and a specific version to measure the presence of burnout in Health Care workers. The Italian version of MBI—HSS has 20 self-scored items on a seven-point frequency scale ranging from 0 (never) to 6 (every day) and has three subscales, as follow: Emotional Exhaustion (EE), Depersonalization (D), and Personal Accomplishment (PA). Emotionally Exhausted (EE) employees lack adaptive resources and feel that emotional resources are so depleted that they cannot give any more to their jobs. Depersonalization (D) refers to impersonal, negative, and indifferent responses to the care and treatment to be provided to patients. Finally, Personal Accomplishment (PA) refers to a sense of self-efficacy, a feeling of competence as well as a tendency to evaluate oneself positively, and low scores in this scale correspond to higher degrees of experienced burnout. The PA scale is completely independent of the other two scales (Maslach and Jackson, 1981; Maslach et al., 1996).

Statistical Strategy
Study 1
To test for differences in coping strategies and Hardiness skills between the HCWs, ERs, VERs and General Population Groups, a one-way ANOVA was conducted with Bonferroni's *post-hoc* comparisons (Hy1).

To test for effects of hardiness and coping strategies in the General Population, a linear regression model was generated with PSS as the dependent variable, and age, gender, HRG and CSES-SF scales as predictors (Hy2).

Study 2
To test for the presence of higher levels of Emergency Stress and a higher risk of developing work-related stress problems in Health Care Workers and both Emergency Responders and Volunteers Emergency Responders, a one-way ANOVA was performed comparing the three groups (Hy3). To test for the protective effect of resilience capacities (HRG) and coping strategies (CSES-SF) on Burnout levels (MBI-HSS), Pearson correlations were first calculated to identify associations among the variables of interest, and then three distinct multiple regression models (H4) were generated.

Finally, Hardiness and coping were investigated as potential moderators of the impact of Emergency Stress (ESQ) on Burnout,

applying a series of OLS regression models including appropriate interaction terms (Hy5). Interaction effects are displayed graphically using procedures contained in the PROCESS macro (version 4.0) for SPSS (Hayes, 2022).

RESULTS
Study 1
Using *t*-tests to compare means, physicians and nurses were found not to differ on any of the variables except for Total ESQ scores, on which nurses showed higher stress levels ($t = -4.197$; $p < 0.001$). Thus, physicians and nurses were combined into a single Health Care Worker (HCW) group.

In addressing hypothesis 1, a series of one-way ANOVAs were conducted with Bonferroni's *post-hoc* comparisons. These results are displayed in **Table 1**. Health Care, and both professional and volunteers Emergency Responders showed more positive coping strategies and Hardiness skills than the General Population.

The highest Hardiness levels were seen in the Volunteer Emergency Responder (VER) group (Mean = 65.69, SD = 9.82), and the lowest levels in the General Population (GP) sample (Mean = 57.42, SD = 11.98). Similarly, the GP group showed the lowest levels of Problem Focused and Stopping Negative Thoughts-Emotions coping approaches, while Emergency Responders were comparatively high in these positive coping strategies. In terms of Support coping, the only difference observed was with Health Care Workers, show showed lower Support Seeking than Emergency Responders.

Hypothesis 2
To test for a protective role of HRG and CSES-SF scales on stress in the General Population sample, a linear regression model was generated, controlling for age and gender and predicting scores on the Perceived Stress Scale (PSS). The model was significant, explaining 25% of the variance ($R^2 = 0.253$; $F = 16.279$; $p < 0.001$) in PSS scores. Significant predictors were Hardiness Challenge (Beta = -0.125; $p < 0.05$), Problem Focused coping (Beta = -0.125; $p < 0.05$) and Stopping Negative Thoughts-Emotions (Beta = -0.165; $p < 0.01$) coping. Lower scores on all these predictors was associated with higher levels of reported stress. Younger age (Beta = -0.180; $p < 0.001$) and female gender (Beta = 0.180; $p < 0.001$) were also significant predictors, and thus appear to be risk factors for increased stress reactions in the General Population.

Hypothesis 3
To test if there are higher levels of Emergency Stress and Burnout among Health Care Workers, a one-way ANOVAs were performed contrasting the HCWs, ERs and VERs groups on these variables. Comparisons between groups were made with Bonferroni *post-hoc* test (**Table 2**). Results indicate that Health Care Workers are experiencing the highest levels of Emergency Stress and Burnout (Emotional Exhaustion, Depersonalization), significantly more than both Professional and Volunteer Emergency Responders, Hypothesis 4 posits that Hardiness skills and coping strategies exert a protective effect against Burnout, and allow for a greater sense of Personal

TABLE 1 | One way ANOVAs between HCWS, ERs, VERs and GP on HRG and CSES-SF scores.

	HCWs ($N = 220$) Mean (SD)	ERs ($N = 121$) Mean (SD)	VERs ($N = 328$) Mean (SD)	GP ($N = 400$) Mean (SD)	F	Post-hoc[a]
HRG						
Commitment	22.19 (4.58)	23.05 (4.44)	24.53 (4.22)	20.46 (5.34)	44.73**	H – GP = 1.73**
						ER – GP = 2.59**
						VER – GP = 4.07**
						VER – H = 3.34**
						VER – ER = 1.48*
Control	17.10 (3.80)	17.13 (3.57)	17.44 (3.49)	16.95 (4.01)	1.06	
Challenge	21.40 (4.61)	22.45 (4.29)	23.72 (3.94)	20.01 (5.02)	41.59**	H – GP = 1.40**
						ER – GP = 2.44**
						VER – GP = 3.72**
						VER – ER = 1.28*
						VER – H = 3.2 2**
Tot HRG	60.70(10.70)	62.63(10.44)	65.69 (9.82)	57.42(11.98)	35.38**	H – GP = 3.28**
						ER – GP = 5.21**
						VER – GP = 8.28**
						VER – H = 5.00**
						VER – ER = 3.06*
CSES-SF						
Problem Focused	38.40 (6.72)	39.59 (86.86)	39.39 (6.81)	35.45 (7.60)	22.20**	H – GP = 1.95*
						ER – GP = 4.13**
						VER – GP = 3.94**
						VER – H = 1.99*
						H – ER = −2.19*
Stop Negative T-E	31.70 (10.71)	37.16 (9.83)	36.79 (10.74)	29.17 (11.62)	36.05**	H – GP = 2.53*
						ER – GP = 7.99**
						VER – GP = 7.62**
						VER – H = 5.09**
						H – ER = −5.46*
Support	20.06 (7.29)	21.45 (6.32)	21.65 (6.86)	21.16 (5.46)	2.88*	ER – H = 1.39*
						VER – H = 1.59*

HCWs or H, Health Care workers; ERs, Emergency Response Personnel; VERs, Volunteer Emergency Response; GP, General Population; HRG, Hardiness Resilience Gauge; CSES-SF, Coping Self-Efficacy Scale—Short Form.
[a]*Only significant comparations are included.*
$*p \leq 0.05$; $**p \leq 0.001$.

Accomplishment. In order to test for this, Pearson correlations between the variables of interest were first calculated for the total group of Health Care Workers, Emergency Responders and Volunteer Emergency Responders. Hardiness was seen to correlate substantially with all three coping strategies, and with the three burnout scales. Emergency Stress scores also showed significant correlations with the three burnout scales and (negatively) with the coping scales. Complete correlation results are in **Table 3**.

Following this, three separate hierarchical multiple regression models were generated, one for each burnout scale. In consideration of the fact that all ESQ scales show consistently higher levels in the HCWs group compared to the ERs and VERs groups, only total ESQ scores were included in the following analyses. The models included the Burnout scales as dependent variables, and with age, gender, group (HCWs; ERs; and VERs), having managed COVID-19 patients, and HRG scales as predictors in step 1. Coping strategies were added in step 2.

As can be seen in **Table 4**, the final models were all significant, predicting Burnout Emotional Exhaustion, Depersonalization, and Personal Accomplishment. For Group effects, Health Care Workers are experincing more Burnout (EE and D) compared to Professional Emergency Responders, while the Volunteer Emergency Responders report somewhat less. Younger age is predictive of more Depersonalization Burnout. For the Personal Accomplishment Burnout dimension, Hardiness Control and Challenge, and Problem Focused coping all are significant predictors.

Hypothesis 5 stipulates that Hardiness and positive coping strategies operate as moderators in the relation between Emergency Stress and Burnout. To test this, total HRG scores, coping strategies, ESQ (total) and Burnout scores were all

TABLE 2 | One-way ANOVAs on ESQ and burnout (MBI-HSS) between HCWs (N = 220), ERs (N = 121) and VERs (N = 328).

	HCWs (n = 220) Mean (SD)	ERs (n = 121) Mean (SD)	VERs (n = 328) Mean (SD)	F	Post-hoc[a]
ESQ					
Organizzational-Relational	18.26 (4.98)	14.66 (5.74)	12.49 (5.09)	81.94***	HCW – ER = 3.60***
					HCW – VER = 5.77***
					ER – VER = 2.17***
Physical	11.54 (5.69)	6.98 (5.13)	6.52 (5.15)	62.42***	HCW – ER = 4.55***
					HCW – VER = 5.01***
Inefficacy decisional	12.56 (4.01)	10.30 (4.48)	9.56 (4.06)	35.62***	HCW – ER = 2.67***
					HCW – VER = 3.01***
Emotional	12.80 (4.68)	8.95 (4.81)	8.53 (4.49)	60.14***	HCW – ER = 3.85***
					HCW – VER = 4.27***
Cognitive	7.32 (3.09)	5.01 (2.92)	4.89 (3.00)	46.62***	HCW – ER = 2.31***
					HCW – VER = 2.43***
COVID-19	12.75 (4.52)	10.81 (4.83)	9.53 (4.54)	32.51***	HCW – VER = 3.22***
					ER – VER = 1.28*
					HCW – ER = 18.52***
Tot ESQ	75.23 (20.64)	56.71 (22.17)	51.52 (20.18)	88.54***	HCW – ER = 18.52***
					HCW – VER = 23.71***
MBI-HSS					
EE	23.24 (10.93)	13.31 (8.46)	11.24 (7.76)	120.69***	HCW – ER = 9.93***
					HCW – VER = 12.00***
D	7.49 (6.53)	3.66 (4.89)	3.71 (4.13)	39.74***	HCW – ER = 3.83***
					HCW – VER = 3.78***
PA	26.07 (5.76)	26.88 (5.76)	26.54 (5.46)	1.25	

HCWs, Health Care workers; ER, Emergency Response; VERs, Volunteer Emergency Responders; ESQ, Emergency Stress Questionnaire; MBI-HSS, Maslach Burnout Inventory—Human Services Survey; EE, emotional exhaustion; D, depersonalization; PA, personal accomplishment.
[a] *Only significant comparisons are included.*
$p < 0.05$; ***$p \leq 0.001$.

standardized and entered into several univariate general linear models, along with interaction terms for ESQ * HRG and for ESQ and each of the three coping scales. Since ESQ showed no effects on Burnout—Personal Accomplishment (PA), no models were tested for PA.

Results (**Table 5**) showed significant main effects for both Hardiness (HRG) and ESQ on Burnout Emotional Exhaustion (EE) and Depersonalization (D), as well as a significant interaction effect of ESQ * HRG predicting both of these Burnout components (top of **Table 5**). Additional significant interaction effects were found for ESQ * Problem Focused Coping predicting Burnout Depersonalization (D), and for ESQ * Stopping Negative Thoughts-Emotions predicting Burnout Emotional Exhaustion. Support Coping showed main effects predicting Burnout EE and D, but no interaction effects.

In order to visualize the interactions, significant effects were plotted using the PROCESS (v. 4.0) macro for SPSS (Hayes, 2022). As can be seen in **Figure 1**, it is at high levels of Emergency Stress that Hardiness has the strongest effects on Emotional Exhaustion (panel 1) and Depersonalization Burnout (panel 2). Subjects low in Hardiness who are experiencing higher levels of stress are also highest in Burnout. Likewise, those low in Problem-Focused coping and high in Emergency Stress are

highest in Depersonalization Burnout (panel 3). High levels of Emotional Exhaustion are also seen among the high stress workers who are low in the coping style of Stopping Negative Thoughts-Emotions (panel 4).

DISCUSSION

In examining Hardiness and coping strategies, we found significant group differences as predicted. The resilience factors of Hardiness and positive coping approaches of focusing on the problem and Stopping Negative Thoughts-Emotions were higher in all three groups of COVID workers (Health Care Workers, Professional Emergency Responders, and Volunteer Emergency Responders) compared to the General Population sample, lending support to Hypothesis 1. One possible explanation is that people who are high in Hardiness and positive coping skills are more attracted to Health Care and emergency service occupations in the first place. Also, the training and mutual support of coworkers and supervisors may play a role in reinforcing positive attitudes and coping skills in these workers (James, 2021). Another likely influence concerns the meaningfulness of the work itself. During the COVID pandemic while much of the population was in lockdown and unable to

TABLE 3 | Pearson correlations between ESQ, HRG, CSES-SF and burnout MBI-HSS scores ($N = 676$).

	HRG			HRG	CSES-SF			ESQ
	Commitment	Control	Challenge	Total	PF	SNT-E	S	Total
HRG								
Commitment	1	0.54***	0.61***	0.87***	0.50***	0.58***	0.45***	−0.32***
Control	0.54***	1	0.50***	0.79***	0.41***	0.41***	0.30***	−0.16***
Challenge	0.61***	0.50***	1	0.85***	0.52***	0.53***	0.36***	−0.26***
CSES-SF								
PF	0.50***	0.41***	0.52***	0.58***	1	0.65***	0.41***	−0.20***
SNT-E	0.58***	0.41***	0.53***	0.61***	0.65***	1	0.52***	−0.35***
S	0.45***	0.30***	−0.36***	0.45***	0.41***	0.52***	1	−0.21***
MBI-HSS								
EE	−0.35***	−0.16***	−0.24***	−0.30***	−0.19***	−35***	−0.23***	0.72***
D	−0.32***	−0.20***	−0.21***	−0.30***	−0.20***	−0.22***	−0.20***	0.49***
PA	0.36***	0.36***	0.42***	0.45***	0.40***	0.34***	0.24***	−0.14***

ESQ, Emergency Stress Questionnaire; HRG, Hardiness Resilience Gauge; CSES-SF, Coping Self-Efficacy Scale—Short Form; PF, Problem Focused; SNT-E, Stop Negative Thoughts-Emotions; S, support; MBI-HSS, Maslach Burnout Inventory-Human Services Survey; EE, Emotional Exhaustion; D, Depersonalization; PA, Personal Accomplishment.
***p ≤ 0.001.

work or engage in normal activities, Health Care and Emergency Responders were actively engaged in assisting people in need, doing what they were trained and prepared to do. Thus, while these workers are experiencing high levels of work-related stress, at the same time they may benefit by the realization that they are making important contributions to address the crisis, building up a sense of purpose and meaning.

Interestingly, there were no differences between the General Population sample and the COVID worker groups in the coping strategy of finding social support, and all groups were relatively low on this dimension. This makes sense considering that social isolation and social distancing have been medically required in many areas in order to stop the spread of the COVID virus. At the same time, of the various groups examined, it is the Emergency Responders, both volunteer and professional, who report the highest levels of social support. For these workers then, support from coworkers, family and friends appears to be an important stress resistance resource. In contrast, Health Care Workers show significantly lower levels of support compared to Emergency Responders, reflecting their continuing social isolation throughout the pandemic even in the workplace. In this regard, many Health Care Workers have experienced increased social separation and communication difficulties as a result of special precautions and personal protective equipment such as face masks and hoods that must be constantly worn in the workplace. While medically necessary, these measures impose significant communication barriers between the health care workers and their patients, as well as their fellow health care providers.

According to Labrague (2021) Health Care providers during the COVID pandemic were unable to take advantage of social support and used their resilience skills to increase other positive coping strategies. Avoiding persistence in strategies that at that time could not be available is a protective behavior that comes from personal resilience.

In the present study, we included both professional Emergency Responders (firefighters, ambulance medical technicians, and civil protection workers) as well as volunteers (Red Cross workers). Of all the COVID worker groups examined, the Volunteers showed the lowest levels of Burnout. The volunteer workers also showed the highest levels of Hardiness. Other studies have also found greater stress resilience in volunteer workers in high stress jobs. For example, in a study of officers assigned to assist grieving family members after a military death, those who volunteered for this sad duty showed fewer psychiatric symptoms and greater hardiness compared to officers who were ordered to do it (Bartone et al., 1989). It may be that volunteers serving tough duty have a stronger sense of purpose and meaning in their work, which is an important element of the hardiness commitment facet. Also, being a Volunteer Emergency Responder as opposed to a salaried employee may impart a greater sense of control, in that volunteer workers are free to leave at any time without penalty. This expresses Hardiness Control, and at the same time may reinforce it.

Looking at just the General Population sample, Hardiness and positive coping approaches proved predictive of lower stress and fewer stress related problems, supporting Hypothesis 2. Social support did not have an influence here, perhaps again due to restrictions on social activities and contacts during the pandemic. On the other hand, our findings indicate that young people and women are at higher risk for stress reactions. A recent study of burnout in a broad sample of U.S. workers also found that younger workers were at especially high risk (Bartone et al., 2021). Several factors may help to explain this age effect. Younger workers have less job seniority and security than older ones, and so are more vulnerable to layoffs and pay cuts during the pandemic. Also, they generally lack the financial resources and savings needed to make it through hard times. Finally, young people have more limited experience in coping with major social

TABLE 4 | Hierarchical linear regression models on burnout BMI-HSS scales ($n = 676$).

	EE		D		PA	
	B	**Exp(B)**	**B**	**Exp(B)**	**B**	**Exp(B)**
Step 1						
Age	−0.03	−0.04	−0.04	−0.11**	0.02	0.05
Gender[a]	1.05	0.05	−0.69	−0.06	0.24	0.02
Group[b]	−5.00	−0.42***	−1.44	−0.24***	−0.30	−0.05
COVID-19 patient	−2.30	−0.11**	−1.05	−0.10**	−0.31	−0.03
Commitment	−0.55	−0.24***	−0.24	−0.20***	0.12	0.10*
Control	−0.09	−0.03	−0.18	−0.12*	0.26	0.17***
Challenge	0.08	0.03	0.04	0.03	0.35	0.28***
	$R^2 = 0.320$		$R^2 = 0.183$		$R^2 = 0.215$	
	$F_{(7,659)} = 44.392***$		$F_{(7,659)} = 21.028***$		$F_{(7,659)} = 25.801***$	
Step 2						
Age	−0.01	−0.01	−0.04	−0.11**	0.01	0.03
Gender[a]	0.80	0.04	−0.71	−0.06	0.46	0.04
Group[b]	−4.93	−0.42***	−1.46	−0.24***	−0.25	−0.04
COVID-19 patient	−2.28	−0.11**	−1.05	−0.10**	−0.34	−0.03
Commitment	−0.40	−0.17***	−0.22	−0.18**	0.06	0.05
Control	−0.05	−0.02	−0.17	−0.11*	0.21	0.14**
Challenge	0.16	0.07	0.06	0.05	0.27	0.21***
Problem focused	0.12	0.08	−0.04	−0.05	0.16	0.20***
Stop negative T-E	−0.21	−0.21***	0.02	0.04	0.01	0.01
Support	−0.07	−0.05	−0.05	−0.07	0.01	0.02
	$R^2 = 0.347$		$R^2 = 0.187$		$R^2 = 0.243$	
	$\Delta R^2 = 0.03***$		$\Delta R^2 = 0.004$		$\Delta R^2 = 0.03***$	
	$F_{(10,656)} = 34.794***$		$F_{(10,656)} = 15.079***$		$F_{(10,656)} = 21.037***$	

EE, emotional exhaustion; D, depersonalization; PA, personal accomplishment.
[a]Gender (1 = male; 2 = female).
[b]Group (1 = Health Care worker; 2 = emergency response; 3 = volunteer emergency response).
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

and economic challenges of the sort COVID has brought on, and so are more disrupted by them. A large scale study of the general population in China also found greater risk for psychological problems among young people (Yan et al., 2021). Similar to our own findings, these authors also found women to be at greater risk for COVID stress related problems. One of the reasons cited for this is increased job insecurity and difficulty working experienced by women in the Chinese population. More generally, COVID has led to the loss of many service jobs as in hotels and restaurants, which traditionally employ more women than men. And even when women are able to hold onto their jobs and work from home, they also frequently face the increased burden of child care and education of children who are home all day because schools are closed.

One of the main hypotheses of this research was to examine Emergency Stress and Burnout in Italian workers engaged in the COVID response, while also seeking to identify factors contributing to resilience in these workers. Our findings indicate that Italian Health Care Workers are experiencing the highest levels of Emergency Stress and Burnout, followed by Emergency Responders (Hypothesis 3). These results are in line with other research indicating that Health Care Workers around the

world are being most severely affected by this global pandemic (Chutiyami et al., 2022). For example, a review by Spoorthy et al. (2020) found that health care workers in India and China working with COVID patients experienced higher levels of emotional stress, depression, anxiety, depression, and insomnia. Similar findings have been reported with health care workers in Pakistan (Rana et al., 2020), the United Kingdom (Gilleen et al., 2021), and the United States (Prasad et al., 2021). In a 2020 online survey of U.S. health care workers, 76% reported exhaustion and burnout, 86% anxiety, 75% feeling overwhelmed, and 75% with sleep disturbances (Mental Health America, 2022). Recent studies have also found that COVID related stress is linked to a range of psychiatric symptoms as well as intentions to quit the occupation for health care workers and also first responders including firefighters and police (Hendrickson et al., 2022).

Our regression results confirmed that Hardiness and positive coping approaches provide some protection against Burnout (Hypothesis 4), with some different patterns for the Burnout components. Hardiness Commitment shows the largest (negative) effects with Burnout Emotional Exhaustion and Depersonalization. The strong sense of purpose and meaning that comes with Commitment thus appears to protect against

TABLE 5 | OLS regression results of ESQ effect on two burnout scales with HRG and coping strategies entered as moderators.

Parameter	EE			D		
	B	Exp (*B*)	95% CI	*B*	Exp (*B*)	95% CI
Z_ESQ	0.69	24.75***	(0.64; 0.75)	0.45	12.95***	(0.38; 0.52)
Z_HRG	−0.08	−2.94**	(−0.14; −0.03)	−0.15	−4.30***	(−0.22; −0.08)
Z_ESQ *Z_HRG	−0.09	−3.68***	(−0.14; −0.04)	−0.08	−2.59*	(−0.14; −0.02)
Z_ESQ	0.71	25.88***	(0.66; 0.77)	0.48	14.04***	(0.41; 0.55)
Z_Focus-Problem-Focused	−0.05	−1.63	(−0.10; 0.01)	−0.09	−2.72**	(−0.16; −0.03)
Z_ESQ * Z_Problem-Focused	−0.08	−2.83	(−0.13; −0.02)	−0.07	−0.2.14*	(−0.14; −0.01)
Z_ESQ	0.68	23.88***	(0.62; 0.73)	0.48	0.13.36***	(0.41; 0.55)
Z_Stop_Negative T-E	−0.10	−3.41**	(−0.16; −0.04)	−0.04	−1.00	(−0.11; 0.04)
Z_ESQ * Z_StopNegativet-E	−0.08	−0.3.10**	(−0.13; −0.03)	−0.07	−1.98	(−0.13; −0.00)
Z_ESQ	0.70	25.45***	(0.65; 0.75)	0.48	13.91***	(0.41; 0.54)
Z_Support	−0.08	−2.87**	(−0.14; −0.03)	−0.09	−2.64**	(−0.16; −0.02)
Z_ESQ * Z_Support	−0.03	−1.04	(−0.08; 0.03)	−0.05	−1.37	(−0.11; 0.02)

EE, emotional exhaustion; D, depersonalization.
*p < 0.05; **p < 0.01; ***p < 0.001.

these components of Burnout. In contrast, Hardiness Challenge and Control are more strongly (positively) linked to a sense of Personal Accomplishment. Hardiness Challenge entails a readiness to take on new and difficult tasks, as well as accepting disappointments and failures as opportunities to learn and improve. These results are in agreement with Bay and Novinrouz (2022) that demonstrated how being committed to one's activities and believe that life events are challenges for reaching higher professional levels prevent burnout. Moreover, people who have more power to control experience less exhaustion and greater work accomplishment.

For Health Care Workers and Emergency Responders high in Hardiness Challenge, dealing with COVID patients and related problems is apparently a mission they feel is within their skills and capabilities to perform (Control), and an interesting if difficult Challenge to learn from. Problem Focused coping also enters into the model here, suggesting that these workers tend to take action to get things done and solve problems as they come up on the job. Also noteworthy in the regression results, the experience of direct exposure to COVID patients emerged as an additional independent risk factor for developing Burnout Emotional Exhaustion and Depersonalization. This may reflect the workers' ongoing fear of getting infected themselves, or of causing their family members to be infected. Also, their more frequent and close contact with seriously ill and dying COVID patients can lead to increased feelings of sadness and powerlessness.

The coping approach of Stopping Negative Thoughts-Emotions appears to be valuable in protecting against the core Burnout element—Emotional Exhaustion. For workers involved in providing care and support for COVID patients, it is important that they not dwell on negative feelings and ideas as they perform their work. Those who are unable to block out disturbing images and thoughts, for example of sick and dying patients, may experience greater spillover of work into family life, as well as disrupted sleep and eating patterns. This finding is in line

with results from a recent study of health care workers in 32 countries, in which maintaining positive thoughts was reported as an important coping mechanism for dealing with COVID related stress (Htay et al., 2021). Related to this, emergency responders including police, firefighters and ambulance workers are known to use dark or "gallows" humor as a way of distancing themselves from traumatic scenes encountered in their work, such as dead, burned and mangled human bodies (Charman, 2013; Dangermond et al., 2022). The use of such humor is a valuable way to replace negative thoughts and emotions with more positive ones, and is associated with better adjustment for emergency service professionals (Rowe and Regehr, 2010).

In some ways the most important question addressed in the present study is if Hardiness or any of the coping approaches interacts with Emergency Stress to reduce or moderate its impact on Burnout (Hypothesis 5). Here, results were somewhat mixed, but overall as predicted. Hardiness is a significant moderator of Emergency Stress on Burnout Emotional Exhaustion and Depersonalization. This is in accord with many previous studies showing that hardiness is a buffer or protective factor in the relation of stress to symptoms and health (Hystad et al., 2009; Eschleman et al., 2010; Johnsen et al., 2017), and in a recent study on hardiness and burnout in U.S. workers (Bartone et al., 2021). Stopping Negative Thoughts and Emotions was a stress moderator with respect to Burnout Emotional Exhaustion. This provides further confirmation that for those on the front lines dealing with the COVID crisis, being able to shift negative thoughts and feelings away and maintain positive thinking is an important coping strategy for fending off the primary element of Burnout: Emotional Exhaustion.

Problem Focused coping also moderates Emergency Stress, but this time with the Depersonalization element of Burnout. Depersonalization or cynicism develops in workers as they become physically and emotionally exhausted, and experience increasing feelings of powerlessness to change the situation or make things better. They slowly become more and more
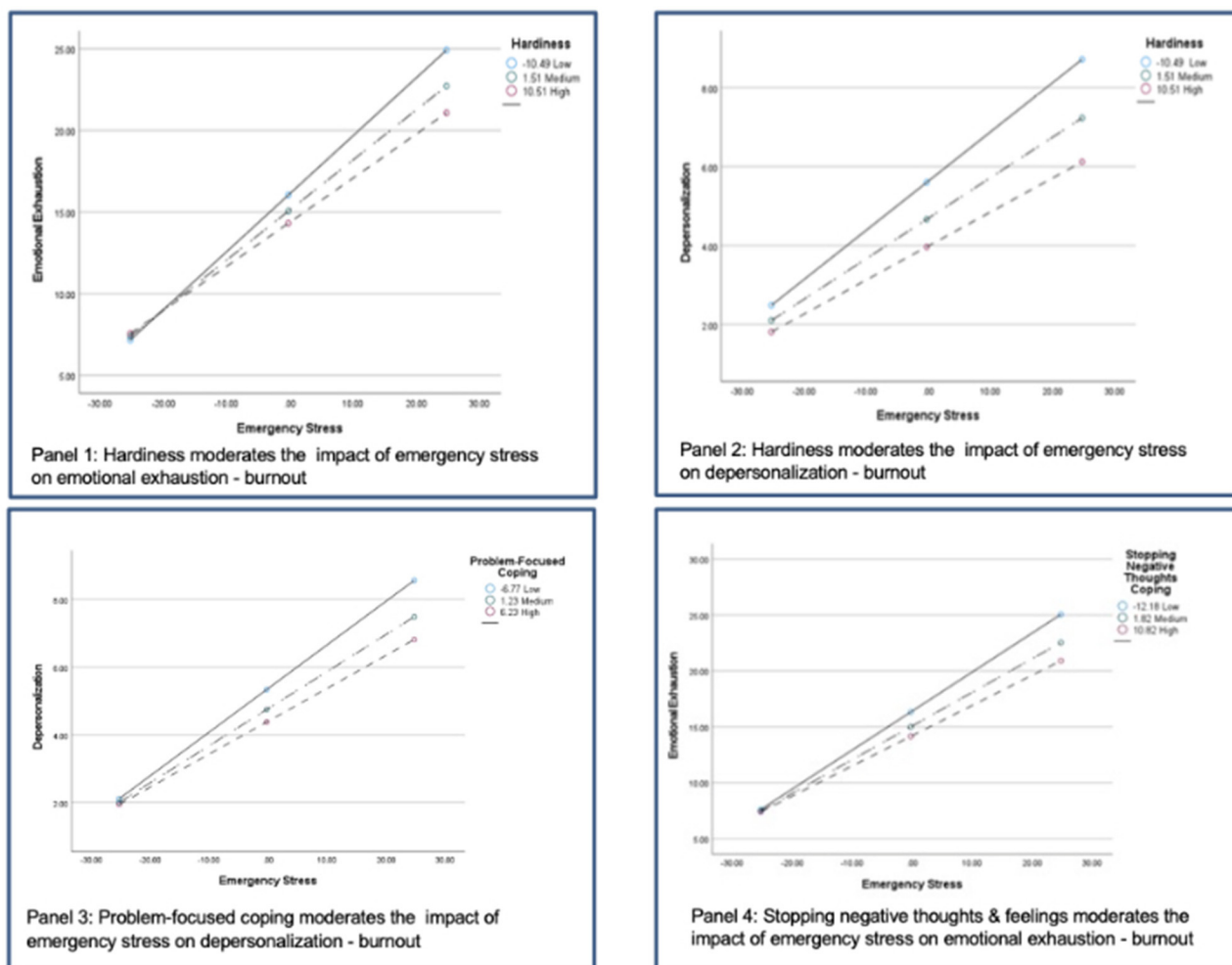
FIGURE 1 | Graphical display of significant interaction effects.

alienated from the job and their coworkers, while also distancing themselves from an unfair system they feel powerless to change. According to our findings, Health Care Workers and Emergency Responders who routinely use Problem Focused coping strategies are more resistant to developing the depersonalization form of Burnout. Problem Focused coping also is quite strongly related to Hardiness in this sample ($r = 0.58$, $p < 0.001$). Health Care and Emergency Workers who are high in hardiness will tend to maintain their commitment and dedication to the work despite the difficulties, keeping their sense of purpose and control.

LIMITATIONS

This study has several limitations that should be mentioned. All data collected were cross-sectional in nature, meaning that definite conclusions regarding causal direction cannot be made. In future studies it would be desirable to collect reports on stress exposure prior in time to Burnout or other outcome measures. It would also be of benefit to have baseline measures of Burnout in order to assess more clearly any COVID stress related increases.

The use of self-reporting tools without control scales to detect any response bias such as social desirability can limit the validity of the results. In any case, it should be noted that the results obtained in are in line with other studies in this area.

Despite these limitations, the present research included multiple samples of Health Care Workers, Emergency Responders, and a sample of the General Population for comparison purposes, which provides greater confidence in the validity of our findings. Another potential limitation is that all data were collected in a single country (Italy), and so results may not be fully generalizable to Health Care Workers and Emergency Responders in other countries around the world. However, there is no *a priori* reason to believe that the kinds of COVID related challenges faced by these workers are substantially different from one country to another, at least in western European countries. In underdeveloped countries where medical resources, drugs and equipment are in short supply, if anything the stressors on workers dealing with COVID patients would be even greater, and so Burnout and other ill-effects of stress potentially more severe. This would tend to make protective resources like Hardiness

attitudes and coping skills even more important in areas where medical resources are limited.

CONCLUSIONS

This study has demonstrated that Health Care Workers and Emergency Responders are experiencing high levels of stress related to their COVID duties, which is leading to increased Burnout symptoms especially among the Health Care Workers. Volunteer Emergency Responders, as opposed to professionals, are somewhat less vulnerable. Most importantly, Hardiness and positive coping skills provide resistance to the ill-effects of work-related stress in these groups.

While Hardiness and coping strategies are somewhat habitual or trait-like (showing stability over time and across situations), research has shown that specialized training programs can increase both hardiness (Bartone and Homish, 2020; Stein and Bartone, 2020) and positive coping skills (Folkman et al., 1991; Chesney et al., 1996). For example, Judkins et al. (2006) developed a training program to build hardiness in nurses, and MHS Assessments in Canada provides hardiness training and coaching strategies to increase hardiness in a range of occupational settings (Stein and Bartone, 2020; McDonald and Hansma, 2022). Leaders and managers in the health care and emergency responder community may wish to consider incorporating some form of hardiness and positive coping skills training into their existing employee training and support programs.

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 Comitato Etico per la Sperimentazione Umana—CESU of the University of Urbino. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ACKNOWLEDGMENTS

REFERENCES

Bartone, P. T., and Homish, G. G. (2020). Influence of hardiness, avoidance coping, and combat exposure on depression in returning war veterans: a moderated-mediation study. *J. Affect. Disord.* 265, 511–518. doi: 10.1016/j.jad.2020.01.127

Bartone, P. T., McDonald, K., and Hansma, B. J. (2021). Hardiness and burnout in adult U.S. workers. *J. Occup. Environ. Med.* doi: 10.1097/JOM.0000000000002448. [Epub ahead of print].

Bartone, P. T., McDonald, K., Hansma, B. J., Stermac-Stein, J., Escobar, E. M. R., Stein, S., et al. (2022). Development and validation of an improved hardiness measure: the hardiness resilience gauge. *Eur. J. Psychol. Assess.* doi: 10.1027/1015-5759/a000709. [Epub ahead of print].

Bartone, P. T., Ursano, R. J., Wright, K. M., and Ingraham, L. H. (1989). The impact of a military air disaster on the health of assistance workers: a prospective study. *J. Nerv. Ment. Dis.* 177, 317–328. doi: 10.1097/00005053-198906000-00001

Bay, F., and Novinrouz, E. (2022). The predictive effect of early maladaptive schemas and hardiness on burnout of elementary school teachers. *Iran. Evol. Educ. Psychol.* 4, 73–83. doi: 10.52547/ieepj.4.1.73

Chan, D. W. (2000). Dimensionality of hardiness and its role in the stress-distress relationship among Chinese adolescents in Hong Kong. *J. Youth Adolesc.* 29, 147–161. doi: 10.1023/A:1005100531194

Charman, S. (2013). Sharing a laugh: the role of humour in relationships between police officers and ambulance staff. *Int. J. Sociol. Soc. Policy* 33, 152–166. doi: 10.1108/01443331311308212

Chesney, M., Folkman, S., and Chambers, D. (1996). Coping effectiveness training for men living with HIV: preliminary findings. *Int. J. STD AIDS* 7(2 Suppl.), 75–82. doi: 10.1258/0956462961917690

Chesney, M. A., Neilands, T. B., Chambers, D. B., Taylor, J. M., and Folkman, S. (2006). A validity and reliability study of the coping self-efficacy scale. *Br. J. Health Psychol.* 11, 421–437. doi: 10.1348/135910705X53155

Chutiyami, M., Cheong, A., Salihu, D., Bello, U. M., Ndwiga, D., Maharaj, R., et al. (2022). COVID-19 pandemic and overall mental health of healthcare professionals globally: a meta-review of systematic reviews. *Front. Psychiatry* 12:804525. doi: 10.3389/fpsyt.2021.804525

Clarke, D. E. (1995). Vulnerability to stress as a function of age, sex, locus of control, hardiness, and type A personality. *Soc. Behav. Pers.* 23, 285–286. doi: 10.2224/sbp.1995.23.3.285

Cohen, S., Kamarck, T., and Mermelstein, R. (1983). Perceived stress scale (PSS). *J. Health Soc. Behav.* 24, 385–396. doi: 10.2307/2136404

Cohen, S., and Williamson, G. (1988). "Perceived stress in a probability sample of the United States" in *The Social Psychology of Health*, eds S. Spacapan, and S. Oskamp (Newbury Park, CA: Sage), 31–67.

Conversano, C., Marchi, L., and Miniati, M. (2020). Psychological distress among healthcareprofessionals involved in the COVID-19 emergency: vulnerability and resilience factors. *Clin Neuropsychiatry* 17, 94. doi: 10.36131/CN20200212

Croghan, I. T., Chesak, S. S., Adusumalli, J., Fischer, K. M., Beck, E. W., Patel, S. R., et al. (2021). Stress, resilience, and coping of healthcare workers during the COVID-19 pandemic. *J. Prim. Care Commun. Health* 12, 21501327211008448. doi: 10.1177/21501327211008448

Dangermond, K., Weewer, R., Duyndam, J., and Machielse, A. (2022). "If it stops, then I'll start worrying." Humor as part of the fire service culture, specifically as part of coping with critical incidents. *HUMOR* 35, 31–50. doi: 10.1515/humor-2021-0106

Dymecka, J., Gerymski, R., Machnik-Czerwik, A., Derbis, R., and Bidzan, M. (2021). Fear of COVID-19 and life satisfaction: the role of the health-

related hardiness and sense of coherence. *Front. Psychiatry* 2, 712103. doi: 10.3389/fpsyt.2021.712103

Eschleman, K. J., Bowling, N. A., and Alarcon, G. M. (2010). A meta-analytic examination of hardiness. *Int. J. Stress Manag.* 17, 277–307. doi: 10.1037/a0020476

Folkman, S., Chesney, M., McKusick, L., Ironson, G., Johnson, D. S., and Coates, T. J. (1991). "Translating coping theory into an intervention" in *The Social Context of Coping*. The Springer series on stress and coping, ed J. Eckenrode (Boston, MA: Springer).

Gilleen, J., Santaolalla, A., Valdearenas, L., Salice, C., and Fusté, M. (2021). Impact of the COVID-19 pandemic on the mental health and well-being of UK healthcare workers. *BJPsych Open* 7, E88. doi: 10.1192/bjo.2021.42

Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression Based Approach, 3rd Edn.* New York, NY: Guilford.

Hendrickson, R. C., Slevin, R. A., Hoerster, K. D., Chang, B. P., Sano, E., McCall, C. A., et al. (2022). The impact of the COVID-19 pandemic on mental health, occupational functioning, and professional retention among health care workers and first responders. *J. Gen. Intern. Med.* 37, 397–408. doi: 10.1007/s11606-021-07252-z

Hines, S. E., Chin, K. H., Glick, D. R., and Wickwire, E. M. (2021). Trends in moral injury, distress, and resilience factors among healthcare workers at the beginning of the COVID-19 pandemic. *Int. J. Environ. Res. Public Health* 18, 488. doi: 10.3390/ijerph18020488

Htay, M., Marzo, R. R., Bahari, R., AlRifai, A., Kamberi, F., El-Abasiri, R. A., et al. (2021). How healthcare workers are coping with mental health challenges during COVID-19 pandemic? a cross-sectional multi-countries study. *Clin. Epidemiol. Glob. Health* 11, 100759. doi: 10.1016/j.cegh.2021.100759

Hystad, S. W., Eid, J., Laberg, J. C., Johnsen, B. H., and Bartone, P. T. (2009). Academic stress and health: exploring the moderating role of personality hardiness. *Scand. J. Educ. Res.* 53, 421–429. doi: 10.1080/00313830903180349

James, D. (2021). Hardiness and attitudes toward professional Health Care services: implications for Health Care service utilization among Black American adults. *Health Psychol. Open* 8(2), 20551029211029157. doi: 10.1177/20551029211029157

Johnsen, B. H., Espevik, R., Saus, E. R., Sanden, S., Olsen, O. K., and Hystad, S. W. (2017). Hardiness as a moderator and motivation for operational duties as mediator: the relation between operational self-efficacy, performance satisfaction, and perceived strain in a simulated police training scenario. *J. Police Crim. Psychol.* 32, 331–339. doi: 10.1007/s11896-017-9225-1

Judkins, S., Reid, B., and Furlow, L. (2006). Hardiness training among nurse managers: building a healthy workplace. *J. Contin. Educ. Nurs.* 37, 202–238. doi: 10.3928/00220124-20060901-03

Kamtsios, S., and Bartone, P. (2021). Preliminary evaluation of the psychometric properties of the "Hardiness-Resilience Gauge" in an undergraduate sample. *Hell. J. Psychol.* 18, 287–310. doi: 10.26262/hjp.v18i3.8205

Kobasa, S. C. (1979). Stressful life events, personality, and health: an inquiry into hardiness. *J. Pers. Soc. Psychol.* 37, 1–11. doi: 10.1037//0022-3514.37.1.1

Kobasa, S. C. (1982). Commitment and coping in stress resistance among lawyers. *J. Pers. Soc. Psychol.* 42, 707–717. doi: 10.1037/0022-3514.42.4.707

Kobasa, S. C., Maddi, S. R., and Kahn, S. (1982). Hardiness and health: a prospective study. *J. Pers. Soc. Psychol.* 42, 168–177. doi: 10.1037/0022-3514.42.1.168

Labrague, L. J. (2021). Psychological resilience, coping behaviours and social support among health care workers during the COVID-19 pandemic: a systematic review of quantitative studies. *J. Nurs. Manag.* 29, 1893–1905. doi: 10.1111/jonm.13336

Lease, S. (1999). Occupational role stressors, coping support and hardiness as predictors of strain in academic faculty: an emphasis on new and female faculty. *Res. High Educ.* 40, 285–307. doi: 10.1023/A:1018747000082

Loera, B., Converso, D., and Viotti, S. (2014). Evaluating the psychometric properties of the Maslach Burnout Inventory–Human Service Survey (MBI-HSS) among Italian nurses: how many factors must a research consider? *PLoS ONE* 9:e114987. doi: 10.1371/journal.pone.0114987

Maiorano, T., Vagni, M., Giostra, V., and Pajardi, D. (2020). COVID-19: risk factors and protective role of resilience and coping strategies for and secondary trauma in medical staff and emergency workers—an online-based inquiry. *Sustainability* 12, 9004. doi: 10.3390/su12219004

Manchia, M., Gathier, A. W., Yapici-Eser, H., Schmidt, M. V., de Quervain, D., van Amelsvoort, T., et al. (2022). The impact of the prolonged COVID-19 pandemic on stress resilience and mental health: a critical review across waves. *Eur. Neuropsychopharmacol.* 55, 22–83. doi: 10.1016/j.euroneuro.2021.10.864

Maslach, C., and Jackson, S. E. (1981). The measurement of experienced burnout. *J. Organiz. Behav.* 2, 99–113. doi: 10.1002/job.4030020205

Maslach, C., and Jackson, S. E. (1986). *Maslach Burnout Inventory, 2nd Edn.* Palo Alto, CA: Consulting Psychologists Press.

Maslach, C., Jackson, S. E., and Leiter, M. P. (1996). *MBI: Maslach Burnout Inventory, 3rd Edn.* Sunnyvale, CA: Consulting Psychologists Press.

McDonald, K., and Hansma, B. (2022). *Harness Hardiness to Protect Yourself and Your Team Against Burnout.* MHS Talent Assessment blog post. Available online at: https://mhs.com/harness-hardiness-to-protect-yourself-and-your-team-against-burnout/ (accessed March 16, 2022).

Mental Health America (2022). *The Mental Health of Healthcare Workers in COVID-19.* Available online at: https://mhanational.org/mental-health-healthcare-workers-covid-19#:$\sim$:text=The%20responses%20collected %20from%20the,75%25%20said%20they%20were%20overwhelmed (accessed March 17, 2022)

Prasad, K., McLoughlin, C., Stillman, M., Poplau, S., Goelz, E., Taylor, S., et al. (2021). Prevalence and correlates of stress and burnout among US healthcare workers during the COVID-19 pandemic: a national cross-sectional survey study. *eClinicalMedicine* 35, 100879. doi: 10.1016/j.eclinm.2021.100879

Rana, W., Mukhtar, S., and Mukhtar, S. (2020). Mental health of medical workers in Pakistan during the pandemic COVID-19 outbreak. *Asian J. Psychiatr.* 51, 102080. doi: 10.1016/j.ajp.2020.102080

Rowe, A., and Regehr, C. (2010). Whatever gets you through today: an examination of cynical humor among emergency service professionals. *J. Loss Trauma* 15, 448–464. doi: 10.1080/15325024.2010.507661

Sirigatti, S., and Stefanile, C. (1993). *Adattamento Italiano del MBI-Maslach Burnout Inventory.* Firenze: Giunti Organizzazioni Speciali.

Spoorthy, M. S., Pratapa, S. K., and Mahant, S. (2020). Mental health problems faced by healthcare workers due to the COVID-19 pandemic—a review. *Asian J. Pychiatr.* 51, 102119.

Stein, S. J., and Bartone, P. T. (2020). *Hardiness: Making Stress Work for You to Achieve Your Life Goals.* Hoboken, NJ: Wiley.

Thomassen, Å. G., Hystad, S. W., Johnsen, B. H., Johnsen, G. E., and Bartone, P. T. (2018). The effect of hardiness on PTSD symptoms: a prospective mediational approach. *Mil. Psychol.* 30, 142–151. doi: 10.1080/08995605.2018.1425065

Thomassen, Å. G., Johnsen, B. H., Hystad, S. W., and Johnsen, G. E. (2022). Avoidance coping mediates the effect of hardiness on mental distress symptoms for both male and female subjects. *Scand. J. Psychol.* 63, 39–46. doi: 10.1111/sjop.12782

Vagni, M., Giostra, V., Maiorano, T., Santaniello, G., and Pajardi, D. (2020a). Personal accomplishment and hardiness in reducing emergency stress and burnout among COVID-19 emergency workers. *Sustainability* 12, 9071. doi: 10.3390/su12219071

Vagni, M., Maiorano, T., Giostra, V., and Pajardi, D. (2020b). Coping with COVID-19: emergency stress, secondary trauma and self-efficacy in healthcare and emergency workers in Italy. *Front. Psychol.* 11, 566912. doi: 10.3389/fpsyg.2020.566912

Vagni, M., Maiorano, T., Giostra, V., and Pajardi, D. (2020c). Hardiness and coping strategies as mediators of stress and secondary trauma in emergency workers during the COVID-19 pandemic. *Sustainability* 12, 7561. doi: 10.3390/su12187561

Vagni, M., Maiorano, T., Giostra, V., and Pajardi, D. (2020d). Hardiness, stress and secondary trauma in italian healthcare and emergency workers during the COVID-19 pandemic. *Sustainability* 12, 5592. doi: 10.3390/su12145592

Vagni, M., Maiorano, T., Giostra, V., and Pajardi, D. (2021). Protective factors against emergency stress and burnout in healthcare and emergency workers during second wave of COVID-19. *Soc. Sci.* 10, 178. doi: 10.3390/socsci10050178

White, A., Zapata, I., Lenz, A., Ryznar, R., Nevins, N., Hoang, T. N., et al. (2020). Medical students immersed in a hyper-realistic surgical training environment leads to improved measures of emotional resiliency by both hardiness and emotional intelligence evaluation. *Front. Psychol.* 11, 569035. doi: 10.3389/fpsyg.2020.569035

Yan, S., Xu, R., Stratton, T. D., Kavcic, V., Luo, D., Hou, F., et al. (2021). Sex differences and psychological stress: responses to the COVID-19 pandemic in China. *BMC Public Health* 21, 79. doi: 10.1186/s12889-020-10085-w

Check for updates

Depression, Anxiety, Stress, and Their Associations With Quality of Life in a Nationwide Sample of Psychiatrists in China During the COVID-19 Pandemic

Mengdie Li[1,2], Lei Xia[1,2], Yating Yang[1,2], Ling Zhang[1,2], Shujing Zhang[3], Tingfang Liu[4], Yuanli Liu[5], Nadine J. Kaslow[3], Feng Jiang[6,7]*, Yi-lang Tang[3,8]* and Huanzhong Liu[1,2]*

[1] Department of Psychiatry, Chaohu Hospital of Anhui Medical University, Hefei, China, [2] Department of Psychiatry, School of Mental Health and Psychological Sciences, Anhui Medical University, Hefei, China, [3] Department of Psychiatry and Behavioral Sciences, Emory University, Atlanta, GA, United States, [4] School of Health Policy and Management, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China, [5] Public Health School, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China, [6] Healthcare Management and Evaluation Research Center, Institute of Health Yangtze River Delta, Shanghai Jiao Tong University, Shanghai, China, [7] School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai, China, [8] Atlanta Veterans Affairs Medical Center, Decatur, GA, United States

Objectives: The COVID-19 pandemic has negatively affected wellbeing. However, the impact on the mental health status of Chinese psychiatrists and their relationship with quality of life (QOL) has not been examined.

Methods: This was a national cross-sectional survey performed between January 11 and March 15, 2021. Demographic and work-related data were collected anonymously using an online questionnaire. Common mental health symptoms and QOL were assessed using the Depression Anxiety Stress Scale-Chinese version and the World Health Organization Quality of Life Schedule-Brief, respectively.

Results: A total of 3,783 psychiatrists completed this questionnaire. The prevalence of depressive, anxious, and stress symptoms were 26.7% (95%CI = 25.3–28.1%), 24.1% (95%CI = 22.8–25.5%), and 11.6% (95%CI = 10–12%), respectively. Moreover, 11.1% of the participants endorsed both depressive and anxious symptoms, and 8% endorsed symptoms in all three domains. Binary logistic regression showed that aged 30–39 years (OR = 1.5, $P = 0.03$), male gender (OR = 1.2, $P = 0.04$), single (OR = 1.44, $P = 0.01$), and having a negative perception of the COVID-19 on healthcare (OR = 2.34, $P<0.001$) were factors associated with higher levels of depressive symptoms. Participants who were divorced and widowed (OR = 1.56, $P = 0.03$), worked more than 4 night shifts/month (OR = 1.33, $P < 0.001$) and/or longer working years (OR = 1.71, $P < 0.001$), and had a negative perceived impact of the COVID-19 on healthcare (OR = 2.05, $P < 0.001$) were more inclined to experience anxious symptoms. In addition, psychiatrists with high QOL scores had lower odds of experiencing depressive, anxious, and stress symptoms (all $P < 0.001$). Multivariate analysis showed that the presence of each of the three types of mental health symptoms was independently associated with lower QOL (all $P < 0.05$). In addition, the depression × anxious × stress interaction was significantly correlated with lower QOL ($P < 0.05$).

Conclusion: Approximately one-fourth of psychiatrists in China experienced depressive and anxious symptoms during the COVID-19 pandemic, and more than one-tenth reported stress. Mental health symptoms were significant contributors to lower QOL. The psychological wellbeing of psychiatrists during the pandemic requires more attention, and interventions are needed to improve the psychological wellbeing and QOL of physicians who care for individuals with mental disorders.

Keywords: psychiatrists, depression, anxiety, stress, quality of life, COVID-19

INTRODUCTION

The coronavirus disease (COVID-19) has had an unprecedented and devastating impact on almost all aspects of the society, including healthcare (Pang et al., 2020; Luo et al., 2020), economy (Hertz-Palmor et al., 2020), education (Kaufman et al., 2021), environment (El Kenawy et al., 2021), and others. Compared with other occupations, healthcare workers have faced greater challenges during the pandemic, including increased risk of infection and workload, as well as heightened exposure to death, trauma, or violence. These experiences in turn impact healthcare workers' physical and psychological wellbeing (Johnson et al., 2021).

Reports from multiple countries involving professionals from different backgrounds have shown that, during the pandemic, healthcare professionals have experienced a range of mental health problems, most notably depression, anxiety, stress, or posttraumatic stress disorder (Lai et al., 2020; Azoulay et al., 2021; Hirten et al., 2021). A cross-sectional study in China revealed that physicians were at a higher risk of severe depression than were nurses and frontline healthcare workers who had more severe insomnia than the second-line healthcare workers (Lai et al., 2020). Unfortunately, this study did not include mental health professionals, such as psychiatrists, as they historically have not been on the frontlines when dealing with infectious diseases. Psychiatrists, however, have played a major role in supporting frontline healthcare professionals during the COVID-19 crisis through the provision of support groups and individual mental health services (Viswanathan et al., 2020; Cormi et al., 2021). The limited relevant data indicate that in the acute phase of the pandemic, levels of mental health symptoms in mental health professionals including psychiatrists tended to be somewhat lower than in the general public in Canada (Brillon et al., 2021) and somewhat lower than physicians from other specialties in Croatia (Jokic-Begic et al., 2020). Moreover, there is some evidence that compared with non-psychiatric physicians, psychiatrists tended to rely more heavily on substance misuse to cope with their pandemic-related stress (Jokic-Begic et al., 2020).

Work-related psychological stress and mental health symptoms often lead to poor quality of life (QOL) (Ruo et al., 2003; Wilmer et al., 2021), as reflected in people's physical, psychological, and social functioning. A study conducted in Saudi Arabia found that healthcare staff in intensive care units (ICU) and emergency units during the pandemic reported low QOL (Maqsood et al., 2021). However, scarce data are available on the effects of the COVID-19 pandemic on the QOL in psychiatrists working in public hospitals. Furthermore, the extent of psychological symptoms and their correlations with QOL in this professional group have not been examined.

Therefore, this study, conducted in a unique time and based on a nationally representative sample, was set to survey the rates of common mental health symptoms, such as depressive, anxious, and stress symptoms, and the QOL among psychiatrists in China during the pandemic. We also explored the comorbidity of different symptoms and the factors associated with those symptoms and QOL. Finally, we examined the relations between mental health symptoms and QOL.

MATERIALS AND METHODS

Study Design and Participants

The study was part of the 2021 National Hospital Performance Evaluation Survey (NHPES) between January 11 and March 15, 2021, sourced by the National Health Commission of China (NHCC). We selected all provincial tertiary psychiatric hospitals in 31 provinces in mainland China. Two provinces (Tibet and Gansu) were not included because there were no tertiary psychiatric hospitals at the time of the survey. The study was reviewed and approved by the Ethics Committee of Chaohu Hospital of Anhui Medical University (202002-kyxm-02). The study was conducted *via* WeChat, a popular social media app in China.

It is worth noting that while the COVID-19 first started in China in December 2019, at the time of this survey (January to March 2021), which was rapidly spreading in most other parts of the world, the pandemic had been mostly under control in mainland China. Therefore, no specific mitigation strategies related to COVID-19 were needed. Furthermore, the survey was mostly conducted online, and minimal in-person contact was needed.

Questionnaires

The questionnaire had three parts. The first part included demographic information and working-related information such as age, sex, marital status, education level, monthly income, number of night shifts per month, and working years. In addition, COVID-19-related issues were also assessed: (1) whether or not they had the frontline work experience with COVID-19 patients (yes/no); (2) perceived impact of the COVID-19 on medical work (negative impact: the intention to leave and change careers; positive impact: prefer to be a medical worker and love the career more; minimal or neutral impact) (Byrne et al., 2021).

The second part was the Depression Anxiety Stress Scale-Chinese version (DASS-C21), which was used to assess depressive, anxious, and stress symptoms in the past week (Lovibond and Lovibond, 1995). The 21-item self-reported scale consists of three subscales (seven items for each), namely, DASS-depression, DASS-anxiety, and DASS-stress. Participants responded to each question by using a 4-point (0–3) Likert-type scale (ranging from 0 = "did not apply to me at all" to 3 = "applied to me very much or most of the time"). The score was calculated by adding up the individual items on each subscale and multiplying them by two, with the subscale scores ranging from 0 to 42 and total scores from 0 to 126 (Yohannes et al., 2019). The DASS-C21 had good internal consistency among the items in the present sample (Cronbach's α = 0.951). In addition, DASS-depression (Cronbach's α = 0.906), DASS-anxiety (Cronbach's α = 0.854), and DASS-stress (Cronbach's α = 0.888) subscales also showed a strong reliability coefficient as Cronbach's α ≥ 0.7 is usually considered "acceptable" (Schober et al., 2021). The higher the score, the more severe the depressive, anxious, or stress symptoms in each subscale (Eyice Karabacak et al., 2021). DASS-depression scores > 9, DASS-anxiety scores > 7, and DASS-stress scores > 14 are considered as "having depression, anxiety, or stress symptoms" (Fawzy and Hamed, 2017).

The third part was the Chinese version of the World Health Organization quality of life Schedule-Brief (WHOQOL-BREF-CHN), an abbreviated version of the WHOQOL-100 that was developed by the WHOQOL Group in 1998 (The WHOQOL Group., 1998). It covers four domains (physical health, psychological, social relationships, and environment) and two separate items (general quality of life and general health state). In this study, overall QOL was assessed using the two separate items of the WHOQOL-BREF-CHN: (1) general quality of life, "How would you rate your quality of life?" (ranging from 1 = "very poor" to 5 = "very good"); (2) general health state, "How satisfied are you with your health?" (ranging from 1 = "very dissatisfied" to 5 = "very satisfied"), in which a higher score represents a better QOL (Li et al., 2021b). Although only two separate items were selected in our study, previous studies (Haag et al., 2017; Li et al., 2021b) found that the general quality of life and general health state were positively correlated with the scores of the four domains of WHOQOL-BREF-CHN, indicating that the two separate items of the scale had a good consistency with the four domains of the scale. Therefore, we chose these two separate items to evaluate the QOL of the overall sample. Furthermore, the WHOQOL-BREF-CHN is a valid and reliable tool to assess QOL (Cronbach's α = 0.78) (Kruithof et al., 2018).

Statistical Analysis

Statistical analyses were executed in IBM SPSS 22.0 version for Windows. The Student's t-test was used and illustrated as mean ± standard deviation if normality distribution; if not, the Mann-Whitney U-test was utilized and expressed as median, quartile spacing (IQR). In our study, the Student's t-test was used for the univariate analysis of continuous variables, such as monthly income, general QOL, and general health status. Categorical variables were analyzed by chi-square tests and described as frequency and percentage. Normality distribution was detected by the one-sample Kolmogorov-Smirnov test for continuous variables. Binary logistic regression models (univariable and multivariable) were used to investigate the independent risk factors associated with depressive, anxious, and stress symptoms. In a multivariable logistic regression model, mental health problems (such as depressive, anxious, and stress symptoms) were the dependent variables, and the covariates were the variables that showed significant differences ($P <$ 0.2) between the depression/no-depression, anxiety/no-anxiety, and stress/no-stress groups in the univariable analysis (Amu et al., 2021). The independent associations of depressive, anxious, and stress symptoms and their interaction with QOL were analyzed using multivariate analysis of covariance (MANOVA) after controlling for variables with striking group differences in univariable analyses. The QOL scores, such as general QOL scores and general health status scores, were used as the dependent variables (continuous variables), and depressive, anxious and stress symptoms were used as the independent variables (categorical variables). A proportionate Venn diagram quantified the prevalence of probable depressive, anxious, and stress symptoms among participants by https://hiplot.com.cn. For all tests (except univariable analysis), $P < 0.05$ was designated as the level of significance (2-tailed).

RESULTS

Basic Features and the Prevalence of Probable Depressive, Anxious, and Stress Symptoms

All psychiatrists working at the selected 41 tertiary psychiatric hospitals ($N = 4,899$) were invited to participate in the study by submitting the online survey on WeChat, a multipurpose messaging App in China, either using their mobile phones or computers. The sample size of this study was calculated by PASS11. A sample size of 3,608 produces a two-sided 95% confidence interval (CI) with a distance from the mean to the limits that is equal to 0.140 when the estimated standard deviation is 4.290 (Zhang et al., 2021). A total of 3,973 responded to the survey (response rate = 81%), and 3,783 (77%) completed and were eligible for the statistical analysis. The demographic features of all psychiatrists are shown in **Table 1**.

The average of DASS-depression, DASS-anxiety, and DASS-stress subscales were 13.43 [standardized deviation (SD) = 7.76], 9.53 (SD = 7.47), and 13.80 (SD = 7.56), respectively. **Figure 1** presents the prevalence of probable depressive, anxious, and stress symptoms. Based on the cut-off scores for DASS-21, 33.68% of the participants experienced mental health symptoms. The rates of participants with probable depressive, anxious and stress symptoms were 26.7% (95%CI = 25.3–28.1%), 24.1% (95%CI = 22.8–25.5%), and 11.6% (95%CI = 10.1–12.0%), respectively. In addition, 11.1% (95%CI = 10.1–12.2%) experienced both depressive and anxious symptoms, 1.4% (95%CI = 1–2%) experienced both anxious and stress symptoms, and 1.5% (95%CI = 1.1–2.0%) experienced both depressive and stress symptoms. Overall, 8% (95%CI = 7.0–8.7%) experienced all three symptom domains.

TABLE 1 | Basic features, occurrences of depressive, anxious and stress symptoms in 3,783 Psychiatrists in China.

| Variable	All sample (N = 3,783)	Depression (N = 1,011)	No depression (N = 2,772)	Univariable analysis T/χ²	P	Anxiety (N = 913)	No anxiety (N = 2,870)	Univariable analysis T/χ²	P	Stress (N = 416)	No stress (N = 3,367)	Univariable analysis T/χ²	P
Age (years)[a]				11.94	**0.008****			11.99	**0.007****			15.18	**0.002****
≤29	495 (13.1)	120 (24.24)	375 (75.76)			104 (21.01)	391 (78.99)			49 (9.90)	446 (90.10)		
30–39	1,770 (46.8)	506 (28.59)	1,264 (71.41)			467 (26.38)	1,303 (73.62)			229 (12.94)	1,541 (87.06)		
40–49	962 (25.4)	264 (27.44)	698 (72.56)			229 (23.80)	733 (76.20)			96 (9.98)	866 (90.02)		
≥50	556 (14.7)	121 (21.76)	435 (78.24)			113 (20.32)	443 (79.68)			42 (7.55)	514 (92.45)		
Sex[a]				10.63	**<0.001*****			2.63	**0.105***			3.15	**0.08***
Male	1,521 (40.2)	450 (29.59)	1,071 (70.41)			388 (25.51)	1,133 (74.49)			184 (12.10)	1,337 (87.90)		
Female	2,262 (59.8)	561 (24.80)	1,701 (75.20)			525 (23.21)	1,737 (76.79)			232 (10.26)	2,030 (89.74)		
Marital status[a]				12.21	**0.016****			7.50	**0.112***			12.31	**0.002****
Single	631 (16.7)	192 (30.43)	439 (69.57)			158 (25.04)	473 (74.96)			89 (14.10)	542 (85.90)		
Married	3,008 (79.5)	772 (25.66)	2,236 (74.34)			708 (23.54)	2,300 (76.46)			304 (10.11)	2,704 (89.89)		
Divorced and widowed	144 (3.8)	47 (1.56)	97 (3.22)			47 (32.64)	97 (67.36)			23 (15.97)	121 (84.03)		
Education level[a]				41.31	**<0.001****			35.51	**<0.001*****			7.23	**0.065***
College degree/medical degree only	2,438 (64.4)	732 (30.02)	1,706 (69.98)			661 (27.11)	1,777 (72.89)			291 (11.94)	2,147 (88.06)		
Add on master degree	1,115 (29.5)	238 (21.35)	877 (78.65)			216 (19.37)	899 (80.63)			106 (9.51)	1,009 (90.49)		
Add on doctorate degree	230 (6.1)	41 (17.83)	189 (82.17)			36 (15.65)	194 (84.35)			19 (8.26)	211 (91.74)		
#Monthly income (RMBs)[b]	12.2 ± 7.6	10.54 ± 6.11	12.86 ± 7.96	8.41	**<0.001*****	10.16 ± 5.64	12.91 ± 7.99	9.64	**<0.001*****	9.83 ± 5.68	12.54 ± 7.73	6.91	**<0.001*****
Number of night shifts per month[a]				32.37	**<0.001*****			52.40	**<0.001*****			32.29	**<0.001*****
≤4 times	2,840 (75.1)	692 (24.37)	2,148 (75.63)			603 (21.23)	2,237 (78.77)			603 (21.23)	2,237 (78.77)		
>4 times	943 (24.9)	319 (33.83)	624 (66.17)			310 (32.87)	633 (67.13)			310 (32.87)	633 (67.13)		
Working years[a]				2.10	0.35			7.08	**0.029****			3.54	**0.171***
≤5 years	834 (22)	207 (24.82)	627 (75.18)			174 (20.86)	660 (79.14)			97 (11.63)	737 (88.37)		
6–10 years	828 (21.9)	222 (26.81)	606 (73.19)			217 (26.21)	611 (73.79)			103 (12.44)	725 (87.56)		
≥11 years	2,121 (56.1)	582 (27.44)	1,539 (72.56)			522 (24.61)	1,599 (75.39)			216 (10.18)	1,905 (89.82)		
Frontline experience with COVID-19 patients[a]				0.24	0.62			0.25	0.62			0.03	0.87
Yes	887 (23.4)	243 (27.40)	644 (72.60)			223 (25.14)	664 (74.86)			101 (11.39)	786 (88.61)		
No	2,764 (73.1)	734 (26.56)	2,030 (73.44)			672 (24.31)	2,092 (75.69)			309 (11.18)	2,455 (88.82)		
Perceived impact of the COVID-19[a] on medical work				248.94	**<.001*****			161.28	**<.001*****			164.81	**<.001*****
Negative	486 (12.8)	266 (54.73)	220 (45.27)			229 (47.12)	257 (52.88)			137 (28.19)	349 (71.81)		
Positive	1,443 (38.1)	262 (18.16)	1,181 (81.84)			273 (18.92)	1,170 (81.08)			109 (7.55)	1,334 (92.45)		
Minimal impact	1,722 (45.5)	449 (26.07)	1273 (73.93)			393 (22.82)	1,329 (77.18)			164 (9.52)	1,335 (77.53)		
QOL score[b]													
General QOL	3.11 ± 0.78	2.63 ± 0.74	3.29 ± 0.73	24.54	**<0.001*****	2.67 ± 0.74	3.25 ± 0.74	20.52	**<0.001*****	2.51 ± 0.82	3.18 ± 0.75	17.27	**<0.001*****
General health status	2.82 ± 0.93	2.32 ± 0.83	3.01 ± 0.89	21.48	**<0.001*****	2.29 ± 0.83	3.00 ± 0.90	20.83	**<0.001*****	2.07 ± 0.79	2.91 ± 0.90	18.27	**<0.001*****

Depression with a cutoff value 9, anxiety with a cutoff value 7, stress with a cutoff value 14.

[a]*Chi-square test.*

[b]*t-test.*

#*Monthly income in thousands (RMBs), one US dollar = 6.3969 RMBs at the time of study.*

Bold values: *P < 0.2, **P < 0.05, ***P < 0.001.
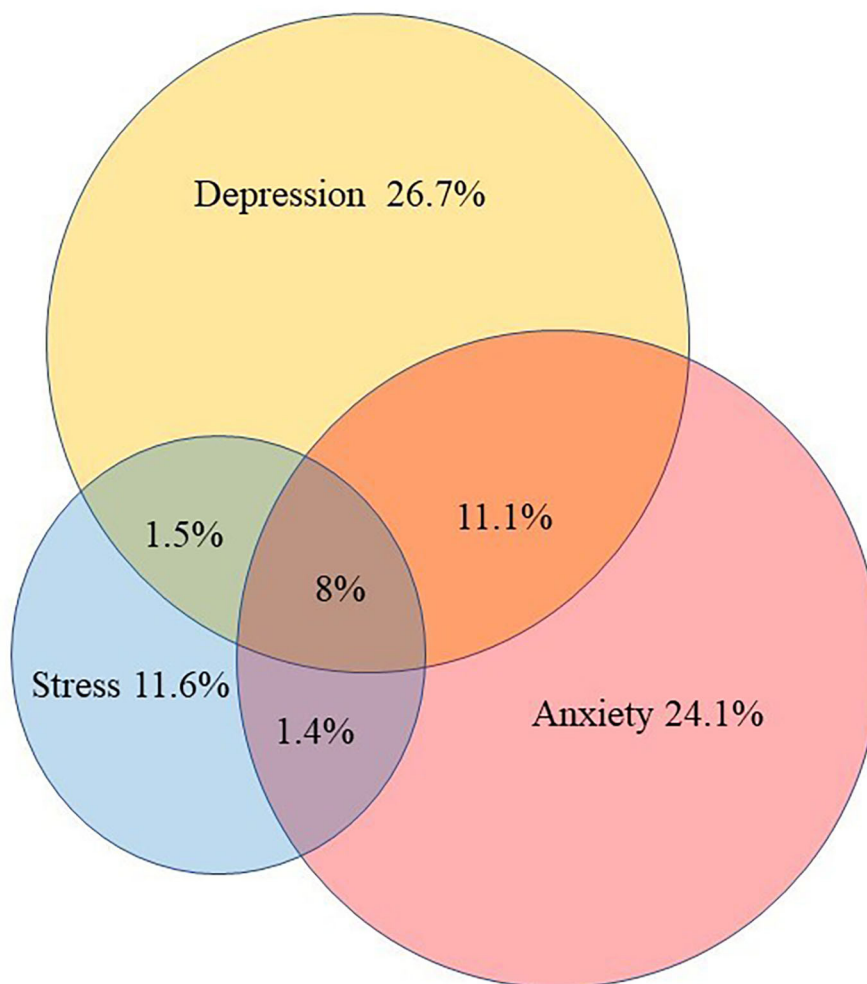
FIGURE 1 | Prevalence of probable depressive, anxious and stress symptoms. Normal participant, 66.32% (2509), either symptoms of depression, anxiety or stress 33.68% (1274). Depressive symptom, 26.7% (1011); anxious symptom, 24.1% (913); stress symptom, 11.6% (416); depressive and anxious symptoms alone, 11.1% (375); depressive and stress symptoms alone, 1.5% (44); anxious and stress symptoms alone, 1.4% (39); all of three symptoms, 8% (304).

Univariable Analysis

In univariable analysis, significant differences were found in age, sex, marital status, education level, monthly income, number of night shifts per month, working years, perceived impact of the COVID-19 on medical work, and the QOL score between the depression and no-depression groups (all $P < 0.05$ except working years), between anxiety and no-anxiety groups (all $P < 0.05$), and between stress and no-stress groups (all $P < 0.05$). However, there was no significant difference in frontline experience with COVID-19 patients between the three groups (**Table 1**).

Multivariable Analysis

Table 2 presents the results of binary logistic regression analysis. Those aged 30–39 years (OR = 1.5, $P = 0.03$), of male gender (OR = 1.2, $P = 0.04$), single (OR = 1.44, $P = 0.01$), and/or had negative perceptions of the impact of COVID-19 on healthcare

(OR = 2.34, $P < 0.001$) were more inclined to experience depressive symptoms. Psychiatrists who were divorced and widowed (OR = 1.56, $P = 0.03$), worked more than 4 night shifts per month (OR = 1.33, $P < 0.001$), had longer working years (OR = 1.71, $P < 0.001$), and/or had endorsed a negative perceived impact of COVID-19 on healthcare (OR = 2.05, $P < 0.001$) were more inclined to experience anxious symptoms. In addition, psychiatrists with high QOL scores had lower odds of experiencing depressive, anxious, and stress symptoms (all $P < 0.001$) (see **Table 2** for details).

Multivariate Analysis of Variance (MANOVA)

The MANOVA revealed that depressive symptoms were significantly associated with general QOL [$F_{(1,3775)} = 42.266$, $P < 0.001$] and general health status [$F_{(1,3775)} = 11.807$, $P < 0.001$]. Anxious symptoms were significantly associated with the

TABLE 2 | Multivariable logistic regression analysis of depressive, anxious and stress symptoms in 3,783 Psychiatrists in China.

	Depression			Anxiety			Stress		
	B	P	OR (95% CI)	B	P	OR (95% CI)	B	P	OR (95% CI)
Age (ref. $\leq$29)									
30–39	0.41	**0.03****	1.5 (1.03–2.16)	0.16	0.40	1.18 (0.80–1.70)	0.50	**0.04****	1.65 (1.02–2.67)
40–49	0.23	0.32	1.25 (0.80–1.96)	−0.05	0.82	0.94 (0.60–1.49)	0.24	0.43	1.27 (0.70–2.30)
$\geq$50	0.11	0.66	1.11 (0.69–1.79)	0.02	0.93	1.02 (0.63–1.65)	0.24	0.46	1.27 (0.66–2.43)
Sex (ref. female)	0.18	**0.04****	1.20 (1.01–1.42)	0.05	0.56	1.05 (0.88–1.25)	0.14	0.25	1.14 (0.90–1.44)
Marital status (ref. Married)									
Single	0.37	**0.01****	1.44 (1.1–1.88)	0.18	0.21	1.19 (0.90–1.57)	0.43	**0.02****	1.53 (1.07–2.17)
Divorced and widowed	0.28	0.19	1.32 (0.86–2.01)	0.45	**0.03****	1.56 (1.03–2.36)	0.57	**0.04****	1.77 (1.03–3.01)
Education level (ref. College degree/medical degree only)									
Add on master degree	−0.45	**<0.001*****	0.64 (0.52–0.78)	−0.27	**0.01**	0.76 (0.62–0.93)	−0.15	0.31	0.86 (0.65–1.14)
Add on doctorate degree	−0.37	0.097	0.69 (0.44–1.07)	−0.002	0.99	0.99 (0.64–1.54)	0.106	0.73	1.11 (0.61–2.01)
Monthly income (RMBs)	−0.32	**<0.001*****	0.73 (0.63–0.84)	−0.51	**<0.001*****	0.60 (0.51–0.70)	−0.40	**<0.001*****	0.67 (0.53–0.83)
Number of night shifts per month (ref. $\leq$ 4 times)	0.13	0.19	1.14 (0.94–1.38)	0.29	**<0.001*****	1.33 (1.10–1.61)	0.26	**0.046****	1.29 (1.01–1.66)
Working years (ref. $\leq$ 5 years)									
6–10 years	–	–	–	0.19	0.27	1.20 (0.86–1.68)	−0.17	0.43	0.85 (0.56–1.28)
$\geq$11 years	–	–	–	0.54	**<0.001*****	1.71 (1.20–2.45)	0.06	0.81	1.05 (0.67–1.66)
Perceived impact of the COVID-19 on medical work (ref. Minimal impact)									
Negative	0.85	**<0.001*****	2.34 (1.86–2.95)	0.72	**<0.001*****	2.05 (1.62–2.59)	0.88	**<0.001*****	2.39 (1.81–3.18)
Positive	−0.26	**<0.001*****	0.77 (0.64–0.93)	−0.04	0.70	0.96 (0.79–1.16)	−0.02	0.86	0.97 (0.74–1.27)
Quality of life									
General QOL	−0.90	**<0.001*****	0.41 (0.35–0.48)	−0.57	**<0.001*****	0.56 (0.48–0.65)	−0.48	**<0.001*****	0.61 (0.52–0.74)
General health status	−0.45	**<0.001*****	0.64 (0.56–0.72)	−0.58	**<0.001*****	0.56 (0.49–0.63)	−0.81	**<0.001*****	0.45 (0.38–0.53)

OR, Odds ratio; CI, confidence interval; Ref., reference group, COVID-19 Coronavirus Disease 2019. Bold values: **P < 0.05; ***P < 0.001.

general QOL [$F_{(1,3775)}$ =7.13, $P < 0.001$] and general health status [$F_{(1,3775)}$ =17.647, $P < 0.001$]. Stress symptoms were also significantly associated with general QOL [$F_{(1,3775)}$ =12.58, $P < 0.001$] and general health status [$F_{(1,3775)}$ =40.261, $P < 0.001$]. Furthermore, the interaction of depressive × anxious × stress symptoms was also significantly associated with general QOL [$F_{(4,1936)}$ =5.663, $P < 0.001$] and general health status [$F_{(4,2788)}$ = 5.663, $P < 0.001$].

DISCUSSION

This is the largest study conducted to date on the psychological wellbeing of psychiatrists in the context of the pandemic and the first investigation performed in Asia. Findings from an online survey of a large ($N = 3,783$), nationally representative sample of psychiatrists in China revealed the following. First, the prevalence of probable depressive, anxious, and stress symptoms among Chinese psychiatrists was high, 26.7, 24.1, and 11%, respectively. More than 10% (11.1%) reported both depressive and anxious symptoms and 8% experienced all three symptoms during the COVID-19 pandemic. Second, with regard to sociodemographic and pandemic-related factors, psychiatrists who were aged 30–39 years, male, single or divorced or widowed, with a lower level of education and lower levels of income, and those who worked more night shifts per month and who had more work years were more inclined to report depressive or anxious or stress

symptoms. In addition, those who endorsed more perceived negative impact of the COVID-19 pandemic on healthcare and poorer QOL were more prone to report symptoms of depression, anxiety, and stress. Finally, there was a bidirectional association between mental health symptoms and QOL among psychiatrists in China.

Prevalence of Depressive, Anxious, and Stress Symptoms

In the systematic review and meta-analysis, Sahebi et al. (2021) reported that the prevalence of depression and anxiety in the healthcare workers during the COVID-19 pandemic was 24.83 and 24.94%, respectively; these percentages are consistent with this study (corresponding 26.7 and 24.1%). However, this study reported higher prevalence rates of depressive (26.7%) and anxious (24.1%) symptoms among Chinese psychiatrists than in the corresponding studies (18.4% depression and 13.3% anxiety) in Chinese medical staff (including 40.6% doctors and 59.4% nurses) during the pandemic (Liu et al., 2021) and in Chinese psychiatric medical staff (17.4% depression) before the COVID-19 pandemic (Hu et al., 2020). This may relate to sample differences in measurements, professions, and/or regions. Another possible explanation is that the epidemic dramatically influenced Chinese psychiatrists' mental wellbeing. Additionally, other scholars recently reported that depressive, anxious, and stress symptoms of healthcare workers ranged

from 38.4 to 58%, 25.8 to 54.2%, and 37.9% to 55.1%, respectively, all of which were higher than our results (Xiao et al., 2020; Zhou et al., 2020; Campos et al., 2021). This difference may be because this study was executed after these aforementioned investigations; hence, there may have been understandable improvements in the psychological health of healthcare workers over time. Of note, the prevalence of all three symptoms (8%) among Chinese psychiatrists who specialize in interventions for individuals with mental illness in this study was similar to that of the general population in at least one other country (Ghana) (8.3%) (Amu et al., 2021), suggesting that caring for this patient population may be detrimental to the mental health and wellbeing of psychiatrists. Such a high prevalence of mental health symptoms among Chinese psychiatrists means that more easily accessible and uniquely tailored healthcare services should be provided to this population.

Associated Factors for Depressive, Anxious, and Stress Symptoms

Most previous studies (Lai et al., 2020; Xiao et al., 2020; Peng et al., 2021; Li et al., 2021a) found that women were more vulnerable to depressive and anxious symptoms during the COVID-19 pandemic, which contrasts with our results. However, like our study, Alnazly et al. (2021) reported that being male was associated with greater psychological distress among healthcare workers during the pandemic. One possible explanation for the inconsistency is that men had higher unemployment (Matthay et al., 2021) and greater economic stress during the outbreak. Furthermore, female doctors in psychiatry may be better at using their expertise to care for themselves psychologically than their male counterparts and medical staff in other specialties. In terms of sociodemographic factors, however, consistent with several previous reports (Ridley et al., 2020; Zhou et al., 2020; Schmitt et al., 2021), we found that participants who were younger, single, had more night shifts per month, and had longer working years and/or low-level income were more inclined to experience mental health symptoms.

We did not replicate findings from several prior studies (Rossi et al., 2020; Zhang et al., 2020; Zhou et al., 2020) that frontline healthcare workers were more prone to report mental health symptoms than those not caring directly for patients diagnosed with COVID-19. This may reflect the fact that the majority of psychiatrists had more access to mental health training than medical staff in other departments and disciplines (Lima et al., 2020; Mattila et al., 2021) and thus may be better prepared for the tremendous pressures associated with providing frontline healthcare services (Dal Santo et al., 2020). Future health workers should be required to receive mental health training. Previous studies have reported negative psychological effects of the COVID-19 pandemic on medical staff (including burnout, compassion fatigue, and moral injury) (Meynaar et al., 2021; Su et al., 2021). On the contrary, Byrne et al. (2021) indicated that the COVID-19 pandemic improved healthcare working environments by increasing the staffing of doctors, offering more access to senior clinical support, and

supporting accelerated clinical decision-making by physicians. However, our study reported that up to 45.5% of the psychiatrists viewed the pandemic as having neither a negative nor a positive impact on their medical work. One possible explanation is that psychiatrists are accustomed to enduring stressful work schedules and attending to vulnerable patients with psychiatric disorders. Of note, however, in this study, we did find that 12.8% of Chinese psychiatrists perceived that COVID-19 had a negative impact on their medical work, such that they were intending to leave and change careers. Future research should shed light on these vulnerable healthcare workers and increase efforts to provide them much needed mental health support.

An additional finding of note is that poor QOL was an independent risk factor for depressive, anxious, and stress symptoms. This result is consistent with previous research demonstrating that high levels of depressive and anxious symptoms correlated with reduced levels of QOL and health status in different individuals (Stark et al., 2002; Johnston et al., 2019; Phillips et al., 2020), such as concussion symptoms (Doroszkiewicz et al., 2021), Parkinson's disease (Lo Buono et al., 2021), older adults (Wu et al., 2021), and ischemic stroke (Huang et al., 2010).

Bidirectional Relations Between Depressive, Anxious, Stress Symptoms, and QOL

In this study, we found that depressive, anxious, and stress symptoms were independently related to general QOL and general health status. In addition, our findings are in concordance with previous studies showing that high levels of perceived stress are not conducive to QOL (Altunan et al., 2021). In this study, tests of between-subjects effects showed that the depression × anxiety × stress interaction had an effect on general QOL and general health status. This result is consistent with prior reports in which depressive and anxiety disorders were co-morbid in at least half of the patients who had either diagnosis (Davey et al., 2017) and that the co-occurrence of depression and anxiety had markedly lower overall QOL (Li et al., 2021b). Therefore, we emphasize the bidirectional relation between depressive, anxious, and stress symptoms on the one hand and QOL on the other hand.

Of note, unlike most other studies (Suarez et al., 2018; Yao et al., 2021; Yen et al., 2022), this study only used two items (i.e., general quality of life and general health state) instead of the four domains (i.e., physical health, psychological, social relationships, and environment) to evaluate QOL. Our findings support the feasibility of these two separate items in assessing the overall QOL (Haag et al., 2017; Li et al., 2021b). Future studies to replicate our findings in different samples may be needed.

Strengths and Limitations

In this study, we provide relatively comprehensive, valid, and reliable data. The tertiary hospitals involved in this study come from almost all provinces and autonomous regions in mainland China (except Gansu and Tibet). Thus, the results are likely generalizable throughout the country. In

addition, the online anonymous survey attracted a large number of participants and generated good response rates, yielding representative information.

Nevertheless, several limitations need to be considered. First, depressive, anxious, and stress symptoms are not clinical diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders, fifth edition, abbreviated as DSM-5, or the International Classification of Diseases, 10th revision, abbreviated as ICD-10. Rather, the questionnaire responses reflect trends of mental health problems in the past week. Second, other factors that might be associated with depressive, anxious, and stress symptoms, as well as QOL, such as burnout (Murat et al., 2021), smoking cigarettes (Fluharty et al., 2017), or insomnia (Shanahan et al., 2014), were not examined. Third, the cross-sectional study design limits our ability to track participants' mental health problems and QOL, which may have shifted in response to the changing pandemic landscape. In addition, the cross-sectional design precludes us from making causal interpretations. Fourth, this study used only two separate items to assess the overall QOL, which may be considered less comprehensive as the ones that used the four-domain instrument (Suarez et al., 2018; Yao et al., 2021; Yen et al., 2022), and it may also limit the generalizability of our findings. Finally, due to differences in work environment and exposures between diverse medical specialties and across countries, the generalizability of the findings to other populations deserves further investigation.

CONCLUSION

In conclusion, during the COVID-19 pandemic, nearly one-fourth of psychiatrists in China reported symptoms of depression and anxiety, and more than 10% of psychiatrists reported stress symptoms. There was a high level of comorbidity among the three mental health symptom clusters in Chinese psychiatrists. We also found that mental health issues are associated with poor QOL. In addition, 12.8% of psychiatrists still experience the negative impact of the COVID-19 on their healthcare work. Therefore, to improve the mental health system in China, more attention and awareness need to be directed to the psychological wellbeing of the psychiatric workforce. This must include efforts to ensure early detection and increase the accessibility and effectiveness of mental health interventions for psychiatrists in the face of crises, such as the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article material; further inquiries can be directed to the corresponding authors.

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

HL, FJ, and Y-lT were the guarantor and designed the study. ML, LX, YY, LZ, TL, and YL participated in the acquisition, analysis, and interpretation of the data. ML drafted the initial manuscript. SZ, Y-lT, and NK revised the article critically for important intellectual content. All authors contributed to manuscript revision, read, and approved the submitted version.

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Alnazly, E., Khraisat, O. M., Al-Bashaireh, A. M., and Bryant, C. L. (2021). Anxiety, depression, stress, fear and social support during COVID-19 pandemic among Jordanian healthcare workers. *PLoS ONE* 16, e0247679. doi: 10.1371/journal.pone.0247679

Altunan, B., Unal, A., Bingol, A., Dilek, F., and Girgin, D. (2021). Coping with stress during the first wave of the COVID-19 pandemic by Turkish people with Multiple Sclerosis: the relationship between perceived stress and quality of life. *Mult. Scler. Relat. Dis.* 53, 103039. doi: 10.1016/j.msard.2021.103039

Amu, H., Osei, E., Kofie, P., Owusu, R., Bosoka, S. A., Konlan, K. D., et al. (2021). Prevalence and predictors of depression, anxiety, and stress among adults in Ghana: a community-based cross-sectional study. *PLoS ONE* 16, e0258105. doi: 10.1371/journal.pone.0258105

Azoulay, E., Pochard, F., Reignier, J., Argaud, L., Bruneel, F., Courbon, P., et al. (2021). Symptoms of mental health disorders in critical care physicians facing the second COVID-19 wave. A cross-sectional study. *Chest* 160, 944–955. doi: 10.1016/j.chest.2021.05.023

Brillon, P., Philippe, F.L., Paradis, A., Geoffroy, M. C., Orri, M., and Ouellet-Morin, I. (2021). Psychological distress of mental health workers during the COVID-19 pandemic: A comparison with the general population in high-and low-incidence regions. *J. Clin. Psychol.* 78, 602–621. doi: 10.1002/jclp.23238

Byrne, J. P., Creese, J., Matthews, A., McDermott, A. M., Costello, R. W., and Humphries, N. (2021). '...the way it was staffed during COVID is the way it should be staffed in real life...': a qualitative study of the impact of COVID-19 on the working conditions of junior hospital doctors. *BMJ Open* 11, e050358. doi: 10.1136/bmjopen-2021-050358

Campos, J. A. D. B., Martins, B. G., Campos, L. A., Valadao-Dias, F. D., and Maroco, J. (2021). Symptoms related to mental disorder in healthcare workers during the COVID-19 pandemic in Brazil. *Int. Arch. Occ. Environ. Health* 94, 1023–1032. doi: 10.1007/s00420-021-01656-4

Cormi, C., Sanchez, S., de l' Estoile, V., Ollivier, L., Letty, A., Berrut, G., et al. (2021). Telepsychiatry to provide mental health support to healthcare professionals during the COVID-19 crisis: a cross-sectional survey among 321 healthcare professionals in France. *Int. J. Environ. Res. Public Health* 18, 10146. doi: 10.3390/ijerph181910146

Dal Santo, F., Rodriguez-Revuelta, J., Garcia-Portilla, M. P., and Bobes, J. (2020). Psychiatry residency during the COVID-19 pandemic: navigating uncharted waters. *Asian J. Psychiatr.* 53, 102214. doi: 10.1016/j.ajp.2020.102214

Davey, C. G., Lopez-Sola, C., Bui, M., Hopper, J. L., Pantelis, C., Fontenelle, L. F., et al. (2017). The effects of stress-tension on depression and anxiety symptoms: evidence from a novel twin modelling analysis (vol 46, pg 3213, 2016). *Psychol. Med.* 47, 1865–1865. doi: 10.1017/S003329171700037X

Doroszkiewicz, C., Gold, D., Green, R., Tartaglia, M. C., Ma, J., and Tator, C. H. (2021). Anxiety, depression, and quality of life: a long-term follow-up study of patients with persisting concussion symptoms. *J. Neurotrauma* 38, 493–505. doi: 10.1089/neu.2020.7313

El Kenawy, A. M., Lopez-Moreno, J. I., McCabe, M. F., Dominguez-Castro, F., Pena-Angulo, D., Gaber, I. M., et al. (2021). The impact of COVID-19 lockdowns on surface urban heat island changes and air-quality improvements across 21 major cities in the Middle East. *Environ. Pollut.* 288, 117802. doi: 10.1016/j.envpol.2021.117802

Eyice Karabacak, D., Demir, S., Yegit, O. O., Can, A., Terzioglu, K., Unal, D., et al. (2021). Impact of anxiety, stress and depression related to COVID-19 pandemic on the course of hereditary angioedema with C1-inhibitor deficiency. *Allergy* 76, 2535–2543. doi: 10.1111/all.14796

Fawzy, M., and Hamed, S. A. (2017). Prevalence of psychological stress, depression and anxiety among medical students in Egypt. *Psychiatr. Res.* 255, 186–194. doi: 10.1016/j.psychres.2017.05.027

Fluharty, M., Taylor, A. E., Grabski, M., and Munafo, M. R. (2017). The association of cigarette smoking with depression and anxiety: a systematic review. *Nicotine Tob. Res.* 19, 3–13. doi: 10.1093/ntr/ntw140

Haag, D. G., Peres, K. G., and Brennan, D. S. (2017). Tooth loss and general quality of life in dentate adults from Southern Brazil. *Qual. Life Res.* 26, 2647–2657. doi: 10.1007/s11136-017-1587-4

Hertz-Palmor, N., Moore, T. M., Gothelf, D., DiDomenico, G. E., Dekel, I., Greenberg, D. M., et al. (2020). Association among income loss, financial strain and depressive symptoms during COVID-19: evidence from two longitudinal studies. *J. Affect. Disord.* 291, 1–8. doi: 10.1101/2020.09.15.20195339

Hirten, R. P., Danieletto, M., Tomalin, L., Choi, K. H., Zweig, M., Golden, E., et al. (2021). Factors associated with longitudinal psychological and physiological stress in health care workers during the COVID-19 pandemic: observational study using apple watch data. *J. Med. Internet Res.* 23, e31295. doi: 10.2196/preprints.31295

Hu, W. M., Yin, X. Y., Yin, X. L., Zhu, Z. H., Guan, L. Y., Hou, W. L., et al. (2020). Prevalence, social-demographic and cognitive correlates of depression in Chinese psychiatric medical staff. *J. Affect. Disord.* 263, 60–63. doi: 10.1016/j.jad.2019.11.133

Huang, C. Y., Hsu, M. C., Hsu, S. P., Cheng, P. C., Lin, S. F., and Chuang, C. H. (2010). Mediating roles of social support on poststroke depression and quality of life in patients with ischemic stroke. *J. Clin. Nurs.* 19, 2752–2762. doi: 10.1111/j.1365-2702.2010.03327.x

Johnson, T. J., Millinchamp, F. J., and Kelly, F. E. (2021). Use of a team immediate debrief tool to improve staff well-being after potentially traumatic events. *Anaesthesia* 76, 1001–1002. doi: 10.1111/anae.15437

Johnston, K. M., Powell, L. C., Anderson, I. M., Szabo, S., and Cline, S. (2019). The burden of treatment-resistant depression: a systematic review of the economic and quality of life literature. *J Affect Disord.* 242, 195–210. doi: 10.1016/j.jad.2018.06.045

Jokic-Begic, N., Lauri Korajlija, A., and Begic, D. (2020). Mental health of psychiatrists and physicians of other specialties in early COVID-19 pandemic: risk ind protective factors. *Psychiatr. Danub.* 32, 536–548. doi: 10.24869/psyd.2020.536

Kaufman, B. G., Mahendraratnam, N., Nguyen, T. V., Benzing, L., Beliveau, J., Silcox, C., et al. (2021). Factors associated with initial public school reopening plans during the US COVID-19 pandemic: a retrospective study. *J. Gen. Intern. Med.* 36, 852–854. doi: 10.1007/s11606-020-06470-1

Kruithof, N., Haagsma, J. A., Karabatzakis, M., Cnossen, M. C., de Munter, L., van de Ree, C. L. P., et al. (2018). Validation and reliability of the Abbreviated World Health Organization Quality of Life Instrument (WHOQOL-BREF) in the hospitalized trauma population. *Injury* 49, 1796–1804. doi: 10.1016/j.injury.2018.08.016

Lai, J. B., Ma, S. M., Wang, Y., Cai, Z.X., Hu, J. B., Wei, N., et al. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA. Netw. Open.* 3, e203976. doi: 10.1001/jamanetworkopen.2020.3976

Li, T., Sun, S. W., Liu, B., Wang, J., Zhang, Y. L., Gong, C., et al. (2021a). Prevalence and risk factors for anxiety and depression in patients with COVID-19 in Wuhan, China. *Psychosom. Med.* 83, 368–372. doi: 10.1097/PSY.0000000000000934

Li, W., Zhao, N., Yan, X., Zou, S., Wang, H., Li, Y., et al. (2021b). The prevalence of depressive and anxiety symptoms and their associations with quality of life among clinically stable older patients with psychiatric disorders during the COVID-19 pandemic. *Transl. Psychiatry* 11, 75. doi: 10.1038/s41398-021-01196-y

Lima, C. K. T., Carvalho, P. M. D., Lima, I. D. A. S., Nunes, J.V.A. D., Saraiva, J. S., de Souza, R. I., et al. (2020). The emotional impact of Coronavirus 2019-nCoV (new Coronavirus disease). *Psychiatry Res.* 287, 112915. doi: 10.1016/j.psychres.2020.112915

Liu, Y., Chen, H. G., Zhang, N., Wang, X., Fan, Q. Y., Zhang, Y. L., et al. (2021). Anxiety and depression symptoms of medical staff under COVID-19 epidemic in China. *J. Affect. Disord.* 278, 144–148. doi: 10.1016/j.jad.2020.09.004

Lo Buono, V., Palmeri, R., De Salvo, S., Berenati, M., Greco, A., Ciurleo, R., et al. (2021). Anxiety, depression, and quality of life in Parkinson's disease: the implications of multidisciplinary treatment. *Neural Regen. Res.* 16, 587–590. doi: 10.4103/1673-5374.293151

Lovibond, P. F., and Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav. Res. Ther.* 33, 335–343. doi: 10.1016/0005-7967(94)00075-U

Luo, H., Liu, J., Li, C., Chen, K., and Zhang, M. (2020). Ultra-rapid delivery of specialty field hospitals to combat COVID-19: lessons learned from the Leishenshan Hospital project in Wuhan. *Autom. Constr.* 119, 103345. doi: 10.1016/j.autcon.2020.103345

Maqsood, M. B., Islam, M. A., Zeb Un, N., Naqvi, A. A., Qarni, A. A., Al-Karasneh, A. F., et al. (2021). Assessment of quality of work life (QWL) among healthcare staff of intensive care unit (ICU) and emergency unit during COVID-19 outbreak using WHOQoL-BREF. *Saudi Pharm. J.* 29, 1348–1354. doi: 10.1016/j.jsps.2021.09.002

Matthay, E. C., Duchowny, K. A., Riley, A. R., and Galea, S. (2021). Projected all-cause deaths attributable to COVID-19-related unemployment in the United States. *Am. J. Public Health* 111, 696–699. doi: 10.2105/AJPH.2020.306095

Mattila, E., Peltokoski, J., Neva, M. H., Kaunonen, M., Helminen, M., and Parkkila, A. K. (2021). COVID-19: anxiety among hospital staff and associated factors. *Ann. Med.* 53, 237–246. doi: 10.1080/07853890.2020.1862905

Meynaar, I. A., Ottens, T., Zegers, M., van Mol, M. M. C., and van der Horst, I. C. C. (2021). Burnout, resilience and work engagement among Dutch intensivists in the aftermath of the COVID-19 crisis: a nationwide survey. *J. Crit. Care* 62, 1–5. doi: 10.1016/j.jcrc.2020.11.010

Murat, M., Kose, S., and Savaser, S. (2021). Determination of stress, depression and burnout levels of front-line nurses during the COVID-19 pandemic. *Int. J. Ment. Health Nurs.* 30, 533–543. doi: 10.1111/inm.12818

Pang, K. H., Carrion, D. M., Rivas, J. G., Mantica, G., Mattigk, A., Pradere, B., et al. (2020). The impact of COVID-19 on European health care and urology trainees. *Eur. Urol.* 78, 6–8. doi: 10.1016/j.eururo.2020.04.042

Peng, X. F., Meng, X. Y., Li, L., Hu, C. H., Liu, W., Liu, Z. Y., et al. (2021). Depressive and anxiety symptoms of healthcare workers in intensive care unit under the COVID-19 epidemic: an online cross-sectional study in China. *Front. Public Health* 9, 603273. doi: 10.3389/fpubh.2021.603273

Phillips, A. E., Faghih, M., Drewes, A. M., Singh, V. K., Yadav, D., Olesen, S. S., et al. (2020). Psychiatric comorbidity in patients with chronic pancreatitis associates with pain and reduced quality of life. *Am. J. Gastroenterol.* 115, 2077–2085. doi: 10.14309/ajg.0000000000000782

Ridley, M., Rao, G., Schilbach, F., and Patel, V. (2020). Poverty, depression, and anxiety: causal evidence and mechanisms. *Science* 370, 1289. doi: 10.1126/science.aay0214

Rossi, R., Socci, V., Pacitti, F., Di Lorenzo, G., Di Marco, A., Siracusano, A., et al. (2020). Mental health outcomes among frontline and second-line health care workers during the coronavirus disease 2019 (COVID-19) pandemic in Italy. *JAMA. Netw. Open.* 3, e2010185. doi: 10.1001/jamanetworkopen.2020.10185

Ruo, B., Rumsfeld, J. S., Hlatky, M. A., Liu, H., Browner, W. S., and Whooley, M. A. (2003). Depressive symptoms and health-related quality of life: the Heart and Soul Study. *JAMA* 290, 215–221. doi: 10.1001/jama.290.2.215

Sahebi, A., Nejati-Zarnaqi, B., Moayedi, S., Yousefi, K., Torres, M., and Golitaleb, M. (2021). The prevalence of anxiety and depression among healthcare workers during the COVID-19 pandemic: an umbrella review of meta-analyses. *Progr. Neuropsychoph.* 107, 110247. doi: 10.1016/j.pnpbp.2021.110247

Schmitt, A. A. Jr., Brenner, A. M., Primo de Carvalho Alves, L., Claudino, F. C. A., Fleck, M. P. A., and Rocha, N. S. (2021). Potential predictors of depressive symptoms during the initial stage of the COVID-19 outbreak among Brazilian adults. *J. Affect. Disord.* 282, 1090–1095. doi: 10.1016/j.jad.2020.12.203

Schober, P., Mascha, E. J., and Vetter, T. R. (2021). Statistics From A (Agreement) to Z (z Score): a guide to interpreting common measures of association, agreement, diagnostic accuracy, effect size, heterogeneity, and reliability in medical research. *Anesth. Analg.* 133, 1633–1641. doi: 10.1213/ANE.0000000000005773

Shanahan, L., Copeland, W. E., Angold, A., Bondy, C. L., and Costello, E. J. (2014). Sleep problems predict and are predicted by generalized anxiety/depression and oppositional defiant disorder. *J. Am. Acad. Child Adolesc Psychiatry* 53, 550–558. doi: 10.1016/j.jaac.2013.12.029

Stark, D., Kiely, M., Smith, A., Velikova, G., House, A., and Selby, P. (2002). Anxiety disorders in cancer patients: their nature, associations, and relation to quality of life. *J. Clin. Oncol.* 20, 3137–3148. doi: 10.1200/JCO.2002.08.549

Su, J. C., Shen, L. J., and Chen, H. C. (2021). Maintaining mental health among medical staff during the COVID-19 pandemic: Taiwan's experience. *J. Formos. Med. Assoc.* 120, 923–925. doi: 10.1016/j.jfma.2020.08.049

Suarez, L., Tay, B., and Abdullah, F. (2018). Psychometric properties of the World Health Organization WHOQOL-BREF Quality of Life assessment in Singapore. *Qual. Life Res.* 27, 2945–2952. doi: 10.1007/s11136-018-1947-8

The WHOQOL Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychol. Med.* 28, 551–558. doi: 10.1017/S0033291798006667

Viswanathan, R., Myers, M. F., and Fanous, A. H. (2020). Support groups and individual mental health care via video conferencing for frontline clinicians during the COVID-19 pandemic. *Psychosomatics* 61, 538–543. doi: 10.1016/j.psym.2020.06.014

Wilmer, M. T., Anderson, K., and Reynolds, M. (2021). Correlates of quality of life in anxiety disorders: review of recent research. *Curr. Psychiatry Rep.* 23, 77. doi: 10.1007/s11920-021-01290-4

Wu, V. X., Chi, Y., Lee, J. K., Goh, H. S., Chen, D. Y. M., Haugan, G., et al. (2021). The effect of dance interventions on cognition, neuroplasticity, physical function, depression, and quality of life for older adults with mild cognitive impairment: a systematic review and meta-analysis. *Int. J. Nurs. Stud.* 122, 104025. doi: 10.1016/j.ijnurstu.2021.104025

Xiao, X., Zhu, X. B., Fu, S., Hu, Y. G., Li, X. N., and Xiao, J. S. (2020). Psychological impact of healthcare workers in China during

COVID-19 pneumonia epidemic: a multi-center cross-sectional survey investigation. *J. Affect Disord.* 274, 405–410. doi: 10.1016/j.jad.2020.05.081

Yao, H., Zhang, J., Wang, Y., Wang, Q., Zhao, F., and Zhang, P. (2021). Stroke risk and its association with quality of life: a cross-sectional study among Chinese urban adults. *Health Qual. Life Outcomes* 19, 236. doi: 10.1186/s12955-021-01868-9

Yen, T. J., Chan, T. C., Fu, Y. C., and Hwang, J. S. (2022). Quality of life and multilevel contact network structures among healthy adults in Taiwan: online participatory cohort study. *J. Med. Internet Res.* 24, e23762. doi: 10.2196/23762

Yohannes, A. M., Dryden, S., and Hanania, N. A. (2019). Validity and responsiveness of the depression anxiety stress scales-21 (DASS-21) in COPD. *Chest* 155, 1166–1177. doi: 10.1016/j.chest.2018.12.010

Zhang, H. H., Zhao, Y. J., Wang, C., Zhang, Q., Yu, H. Y., Cheung, T., et al. (2021). Depression and its relationship with quality of life in frontline psychiatric clinicians during the COVID-19 pandemic in China: a national survey. *Int. J. Biol. Sci.* 17, 683–688. doi: 10.7150/ijbs.56037

Zhang, W. R., Wang, K., Yin, L., Zhao, W. F., Xue, Q., Peng, M., et al. (2020). Mental health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. *Psychother. Psychosom.* 89, 242–250. doi: 10.1159/000507639

Zhou, Y., Wang, W., Sun, Y., Qian, W., Liu, Z., Wang, R., et al. (2020). The prevalence and risk factors of psychological disturbances of frontline medical staff in china under the COVID-19 epidemic: workload should be concerned. *J. Affect. Disord.* 277, 510–514. doi: 10.1016/j.jad.2020.08.059

Effects of Cell Phone Dependence on Mental Health Among College Students During the Pandemic of COVID-19: A Cross-Sectional Survey of a Medical University in Shanghai

Ting Xu [1,2,3], Xiaoting Sun [4], Ping Jiang [5], Minjie Chen [6], Yan Yue [7] and Enhong Dong [1,2,3*]

[1] School of Nursing and Health Management, Shanghai University of Medicine and Health Science, Shanghai, China,
[2] School of Media and Communication, Shanghai Jiao Tong University, Shanghai, China, [3] Institute of Health Yangtze River Delta, Shanghai Jiao Tong University, Shanghai, China, [4] Shanghai Tenth People's Hospital, Tongji University School of Medicine, Shanghai, China, [5] Genetics and Biochemistry Laboratory, Shanghai Mental Health Center, Shanghai, China, [6] Renji Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China, [7] School of Health Care Management, Tsinghua University, Beijing, China

Objective: To investigate the effects of cell phone dependence (CPD) on mental health among undergraduates during the COVID-19 pandemic and further identify the determinants that may affect their mental health in China.

Methods: The data were collected from 602 students at a medical school in Shanghai *via* an online survey conducted from December 2021 to February 2022. The Mobile Phone Addiction Index (MPAI) and Depression Anxiety Stress Scale (DASS) were applied to evaluate CPD and mental health, respectively. Independent sample t-test and one-way analysis of variance (ANOVA) were employed to compare the means of continuous variables among categorical groups. Correlations between continuous variables were detected using Pearson's correlation analysis. Univariable and multivariable logistic regressions were employed to identify the determinants of mental health.

Results: Among the 402 eligible students, 73.88% were women with an average age of 20.19 ± 2.36 years. On average, the DASS score was 32.20 ± 11.07, the CPD score was 36.23 ± 11.89, and the cell phone use duration was 7.67 ± 3.61 h/day. CPD was found to have a negative effect on mental health among college students in Shanghai. Additionally, cell phone use duration, age, being senior students, faculty-student relationship, insomnia, tobacco use, obesity, and life satisfaction were clarified as contributing factors to mental health among college students.

Conclusion: High degree of CPD could have a negative effect on college students' mental health, which might lead to some psychological problems. Appropriate actions and effective interventions are highly needed to prevent severe psychological injuries among college students in China.

Keywords: cell phone dependence, mental health, effect, college students, China

INTRODUCTION

Coronavirus Disease-19 has become a global public health problem since its outbreak in early 2020. It not only causes a number of physical problems but also affects people's mental health. Currently, the COVID-19 pandemic still continues to challenge people's livelihoods and economies around the world and bring tremendous changes to people's daily life (Moreno et al., 2020; Vindegaard, 2020; Kooli, 2021). The education industry, especially the higher education industry is one of the most affected fields. Due to the prevention and control of COVID-19 requirements, such as online teaching, outdoor activities' suspension, and gatherings prohibition in the public field, college students have to increase their online time and social media usage, which result in poor sleep quality, irregular eating pattern, and even anxiety and depression (Fu et al., 2021). As the outbreak of COVID-19, the governments had initiated the appropriate program of health education and relevant regulations to strictly prevent the spread of COVID-19, such as outdoor activities' suspension, social distance keeping, and gatherings prohibition in the public field. For college students, they had to be required to come to home study online or in group isolation in school dormitories, which increased their online time, social media usage, and potentially changed their learning and life styles. Despite cell phones could bring convenience to people, inappropriate usage of mobile devices has the potential to be detrimental. For example, many people used cell phones frequently, leading to internet addiction (Ozturk, 2021). One study showed more frequent cell phone overuse among college students when compared with the pre-epidemic period (Kim, 2018). Additionally, it was also reported that frequent use of the internet on cell phones among college students would cause poor sleep quality, irregular eating patterns, and even anxiety and depression (Liu et al., 2021). Within the Chinese context, according to a report from the China Internet Network Information Center (CINIC), up to December 2020, there were 1.614 billion mobile phone users in China, among whom students accounted for 21%, with college students aged 18–22 being the largest- and fastest-growing group (China Internet Network Information Center, 2021; Conrad et al., 2021). Especially in the era of routine epidemic control and prevention after 2020, college students are used to employ mobile phones as their daily life instrument for conducting interactive learning activities, such as taking online lessons and completing class assignments (Shi et al., 2021). However, there still without exception existed cell phone dependence (CPD) among Chinese college students (Hong et al., 2021). CPD is described as the compulsive habit of avoiding reality or producing excitement *via* cell phone use with symptoms, such as salience and withdrawal (Lam et al., 2009). It included any behavioral addiction thought to be similar to that of an internet, gambling, shopping, or video game addiction (Chen and Oliffe, 2018). Though no evidence was present to show that the COVID-19 pandemic directly altered the relationship between CPD and mental health, some studies had found the mediating and moderating role of cyberchondria severity in the association between fear of COVID-19 and smartphone addiction among individuals (Kayis et al., 2021). Literature has reported that CPD was associated with social and emotional intelligence (Zou et al., 2019a), in which it demonstrated that the lower emotional intelligence (or lack it entirely) one has, severer CPD is (Xie et al., 2019a). Excessive CPD was also found to be associated with difficulties in cognitive-emotion regulation, impulsivity, impaired cognitive function, addiction to social networking, shyness, and low self-esteem (Volkmer, 2018; Oviedo-Trespalacios et al., 2019). For college students, it is also reported that CPD may have a negative impact on them in terms of time allocation and management, school performance, interpersonal relationships, and health (Dempsey et al., 2020).

College students have high need of accessing knowledge through digital platforms because they often need to search for extra information during their learning activities and clinical practices. They are also required to gain skills of delivering health services through mobile platforms, due to the fast development of mobile health (mHealth) and electronic health (eHealth). However, current literature lacks in-depth research on how CPD may affect college students on their health and performances. Therefore, the purpose of this study was to investigate the effects of CPD on mental health among undergraduates in Shanghai, China during the COVID-19 pandemic.

In order to identify independent effects of CPD on mental health for college students, other related characteristics must be controlled. We take into account age (Xie et al., 2019b), grade (Dou et al., 2020), gender (Lu et al., 2018), monthly allowance (Li et al., 2020), Faculty-Student relationship (Liang and Liu, 2021), substance use (Carreiro et al., 2018), physical exercise (Zhong and Wang, 2020), insomnia (Zhang et al., 2021), obesity (Ali et al., 2021), life satisfaction (Kuang-Tsan, 2017), and subjective wellbeing (SWB) (Ye et al., 2021) to confirm the salient effect of CPD and mental health.

MATERIALS AND METHODS

Data Sources

Firstly, to ensure the representativeness of the sample, we used the following formula to calculate the required minimum sample size according to Krejcie and Morgan (1970):

$$n = \frac{Z_{1-\alpha}^2 NP(1-P)}{d^2(N-1) + Z_{1-\alpha}^2 P(1-P)} \tag{1}$$

Where n refers to the required minimum sample size, $Z_{1-\alpha}$ is the value from the standard normal distribution for the selected confidence level (e.g., for $\alpha = 0.05$, for 95% confidence level, and Z = 1.96). N is the given population size. P refers to the prevalence of the interest; and d is the degree of accuracy. In this study, we set P to 0.228 (Zou et al., 2019b), α is 0.05, and d is 0.05. The value of N is 10,000, so we get the required minimum size equal to 263. Considering the follow-up loss rate, rejection rate, and questionnaire efficiency, we finally set the needed minimum sample size as 600.

The data were collected from a convenience sample of 602 students at a medical school in Shanghai using an online survey with a total of 80 questions from December 2021 to February 2022. The online questionnaire was set to be answered through

a single IP address. If the survey was detected to be (1) completed within <200 s (61, 10.13%); (2) provided with repeated answers or a certain pattern of answers (98, 16.28%); (3) having 5% or more missing values (20, 3.33%); or (4) having logical errors (21, 3.49%), it will be classified as unqualified and excluded. After exclusion, 402 eligible participants were enrolled in the final analyses. The relatively low response rate (66.77%) was due to the abovementioned rigid exclusion criteria, which made many questionnaires excluded for quality reasons.

To reduce the privacy concern, the respondents did not need to fill in their real names, contact information, or other private information. The questionnaire designed by the research group contained the following variables: (1) demographic and socioeconomic characteristics (e.g., age, gender, ethnicity, grade, major, monthly expenditure, etc.), and (2) seven questions on mental health status, CPD, substance abuse, faculty-student relationship, physical activity, body mass index (BMI), life satisfaction, and SWB.

Measurements

Mental health was measured using the Chinese version of the Depression Anxiety Stress Scale (DASS) (Zhang et al., 2021), a 21-item scale that includes three dimensions of mental health—depression, anxiety, and stress. Each item was anchored from "Don't apply to me at all" (scored with 1) to "Applied to me very much" (scored with 4), with higher scores indicating severer psychological problems. In the present study, all three dimensions and the total scale had good reliability and validity. The internal consistency coefficients of the three subscales were 0.917, 0.878, and 0.899, respectively. The internal consistency coefficient of the total scale was 0.961.

Cell phone dependence was measured using the Chinese version of Mobile Phone Addiction Index (MPAI) (Liu et al., 2021), a 17-item scale that includes four dimensions: inability to control craving, feeling anxious and lost, mood improvement, and productivity loss. The 17 items were answered on a five-point Likert scale with 1 indicating "not at all" and 5 indicating "always." The total score was obtained by summing up the scores of 17 items. The higher the score of MPAI was, the greater the level of mobile phone addiction was. In this study, all four dimensions and the total scale had good reliability and validity. The internal consistency coefficients of the total scale and the three subscales were 0.912, 0.828, 0.800, 0.891, and 0.815, respectively.

The satisfaction with life scale (SWLS), a five-question scale, was used to measure individual satisfaction with life as a whole (Bieda et al., 2018; Li et al., 2019). Respondents rated the scale on a five-point Likert scale from "very dissatisfied" (assigned a score of 1) to "very satisfied" (assigned a score of 5), with higher scores indicating higher satisfaction with life. In the present study, the internal consistency coefficient of the scale was 0.913.

Subjective wellbeing is defined as a person's evaluative response to his or her life and can be divided into cognitive components, such as life satisfaction and affective components, i.e., happiness. This paper used Stubbe et al.'s SWB scale, which also contains five questions measuring individuals' life

satisfaction and happiness (Nie and Ma, 2020; Zhang et al., 2020). The respondents rated the scale on a Likert scale from "strongly disagree" (assigned a score of 1) to "strongly agree" (assigned a score of 5), with higher scores indicating higher SWB. In the present study, the internal consistency coefficient of the scale was 0.894.

Faculty-student relationship was measured using the Student-Faculty Relationship Perception Questionnaire developed by Yu et al. (2017), which contains seven items. It was adopted from the "Leader-member exchange differentiation" questionnaire (Yu et al., 2017; Liang and Liu, 2021), which is a widely used relationship measurement tool based on social exchange theory (Khuram et al., 2021). The internal consistency coefficient of this measurement in this study was 0.945.

The measurement and type for the other key variables can be seen in **Appendix 1**.

Date Analysis

In the first step, an S-K test was conducted to test the normality of the data and followed by a descriptive analysis of the data, such as demographic and socioeconomic characteristics, faculty-student relationships, physical activity, substance abuse, CPD, life satisfaction, and SWB. Then, we conducted an independent sample t-test and one-way analysis of variance (ANOVA) to determine whether there were any statistically significant differences in the means of two and more independent groups. Additionally, Pearson's correlation analysis was performed to test linear relationships between continuous variables. Lastly, we conducted univariate (model 1—unadjusted model) and multivariable logistic regressions to calculate the effects of the CPD on mental health. Variables that were significant in univariate analyses at a liberal p-value (p-value < 0.5) were retained as covariates for the adjusted models (models 2 and 3). Model 2 controlled for the variables, such as personal characteristics, faculty-student relationship, insomnia, substance abuse, and physical exercise, while model 3 additionally added life satisfaction and SWB. To check for multi-collinearity in the independent variables, we used the Variance Inflation Factor (VIF) technique. The variable is acceptable and will be included in regression analysis if its VIF is <5.

All analyses were conducted using Stata.15.0 (StataCorp LP, College Station, TX, USA). Statistical significance of the results was based on p < 0.05 two-tailed test.

RESULTS

Descriptive Characteristics

From a total of 602 returned surveys, 402 respondents (66.7%) were selected according to the exclusion criteria [297 women (73.88%), 105 men (26.12%)], among which the majority of Han nationality (n = 368) accounted for 91.54%. The average age of the students was 20.19 ± 2.36, 127 (31.59%) were sophomores, 283 (70.40%) were unmarried, and 307 (76.37%) were living in city hometowns. The mean DASS score was 32.20 ± 11.07, the mean CPD score was 36.23 ± 11.89, the cell phone use duration was 7.67 ± 3.61 h/day, the faculty-student relationship score was 3.80 ± 0.81, the life-satisfaction score was 18.7 ± 4.15, and the

Characteristic	N	%
Gender		
Male	105	26.12
Female	297	73.88
Grade		
Freshman	107	26.62
Sophomore	127	31.59
Junior	120	29.85
Senior	48	11.95
Hometown type		
Urban	307	76.37
Rural	95	23.63
Ethnic group		
Han	368	91.54
Minority nationality	34	8.46
Specialty		
Medical	235	58.46
Health economy and management	167	41.54
Relationship status		
Not dating nor married	283	70.40
Dating but unmarried	108	26.87
Married	9	2.24
Others	2	0.50
Monthly allowances (RMB)		
<1,000	24	5.97
1,000–1,499	143	35.57
1,500–1,999	137	34.08
2,000–2,499	59	14.68
2,500–2,999	19	4.73
>3,000	20	4.98
Insomnia		
No	162	40.30
Seldom	153	38.06
Sometimes	63	15.67
Often	19	4.73
Daily	5	1.24
Physical activity		
Never	23	5.72
Rare (≤2 times/month)	148	36.82
Sometimes (1–2 times/month)	182	45.27
Often (3–5 times/month)	41	10.20
Daily	8	1.99
Cigarette use		
Never	380	94.53
Ex-smoker	8	1.99
Current smoker	14	3.48
Alcohol use		
Never	260	64.68
Rare (≤2 times/month)	103	25.62
Sometimes (≤4 times/month)	29	7.21
Often (≤12 times/month)	5	1.24
Always (>12 times/month)	5	1.24

(Continued)

TABLE 1 | Continued

Characteristic	N	%
BMI index		
Low weight	66	16.42
Normal	250	62.19
Overweight	57	14.18
Obesity	29	7.21
	Mean	**SD**
Age (year)	20.19	2.36
Phone use duration (hours)	7.67	3.61
DASS	32.20	11.07
MPAI	36.23	11.89
SWLS	18.71	4.15
SWB	15.90	1.47
F-S relationship	3.80	0.81

DASS, Depression Anxiety Stress Scales; MPAI, mobile phone addiction index; SWLS, The satisfaction with life scale; SWB, Subjective well-being; F-S relationship, Faculty-Student relationship.

SWB score was 15.90 ± 1.47. The other variables are detailed in **Table 1**.

Univariate Analyses and Correlation Analyses

Through the S-K normality test, the data of all the dependent and independent variables of interest for this study were acceptable to conduct the following analysis, with the skewness values being all near zero, and the kurtosis values being all <3. Moreover, the means of CPD were significantly different between the two gender groups ($t = -1.91$, $p = 0.0286$). The means of CPD were also different between at least two of the insomnia groups ($F = 3.96$, $p = 0.004$), physical exercise groups ($F = 4.80$, $p = 0.001$), alcohol use groups ($F = 2.41$, $p = 0.049$), and BMI groups ($F = 5.85$, $p = 0.047$). In addition, the variables that were found to be significantly associated with CPD included the cell phone use duration ($r = 0.249$, $p < 0.001$), faculty-student relationship ($r = -0.200$, $p < 0.001$), and life satisfaction ($r = -0.194$, $p < 0.001$). Similarly, the variables significantly associated with DASS were CPD use duration ($r = 0.259$, $p < 0.001$), faculty-student relationship ($r = -0.085$, $p = 0.0471$), life satisfaction ($r = -0.209$, $p < 0.001$), and SWB ($r = -0.219$, $p < 0.001$). The mean of DASS was significantly different between at least two of the three or more groups when classifying by grade ($F = 4.64$, $p = 0.003$), monthly allowance ($F = 2.24$, $p = 0.049$), insomnia ($F = 12.26$, $p < 0.001$), physical exercise ($F = 2.77$, $p = 0.027$), tobacco use ($F = 3.61$, $p = 0.028$), alcohol use ($F = 3.50$, $p = 0.008$), and BMI ($F = 5.41$, $p = 0.046$). Details of the above analyses are shown in **Table 2**.

Logistic Regression Analyses

Through the multi-collinearity test, each VIF of the predictors significant in univariate analysis was included in the logit regression model and was between 1.06 and 2.06, indicating no multicollinearity will occur in the regression analysis.

TABLE 2 | Univariate/correlation analysis results (*N* = 402).

Variable	CPD score			DASS score		
	Mean ± SD	*t/F*-Value	*P*	Mean ± SD	*t/F*-Value	*P*
Age (year)		0.027	0.583		−0.037	0.455
Phone use duration (hours)		0.249[a, ***]	<0.001		0.259***	<0.001
Grade		1.09	0.3518		4.64	0.003
Freshman	34.93 ± 12.07			30.47 ± 10.91		
Sophomore	35.80 ± 11.04			32.44 ± 9.79		
Junior	37.07 ± 12.66			31.45 ± 11.16		
Senior	39.12 ± 10.65			38.70 ± 12.54		
Gender		−1.9076*	0.029		0.6337	0.527
Male	34.33 ± 12.42			32.84 ± 12.37		
Female	36.90 ± 11.64			31.98 ± 10.58		
Ethnic groups		−1.5900	0.056		−1.167	0.244
Han	35.94 ± 11.83			32.01 ± 10.95		
Minority nationality	39.32 ± 12.22			34.32 ± 12.29		
Hometown type		−0.6640	0.254		−0.685	0.494
Urban	36.01 ± 12.12			31.99 ± 11.13		
Rural	36.94 ± 11.11			32.88 ± 10.90		
Relationship status		1.07	0.360		0.35	0.792
Not dating nor married	35.85 ± 11.61			32.23 ± 11.09		
Dating but unmarried	36.70 ± 12.22			31.81 ± 10.59		
Married	39.78 ± 15.82			34.89 ± 16.73		
Others	48.00 ± 12.73			37.00 ± 7.07		
Monthly allowances (RMB)		2.18	0.056		2.24*	0.049
<1,000	35.79 ± 11.42			35.46 ± 12.76		
1,000–1,499	36.45 ± 11.67			32.76 ± 11.44		
1,500–1,999	34.27 ± 11.13			29.97 ± 9.87		
2,000–2,499	38.32 ± 12.74			34.27 ± 11.30		
2,500–2,999	42.37 ± 12.08			34.53 ± 11.54		
>3,000	36.60 ± 14.29			31.30 ± 11.23		
Specialty		−0.606	0.272		0.028	0.977
medical	35.93 ± 12.02					
Health economy and management	36.67 + 11.71					
Faculty-student relationship		−0.200[a, ***]	<0.001		−0.085[a, *]	0.047
Insomnia		3.96**	0.004		12.26***	<0.001
NO	34.27 ± 12.10			28.50 ± 9.83		
Seldom	35.99 ± 10.40			32.92 ± 9.93		
Sometimes	40.89 ± 13.11			36.65 ± 12.94		
Often	38.16 ± 12.59			41.37 ± 8.87		
Daily	40.80 ± 15.52			39.40 ± 18.50		
Cigarette use		0.63	0.534		3.61*	0.028
Never	36.08 ± 11.88			31.98 ± 10.89		
Ex-smoker	37.13 ± 12.63			29.75 ± 11.49		
Current smoker	39.64 ± 11.83			39.79 ± 13.65		
Alcohol use		2.41*	0.049		3.50**	0.008
Never	35.15 ± 11.59			31.04 ± 10.58		
Rare (≤2 times/month)	38.32 ± 11.65			33.83 ± 11.13		
Sometimes (≤4 times/month)	36.31 ± 13.56			33.52 ± 11.00		
Often (≤12 times/month)	47.00 ± 11.77			44.60 ± 16.24		
Always (>12 times/month)	37.80 ± 15.55			39.00 ± 18.62		
Physical exercise		4.80**	0.001		2.77*	0.027
Never	42.35 ± 14.50			37.13 ± 14.10		

(Continued)

TABLE 2 | Continued

Variable	CPD score			DASS score		
	Mean ± SD	t/F-Value	P	Mean ± SD	t/F-Value	P
Rare (≤2 times/month)	37.86 ± 12.36			33.57 ± 11.66		
Sometimes (1–2 times/month)	35.21 ± 10.82			30.80 ± 9.85		
Often (3–5 times/month)	33.39 ± 10.64			31.51 ± 10.50		
Daily	26.00 ± 13.18			28.25 ± 14.54		
BMI		5.85*	0.047		5.41*	0.046
Low weight	38.61 ± 1.04			32.62 ± 1.34		
Normal	36.37 ± 1.76			31.93 ± 10.41		
Overweight	32.90 ± 12.47			31.51 ± 10.67		
Obesity	36.14 ± 12.73			35.00 ± 15.98		
SWLS		−0.194[a],***	<0.001		−0.209[a],***	<0.001
SWB		−0.070[a]	0.1613		−0.219[a],***	<0.001

[a] Coefficient by Pearson Correlation Analysis.

*p < 0.05.

**P < 0.01.

***P < 0.001.

The unadjusted odds ratio (OR) value of CPD was 1.069 ($p < 0.001$; model 1) (**Table 3**). Similarly, as seen in model 2, the OR of CPD, cell phone use time, age, senior year, frequent insomnia, current smoking cessation, and obesity are statistically associated with mental health. Among them, the OR of CPD is 1.072 ($p < 0.001$), indicating that for every 1 increase in the CPD score, a college student is 1.07 times as likely to have mental issues.

The OR of cell phone use duration is 1.092 ($p < 0.05$), revealing that the more time students spend on mobile phones, the greater risk of psychological problems will occur, that is, with every 1 h increase in cell phone use time, a college student is 1.09 times as likely to have mental issues. Contrastly, the OR of age is 0.822 ($p < 0.05$), exhibiting for every 1 year increase, a college student is only 82.2% as likely to have mental issues. Similarly, as the OR of the faculty-student relationship is 0.582 ($p < 0.01$), exhibiting that the OR of having severe psychological problems will decrease as a relationship between faculty and student develops. It was the case for the students who have quit smoking as compared to non-smokers.

Similarly, controlling the same confounders, in model 3, we also got the similar results for three sub-dimensions: depression, anxiety, and stress when regressing CPD and cell phone use duration (see **Appendix 2**).

Senior students relative to freshmen, OR = 8.42, had greater odds of having mental disorder. It was also the case for students having a frequent insomnia (OR = 7.043, $p < 0.001$) and being obesity (OR = 3.979, $p < 0.01$) as compared to their counterparts, respectively.

Similarly, in model 3, when taking consideration of additional life satisfaction and SWB based on the model 2, it can be also seen that CPD (OR = 1.075, $p < 0.001$), cell phone time duration (OR = 1.090, $p < 0.05$), age (OR = 0.845, $p < 0.01$), faculty-student relationship (OR = 0.577, $p < 0.01$), senior-year (OR = 8.019, $p < 0.01$), frequent insomnia (OR = 6.390, $p < 0.01$), current smoking cessation (OR = 0.01, $p < 0.01$), and obesity (OR = 3.693, $p < 0.01$) still have the statistically significant association with mental health. Additionally, life satisfaction also shows a statistically significant effect on mental health. As an illustration, the OR for college students whose life satisfaction is 0.913 ($p < 0.05$), indicating that for every 1 increase in life satisfaction score, a college student is only 91.3% as likely to have psychological issues.

DISCUSSION

The findings showed that the average time that college students spent on their cell phones was 8 h a day, which was much longer than previous studies during the COVID-19 pandemic (Mach et al., 2020; Jiang et al., 2021).

For example, the average duration of mobile phone use for university students reported by Jiang et al. (2021) in Shanghai was 7.39 h each day during the COVID-19 pandemic. It indicated these students were somewhat addicted to their cell phones (Jiang et al., 2021). After adjusting confounders in the logistic regression analyses, this study supported the significant effects of CPD on decreasing mental health among college students in Shanghai (Zou et al., 2021). Additionally, cell phone use duration was also significantly clarified as contributing factor to mental health among college students (Tao et al., 2016; Liu et al., 2019). These findings would help educational institutions to address the disruptive cell phone addiction behavior among the students (Li, 2021).

The finding that CPD was negatively associated with mental health indicated that college students who have greater CPD were more likely to suffer from serious psychological problems (Lopez-Fernandez et al., 2014; Zhen et al., 2019). It hinted that excessive CPD would increase the experiences of mental health issues, such as depression, anxiety, and tension/stress, for college students. Our study contributed to the existing evidence of CPD

TABLE 3 | Logistic regression analysis results ($N = 402$).

Variable	Model 1 (Unadjusted model) OR	Model 2 (Adjustment model) OR	Model 3 (Adjustment model) OR
CPD	1.069*** (1.046–1.093)	1.072*** (1.047–1.098)	1.075*** (0.048–0.097)
Cell phone use duration	1.122*** (1.052-1.193)	1.092* (1.009–1.183)	1.090* (1.003–1.185)
Age		0.822* (0.701–0.963)	0.845** (0.722–0.989)
Grade			
Freshman		1.000	1.000
Sophomore		2.336 (0.944–5.781)	2.471 (0.958–6.374)
Junior		2.244 (0.850–5.919)	2.560 (0.941–6.961)
Senior		8.417** (1.922–36.857)	8.019** (1.760–36.54)
F-S relationship		0.582** (0.027–0.989)	0.577** (0.029–0.919)
Insomnia			
No		1.000	1.000
Seldom		1.820 (0.961–3.445)	1.770 (0.924–3.390)
Sometimes		2.079 (0.939–4.604)	1.792 (0.836–3.840)
Often		7.043*** (2.414–20.552)	6.390** (2.083–19.60)
Daily		2.158 (0.045–103.136)	3.347 (0.138–80.88)
Physical exercise			
Never		1.000	1.000
Rare (≤2 times/month)		2.774 (0.909–8.466)	2.787 (0.932–8.332)
Sometimes (1–2 times/month)		2.080 (0.680–6.360)	1.959 (0.657–5.846)
Often (3–5 times/month)		1.558 (0.416–5.837)	1.566 (0.423–5.801)
Daily		1.636 (0.153–17.525)	2.289 (0.192–27.32)
Cigarette use			
Never		1.000	1.000
Ex-smoker		0.169* (0.030–0.951)	0.0996** (0.0199–0.499)
Current smoker		0.896 (0.157–5.127)	0.829 (0.149–4.618)
Alcohol use			
Never		1.000	1.000
Rare (≤2 times/month)		1.275 (0.658–2.471)	1.270 (0.656–2.459)
Sometimes (≤4 times/month)		1.875 (0.729–4.820)	2.642 (0.970–7.195)
Often (≤12 times/month)		9.750 (0.352–270.248)	14.90 (0.530–418.4)
Always (>12 times/month)		2.517 (0.205–30.914)	2.429 (0.147–40.13)
BMI index			
Low weight		1.000	1.000
Normal		1.191 (0.572–2.480)	1.176 (0.572–2.417)
Overweight		1.862 (0.717–4.840)	1.988 (0.774–5.107)
Obesity		3.979** (1.486–10.654)	3.693** (1.360–10.03)
SWLS			0.913** (0.836–0.996)
SWB			0.880 (0.729–1.063)
Constant t	0.025 (0.010–0.059)	0.078 (0.003–2.130)	0.555 (0.0114–27.06)
Pseudo R^2-value	0.095	0.198	0.219
Observation	402	402	402

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

that is negatively affecting college students' mental health and also identified a group of other significant determinants of mental health, which should be considered to improve the psychological resilience of college students in China. Interestingly, we also found that there was a positive relationship between the mobile phone use duration and mental health problems, indicating

that the prolongation of cell phone use time would directly increase the probability of mental health problems in college students, which was consistent with the findings from previous studies (De-Sola Gutiérrez et al., 2016; Cha, 2018). It hinted that some international guidelines were needed for the integration of psychosocial support and mental health promotion intervention

among colleges and universities during the pandemic of COVID-19. Accordingly, college instructors were suggested to allocate time for mental health support to relieve students' concerns and worries through reducing the overuse of cell phones by (1) signing cell phone use agreements in the classroom (Zhong and Wang, 2020), (2) designing innovative experiments and interactive learning activities to attract students to participate in classroom learning (Subba et al., 2013), and (3) guiding college students to engage in hobbies or activities that do not involve their cell phones, such as playing a musical instrument or painting to balance their engagement in the real world along with screen time (Sumuer, 2021).

Other covariates, such as physical exercise, alcohol use, and SWB, had non-significant effects on CPD. In contrast, age, grade, faculty-student relationship, insomnia, cigarette use, BMI, and life satisfaction were significantly associated with mental health. These findings echoed prior observations on the determinants of mental health for college students (Lopez-Fernandez et al., 2014; Fergusson et al., 2015; De-Sola Gutiérrez et al., 2016; Bieda et al., 2018; Cha, 2018; Zhen et al., 2019; Nie and Ma, 2020; China Internet Network Information Center, 2021; Jiang et al., 2021; Liu et al., 2021). Notably, in this study, having higher life satisfaction was associated with lower odds of suffering from psychological problems for college students, which indicated life satisfaction's role in reducing the psychological problems. These findings were all consistent with Fergusson et al. (2015), Anderssen et al. (2020), and Duong (2021). It can be explained that with the improvement of life satisfaction, college students might have positive and stable attitudes toward their own living conditions, recognize the true value of life, pursue work-leisure balance, and actively conduct coping strategies (such as participating in physical exercise) to relieve the pressure, depression, stress, and anxiety they encountered in college life (Zhai et al., 2020). Though mental health problems can be either causes or consequences of life satisfaction, it is of interest to emphasize that government and educators can improve the level of mental health by improving college students' life satisfaction, such as guiding positive-oriented education about subjective norms, optimism, and active attitudes. Unfortunately, the causal relationships among insomnia, obesity, and mental health were inconclusive in the psychological problem research field (Taylor et al., 2011; Fergusson et al., 2015; Jiang et al., 2021; Sumuer, 2021), which suggested that research using a longitudinal dataset to further investigate the relationships is needed in the future.

There were some limitations that should be noted for this study. Firstly, since the data were collected from a convenience sample of a medical college, the generalizability of the findings to the entire population of general undergraduates should be cautious. Further research has been planned to be conducted in multiple colleges with representative samples. Secondly, due to the cross-sectional survey design, the relationships between mental health and CPD and other variables were not causality. If causality was to be figured out, further studies are needed using a long termly collected data in the future. Thirdly, the degree of CPD and mental health status of interviewees might be different under different

pandemic control measures. It would be necessary to conduct a further investigation on the variation of the effects of CPD on mental health when different intervention measures for college students were given. Fourthly, the self-reported variables suffered from recall bias. Some self-reported variables, such as life satisfaction or SWB, could differ by the time of reporting and might be influenced by the individual demographic or socioeconomic characteristics changing over time.

CONCLUSIONS

During the pandemic of COVID-19, college students used mobile phones more frequently, and the duration was nearly 8 h each day on the average. This might be related to the increasing need for learning activities through an online training module and the increasing need for obtaining the latest news and information on the pandemic through mobile phones. The degree of CPD was negatively associated with their mental health status, causing psychological problems, such as anxiety and depression. Thereby, it is necessary to implement policies to guide college students on rationally using cell phones. Engaging in physical exercise and maintaining a good faculty-student relationship could relieve mobile phone addiction. Therefore, it is important to guide and intervene students through more extensive physical training arrangements and more rational assistance to improve the mental status of college students. These findings can help governments and educational policymakers to recognize the impact of the COVID-19 pandemic controlling measures on college students' mental health. Effective interventions are highly needed to prevent severe psychological issues among college students in China during the pandemic.

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 Ethics Committee of Shanghai University of Medicine and Health Sciences. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TX and ED made substantial contributions to the study design. TX, XS, and PJ collected data. MC, YY, and ED analyzed the data. TX, XS, and ED interpreted the results of the analysis, completed the manuscripts, and critically revised the manuscript. All authors contributed to the article and approved the submitted version.

FUNDING

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.920899/full#supplementary-material

REFERENCES

Ali, H. I., Attlee, A., Alhebshi, S., Elmi, F., Al Dhaheri, A. S., and Stojanovska, L. (2021). Feasibility study of a newly developed technology-mediated lifestyle intervention for overweight and obese young adults. *Nutrients* 13, 2547. doi: 10.3390/nu13082547

Anderssen, N., Sivertsen, B., and Lønning, K. J. (2020). Life satisfaction and mental health among transgender students in Norway. *BMC Public Health* 20, 138. doi: 10.1186/s12889-020-8228-5

Bieda, A., Hirschfeld, G., Schönfeld, P., Brailovskaia, J., and Lin, M. (2018). Happiness, life satisfaction and positive mental health: investigating reciprocal effects over four years in a chinese student sample. *J. Res. Pers.* 78, 198–209. doi: 10.1016/j.jrp.2018.11.012

Carreiro, S., Chai, P. R., Carey, J., Lai, J., and Smelson, D. (2018). mHealth for the detection and intervention in adolescent and young adult substance use disorder. *Curr. Addict. Rep.* 5, 110–119. doi: 10.1007/s40429-018-0192-0

Cha, S.-S. (2018). Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. *Health Psychol. Open* 5, 205510291875504. doi: 10.1177/2055102918755046

Chen, K. H., and Oliffe, J. L. (2018). Internet gaming disorder: an emergent health issue for men. *Am. J. Men's Health* 12, 1151–1159. doi: 10.1177/1557988318766950

China Internet Network Information Center (2021). *The 47th Statistical Report on China's Internet Development (2021-04-20).* Available online at: https://www.cnnic.com.cn/IDR/ (accessed March 21, 2022).

Conrad, R. C., Hahm, H., Koire, A., Pinder-Amaker, S., and Liu, C. H. (2021). College student mental health risks during the COVID-19 pandemic: Implications of campus relocation. *J. Psychiatr. Res.* 136, 117–126. doi: 10.1016/j.jpsychires.2021.01.054

Dempsey, S., and Lyons, S., and McCoy, S. (2020). Early mobile phone ownership: influencing the wellbeing of girls and boys in Ireland? *J. Children Media.* 14, 492–509. doi: 10.1080/17482798.2020.1725902

De-Sola Gutiérrez, J., Rodríguez Fonseca, F., and Rubio, G. (2016). Cell-phone addiction: a review. *Front. Psychiatry.* 7, 175. doi: 10.3389/fpsyt.2016.00175

Dou, K., Wang, L.-X., Li, J.-B., Wang, G.-D., Li, Y.-Y., and Huang, Y.-T. (2020). Mobile phone addiction and risk-taking behavior among chinese adolescents: a moderated mediation model. *Int. J. Environ. Res. Public Health* 17, 5472. doi: 10.3390/ijerph17155472

Duong, C. D. T. (2021). The impact of fear and anxiety of Covid-19 on life satisfaction: Psychological distress and sleep disturbance as mediators. *Pers. Indiv. Diff.* 178, 110869. doi: 10.1016/j.paid.2021.110869

Fergusson, D. M., McLeod, G. F. H., Horwood, L. J., Swain, N. R., Chapple, S., and Poulton, R. (2015). Life satisfaction and mental health problems (18 to 35 years). *Psychol. Med.* 45, 2427–2436. doi: 10.1017/S0033291715000422

Fu, W., Yan, S., Zong, Q., Anderson-Luxford, D., Song, X., and Lv, Z. (2021). Mental health of college students during the COVID-19 epidemic in China. *J. Affect. Disord.* 280, 7–10. doi: 10.1016/j.jad.2020.11.032

Hong, W., Liu, R.-D., Ding, Y., Jiang, S., and Yang, X. (2021). Academic procrastination precedes problematic mobile phone use in Chinese adolescents: a longitudinal mediation model of distraction cognitions. *Addict. Behav.* 121, 106993. doi: 10.1016/j.addbeh.2021.106993

Jiang, W., Luo, J., Guan, H., and Jiang, F. (2021). Problematic Mobile Phone Use and Life Satisfaction among University Students during the COVID-19 pandemic. *Front. Public Health* 2451, 805529. doi: 10.3389/fpubh.2021.805529

Kayis, A. R., Satici, B., Deniz, M. E., and Satici, S. A. (2021). Fear of COVID-19, loneliness, smartphone addiction, and mental wellbeing among the Turkish general population: a serial mediation model. *Behav. Inform. Technol.* 26, 1–13. doi: 10.1080/0144929X.2021.1933181

Khuram, W., Wang, Y., and Khan, S. (2021). Academic attitude and subjective norms effects on international doctoral students' academic performance self-perceptions: a moderated-mediation analysis of the influences of knowledge-seeking intentions and supervisor support. *J. Psychol. Africa* 31, 145–152. doi: 10.1080/14330237.2021.1903188

Kim, J.-H. (2018). Psychological issues and problematic use of smartphone: ADHD's moderating role in the associations among loneliness, need for social assurance, need for immediate connection, and problematic use of smartphone. *Comput. Hum. Behav.* 80, 390–398. doi: 10.1016/j.chb.2017.11.025

Kooli, C. (2021). COVID-19: public health issues and ethical dilemmas. *Ethics Med. Public Health* 17, 100635. doi: 10.1016/j.jemep.2021.100635

Krejcie, R. and Morgan, S. (1970). Determining sample size for research activities. *Educ. Psychol. Meas.* 30, 607–610. doi: 10.1177/001316447003000308

Kuang-Tsan, C. (2017). Study on relationship among university students' life stress, smart mobile phone addiction, and life satisfaction. *J. Adult Dev.* 24, 109–118. doi: 10.1007/s10804-016-9250-9

Lam, L. T., Peng, Z., and Mai, J. (2009). Factors associated with internet addiction among adolescents. *CyberPsychol. Behav.* 12, 551–555. doi: 10.1089/cpb.2009.0036

Li, W., Zhang, X., and Chu, M. (2020). The impact of adverse childhood experiences on mobile phone addiction in chinese college students: a serial multiple mediator model. *Front. Psychol.* 11, e00834. doi: 10.3389/fpsyg.2020.00834

Li, X. (2021). Smartphone uses and emotional and psychological well-being in China: the attenuating role of perceived information overload. *Behav. Inform. Technol.* 19, 1–11. doi: 10.1080/0144929X.2021.1929489

Li, X., Ye, L., Tian, L., and Huo, Y. (2019). Infertility-related stress and life satisfaction among chinese infertile women: a moderated mediation model of marital satisfaction and resilience. *Sex Roles* 82, 44–52. doi: 10.1007/s11199-019-01032-0

Liang, W., and Liu, S. (2021). Impact of student-supervisor relationship on postgraduate students' subjective well-being: a study based on longitudinal data in China. *Higher Educ.* 82, 273–305. doi: 10.1007/s10734-020-00644-w

Liu, J., Liu, C., Wu, T., Liu, B.-P., and Jia, C.-X. (2019). Prolonged mobile phone use is associated with depressive symptoms in Chinese adolescents. *J. Affect. Disord.* 259, 128–134. doi: 10.1016/j.jad.2019.08.017

Liu, S., Zhou, W., Wang, J., Chen, B., and He, G. (2021). Association between mobile phone addiction index and sugar-sweetened food intake in medical college students stratified by sex from Shanghai, China. *Nutrients* 13, 2256. doi: 10.3390/nu13072256

Lopez-Fernandez, O., Honrubia-Serrano, L., and Freixa-Blanxart, M. (2014). Prevalence of problematic mobile phone use in british adolescents. *Cyberpsychol. Behav. Soc. Network.* 17, 91–98. doi: 10.1089/cyber.2012.0260

Lu, S., Hu, S., Guan, Y., Xiao, J., Cai, D., and Gao, Z. (2018). Measurement invariance of the depression anxiety stress scales-21 across gender in a sample of Chinese University Students. *Front. Psychol.* 9, e02064. doi: 10.3389/fpsyg.2018.02064

Mach, A., Demkow-Jania, M., Klimkiewicz, A., Jakubczyk, A., Abramowska, M., and Kuciak, A. (2020). Adaptation and validation of the polish version of the 10-item mobile phone problematic use scale. *Front. Psychiatry.* 11, 427. doi: 10.3389/fpsyt.2020.00427

Moreno, C., Wykes, T., Galderisi, S., Nordentoft, M., Crossley, N., and Jones, N. (2020). How mental health care should change as a consequence of the COVID-19 pandemic. *Lancet Psychiatry*. 7, 813–824. doi: 10.1016/S2215-0366(20)30307-2

Nie, P., and Ma, W. (2020). The relationship between smartphone use and subjective well-being in rural China. *Electr. Comm. Res.* 21, 983–1009. doi: 10.1007/s10660-020-09397-1

Oviedo-Trespalacios, O., Nandavar, S., Newton, J. D. A., and Demant, D. (2019). Problematic use of mobile phones in Australia…is it getting worse? *Front. Psychiatry* 10, 105. doi: 10.3389/fpsyt.2019.00105

Ozturk, F. O. (2021). Internet addiction and psychosocial problems among adolescents during the COVID-19 pandemic: a cross-sectional study. *Arch. Psychiatric Nurs.* 35, 595–601. doi: 10.1016/j.apnu.2021.08.007

Shi, M., Zhai, X., Li, S., and Shi, Y. (2021). The relationship between physical activity, mobile phone addiction, and irrational procrastination in Chinese college students. *Int. J. Environ. Res. Public Health* 18, 5325. doi: 10.3390/ijerph18105325

Subba, S. H., Mandelia, C., Pathak, V., Reddy, D., Goel, A., Tayal, A., et al. (2013). Ringxiety and the mobile phone usage pattern among the students of a medical college in South India. *J. Clin. Diagn. Res. JCDR* 7, 205. doi: 10.7860/JCDR/2013/4652.2729

Sumuer, E. (2021). The effect of mobile phone usage policy on college students' learning. *J. Comput. Higher Educ.* 33, 281–295. doi: 10.1007/s12528-020-09265-9

Tao, S., Wu, X., Zhang, S., Tong, S., and Hao, J. (2016). Association of alcohol use with problematic mobile phone use and depressive symptoms among college students in Anhui, China. *J. Public Health* 25, 103–112. doi: 10.1007/s10389-016-0766-z

Taylor, D. T., Gardner, C. E., Bramoweth, A. D., Williams, J. M., Roane, B. M., Grieser, E. A., et al. (2011). Tatum insomnia and mental health in college students. *Behav. Sleep Med.* 9, 107–116. doi: 10.1080/15402002.2011.557992

Vindegaard, N. (2020). COVID-19 pandemic and mental health consequences: systematic review of the current evidence. *Brain Behav. Immun.* 89, 531–542. doi: 10.1016/j.bbi.2020.05.048

Volkmer, S. A. (2018). Unhappy and addicted to your phone? - Higher mobile phone use is associated with lower well-being. *Comput. Human Behav.* 93, 210–218. doi: 10.1016/j.chb.2018.12.015

Xie, H., Tao, S., Zhang, Y., and Tao, F. (2019a). Impact of problematic mobile phone use and insufficient physical activity on depression symptoms: a college-based follow-up study. *BMC Public Health* 19, 1640. doi: 10.1186/s12889-019-7873-z

Xie, X., Chen, W., and Zhu, X. (2019b). Parents' phubbing increases Adolescents' Mobile phone addiction: Roles of parent-child attachment, deviant peers, and gender. *Child. Youth Serv. Rev.* 105, 104426. doi: 10.1016/j.childyouth.2019.104426

Ye, B., Li, L., Wang, P., Wang, R., Liu, M., and Wang, X. (2021). Social anxiety and subjective well-being among Chinese college students: a moderated mediation model. *Pers. Indiv. Diff.* 175, 110680. doi: 10.1016/j.paid.2021.110680

Yu, X. M., Zhao, J. R., and Wu, X. (2017). Empirical analysis on the status and influence of the supervisor-students relationship in universities. *J. Tianjin Univ.* 19, 157–161.

Zhai, X., Ye, M., Wang, C., Gu, Q., Huang, T., and Wang, K. (2020). Associations among physical activity and smartphone use with perceived stress and sleep quality of Chinese college students. *Mental Health Phys. Activity* 18, 100323. doi: 10.1016/j.mhpa.2020.100323

Zhang, M. X., Zhou, H., and Yang, H. M. (2021). The prospective effect of problematic smartphone use and fear of missing out on sleep among Chinese adolescents. *Curr. Psychol.* 1–9. doi: 10.1007/s12144-021-01863-9

Zhang, Y., Lv, S., Li, C., Xiong, Y., Zhou, C., and Li, X. (2020). Smartphone use disorder and future time perspective of college students: the mediating role of depression and moderating role of mindfulness. *Child Adoles. Psychiatry Mental Health* 14, 3. doi: 10.1186/s13034-020-0309-9

Zhen, R., Liu, R.-D., and Hong, W. (2019). How do interpersonal relationships relieve adolescents' problematic mobile phone use? The roles of loneliness and motivation to use mobile phones. *Int. J. Environ. Res. Public Health* 16, 2286. doi: 10.3390/ijerph16132286

Zhong, W., and Wang, Y. (2020). The impact of physical activity on college students' mobile phone dependence: the mediating role of self-control. *Int. J. Mental Health Addict.* 19, 2144–2159. doi: 10.1007/s11469-020-00308-x

Zou, L., Wu, X., Tao, S., Xu, H., Xie, Y., and Yang, Y. (2019a). Mediating effect of sleep quality on the relationship between problematic mobile phone use and depressive symptoms in college students. *Front. Psychiatry* 10, 822. doi: 10.3389/fpsyt.2019.00822

Zou, L., Wu, X., Tao, S., Yang, Y., Zhang, Q., and Hong, X. (2021). Anterior cingulate gyrus acts as a moderator of the relationship between problematic mobile phone use and depressive symptoms in college students. *Soc. Cogn. Affect. Neurosci.* 16, 484–491. doi: 10.1093/scan/nsab016

Zou, Y., Xia, N., and Chen, Z. (2019b). Smartphone addiction may be associated with adolescent hypertension: a cross-sectional study among junior school students in China. *BMC Pediatr.* 19, 310. doi: 10.1186/s12887-019-1699-9

Check for updates

Occupational Differences in Psychological Distress Between Chinese Dentists and Dental Nurses

Yingying Zhang[1,2], Li Yan[3], Huiqing Long[1,2], Lu Yang[1,2], Jing Wang[1,2], Yiyun Liu[4], Juncai Pu[4], Li Liu[3], Xiaogang Zhong[4]* and Xin Jin[1,2,5]*

[1] Key Laboratory of Psychoseomadsy, Stomatological Hospital of Chongqing Medical University, Chongqing, China, [2] Chongqing Key Laboratory of Oral Diseases and Biomedical Sciences, Chongqing, China, [3] School of Public Health and Management, Chongqing Medical University, Chongqing, China, [4] NHC Key Laboratory of Diagnosis and Treatment on Brain Functional Diseases, The First Affiliated Hospital of Chongqing Medical University, Chongqing, China, [5] Chongqing Stomatological Association, Chongqing, China

Background: Doctors and allied health professionals are facing serious mental health issues, which have received widespread attention. This study aimed to explore the occupational differences in psychological distress between Chinese dentists and dental nurses.

Materials and Methods: The data was collected from a cross-sectional study conducted by the Chongqing Stomatological Association. Medical personnel involved in this survey were invited to complete a battery of self-administrated questionnaires, specifically the General Health Questionnaire-12, Maslach Burnout Inventory, and career choice regret scale. Data on demographic characteristics and working conditions were also collected. The results of these questionnaires were analyzed with SPSS (version 23.0). Univariate and multivariable analyzes were conducted to explore the influencing factors.

Results: A total of 3,020 valid questionnaires, including 1,855 dentists and 1,165 dental nurses, were collected from 11 provinces of China. In general, 23.8% of responders exhibited psychological distress. The rate of dentists was 25.7%, and that of dental nurses was 20.8%. The prevalence was 4.9% higher in dentists than in dental nurses ($P < 0.05$). The multivariable analysis showed that factors associated with psychological distress for dentists were lower income, burnout, high job stress, career-choice regret, and lack of sufficient personal time, and that for dental nurses were age, lower income, longer working hours per week, burnout, high job stress, low job satisfaction, lack of sufficient personal time, and poor medical environment.

Conclusion: The prevalence of psychological distress was relatively high among dental medical staff, and dentists showed a higher prevalence than dental nurses. Nurses have more risk factors for psychological distress than dentists. These results indicate that it is necessary to monitor the mental health status of dental medical staff and implement accurate strategies for dentists and dental nurses to promote their physical and mental health.

Keywords: psychological distress, General Health Questionnaire, dentists, nurses, occupational differences

INTRODUCTION

Mental health is a significant proposition related to social, psychological, behavioral, and biological factors (Zhou et al., 2018). It can be evaluated by the different psychiatric diagnoses, such as depression, anxiety, and schizophrenia (Hoeymans et al., 2004). With the rapid development of modern society, the above series of psychological distress not only can lead to insomnia and suicidal tendencies but also seriously affect physical health, such as hypertension (Grimsrud et al., 2009), diabetes (Sorsdahl et al., 2018), cardiac disease (Kapfhammer, 2011; Kinley et al., 2015), and even cancer (Mathé, 1996; Braczkowski et al., 1999; Kruk and Aboul-Enein, 2004).

The characteristics of high risk in the medical industry make medical personnel a very stressful profession. The long-term night shift, high workload, and long working hours predispose medical staff to experience negative emotions at work (Lawrence, 1989; Caplan, 1994), which may produce a detrimental effect on their work performance and daily life (Firth-Cozens and Greenhalgh, 1997; West et al., 2009). Numerous studies have shown that psychological distress is common among medical staff (Xu and Zhao, 2006; Wang et al., 2010; Zhou et al., 2017, 2018). For example, a survey of Chinese neurologists showed that 37.8% of respondents experienced psychological distress, which is independently associated with lower income, irregular working hours, high job stress, and low job satisfaction (Zhou et al., 2017). Another study showed that about two-thirds (69%) of American pediatric critical care physicians who experienced severe burnout screened positive for psychological distress (Shenoi et al., 2018), suggesting that job burnout may be a risk factor for psychological distress.

Medical personnel mainly comprise doctors and nurses. Although they work in the same environment, their mental health status may be different due to some distinctions in age, educational background, economic income, working years, and clinical duties (Panagopoulou et al., 2006; Senter et al., 2010; Thomas et al., 2014). Indeed, previous studies have indicated that the mental health of doctors and nurses significantly differs, but the results of these studies have varied. For example, studies about the prevalence of psychiatric distress in a general hospital in Italy or among dialysis healthcare workers have revealed that nurses have a higher prevalence of psychiatric distress than doctors (Klersy et al., 2007; Renzi et al., 2012), while others (e.g., the study of medical staff in a neonatal intensive care unit or in oncology) suggested that doctors are in worse mental health status than nurses (Chan et al., 2015; Grace and VanHeuvelen, 2019). These inconsistent results may be related to different influencing factors (e.g., work-life conflict, irregular work hours, work pressure, or social support) in different medical specialties (Grace and VanHeuvelen, 2019).

Dentistry has many stress elements in clinical practice, such as a noisy medical environment, difficult work postures, prolonged surgical procedures, narrow operating space, and a desire for technical perfection (Song et al., 2017). Dental medical staff members are likely to experience mental health issues after long-term exposure to these stress factors; further, dentists and dental nurses generally cooperate as a dyad, thus skilled and smooth collaboration is vital for efficient job performance in dental practice (Hakanen et al., 2014). Their relationship is closer compared with other specialties, which may predispose them to affect each other's workload and exchange negative emotions (Westman et al., 2011; Hakanen et al., 2014), ultimately affecting their medical behavior. There are few studies that have focused on the comparison between dentists and dental nurses in psychological distress. Therefore, this study aimed to survey the occupational differences in psychological distress between Chinese dentists and dental nurses and explore respective influencing factors. It is hoped that our study can contribute to the development of accurate strategies to promote the physical and mental health of dental medical staff.

MATERIALS AND METHODS

Study Design and Data Collection

The data was collected from the cross-sectional survey conducted by the Chongqing Stomatological Association between February and March 2021 in 11 provinces of China. We adopted convenience sampling to recruit the participants. Firstly, the Chongqing Stomatological Association contacted the directors of stomatology hospitals, dental departments in general hospitals and dental clinics via WeChat (a free messaging and calling app), telephone, or E-mail and invited them to participate in this survey. Secondly, if the director agreed to participate, dentists and dental nurses in their department were invited to participate in this study. Then, we sent self-administered questionnaires to them. The front page of the questionnaire introduced the background and purpose of the survey. The rights and potential risks to participants were also explained. Participation was anonymous and voluntary. If the participants returned the questionnaires, informed consent of participants was presumed. To ensure the accuracy of the data, we evaluated the quality of all questionnaires, and the exclusion criteria were as follows: (1) the same answer was chosen for the whole questionnaire item, and (2) only one questionnaire was included if two or more consecutive questionnaires had identical answers in the same working unit, and the other identical questionnaires were defined as invalid. Ethical approval was granted by the Ethics Committee of Stomatological Hospital of Chongqing Medical University (No. 2021-5).

Survey Questionnaire

The self-administered questionnaires were constructed based on the questionnaire star platform[1], a free platform widely used for surveys in China that creates an internet link to the questionnaire content. The staff of the Chongqing Stomatological Association sent the link to the directors who agreed to participate in this survey. Then, the director sent it to the dentists and dental nurses in their departments to invite them to participate. We implemented some settings for this questionnaire: (1) only the participants who completed all questions could submit the survey successfully to reduce the missing rate; otherwise, the

---

[1]https://www.wjx.cn/

incomplete questions were indicated, requiring participants to answer all questions, and (2) every internet protocol address could only be submitted once to ensure the uniqueness of each questionnaire.

The self-administered questionnaire comprised five parts. The first part was demographic characteristics, including gender, age, education, income, working years, hours worked per week, marital status, children status, commuting time, types of medical institution and major, and whether undertake teaching tasks.

The second part was the Chinese version of the General Health Questionnaire, composed of 12 items. It is widely used to assess mental health status (Zhong et al., 2021), and has also been successfully applied to Chinese civil servants, adolescents, and university students (Li et al., 2009; Ye, 2009; Liang et al., 2016). Each item is used to obtain a dichotomous score based on a conventional bimodal scoring method (0-0-1-1), rated on a 4-point scale. Participants are considered to have psychological distress if their total score is ≥ 4 (Haoka et al., 2010).

The third part was the Chinese version of the Maslach Burnout Inventory consisting of 22 items, which is used to measure the frequency and intensity of burnout in the allied health professions (Maslach et al., 2001). This Inventory measured three domains (emotional exhaustion, depersonalization, and personal accomplishment) of burnout using a 7-point Likert-type scale (range: 0–6). Having high levels of job burnout is considered if a responder scored ≥ 27 on emotional exhaustion or ≥ 10 on depersonalization, and a score of ≤ 33 is considered to indicate low personal accomplishment (Schaufeli et al., 2001; Rotenstein et al., 2018).

The fourth part adopted the Consultants' Mental Health Questionnaire which was used to evaluate sources of job stress and satisfaction (Ramirez et al., 1996). A score of 0–4 indicates "not at all" and "extremely stressful/satisfying", respectively. If a responder scored ≥ 3 on job stress and satisfaction questions, they were considered to have high levels of overall stress and satisfaction, respectively, whereas a score of ≤ 1 was considered low levels of overall stress and satisfaction, respectively (Teasdale et al., 2008).

The last part included seven questions as follows: (1) Would you choose to become a doctor/nurse again if given an opportunity? (2) Do you wish your child to be a doctor/nurse? (3) Do you have enough personal time? (4) What do you think of your current doctor-patient relationships? Each of the above questions was rated on a 3-point Likert scale as yes, neutral, or no. (5) Have you experienced hospital violence events? (6) Have you experienced a medical dispute? (7) Have you experienced an operation accident or misdiagnosis? The latter three questions were rated on a 3-point Likert scale (never, 1–3, or ≥ 4 times).

Statistical Analysis

We performed all analyzes with SPSS version 23.0 (IBM Corp., Armonk, NY, United States). Qualitative data were summarized as frequencies and percentages, while quantitative data were summarized as means with standard deviation (SD) or medians with interquartile ranges depending on

the distribution of the data. A univariate analysis was conducted by Chi-square tests or Fisher's exact test. We adopted univariate logistic regression to screen variables and binary logistics (enter model, backward elimination model, and forward elimination model) to explore the potential influencing factors of psychological distress. The variables were considered to have no or slightly collinearity with the variance inflation factor (VIF) less than 10. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 3,128 respondents from 180 stomatology hospitals, dental departments in general hospitals, and dental clinics in 11 Chinese provinces completed a battery of self-administered questionnaires by the end of March 2021. We excluded 99 invalid questionnaires with the same answers for the whole questionnaire items, and nine invalid questionnaires where two or more consecutive questionnaires had the same answers in the same working unit. Finally, 3,020 valid questionnaires (the effective rate was 96.55%, 3020/3128) were included in the subsequent analysis. A self-administered Chinese version of the questionnaire was adopted in this study, and the Cronbach's α coefficient of the General Health Questionnaire-12 was 0.89. Cronbach's α coefficient of the Maslach Burnout Inventory-22 was 0.74. The Cronbach's α coefficient of the Hospital Consultants' Job Stress and Satisfaction Questionnaire were 0.94 and 0.96, respectively.

Participants Characteristics

Descriptive statistics of the demographic variables is shown in **Table 1**. Generally, about 61.7% of dentists and 99.1% of dental nurses were female. A total of 46.6% of dentists and 1.1% of dental nurses held doctorate or master's degrees. For dentists, 31.8% worked >45 h/week, with 21.9% of them earning a monthly salary of <5,000 CNY. The percentage of dental nurses working >45 h/week was 22 and 37.3% of them earned a monthly salary of <5,000 CNY. Moreover, 60.9% of dentists and 72.5% of dental nurses worked in stomatology hospitals.

Prevalence Comparison of Psychological Distress

Table 2 showed that about 23.8% of the participants exhibited psychological distress, whereas the rate of dentists was 25.7%, and that of dental nurses was 20.8%. The prevalence of psychological distress in dentists was 4.9% higher than in nurses. The difference was statistically significant ($P < 0.05$).

Univariate Analysis of Psychological Distress

The univariate analysis was performed to assess the relationships among personal and professional characteristics, burnout, job stress, job satisfaction, career-choice regret, etc., with

TABLE 1 | Demographic characteristics.

Variables	Doctor	Nurse	χ^2	P	Effect size
	N (%)	N (%)			
Gender			552.816	P < 0.001	0.428
Male	711 (38.3)	10 (0.9)			
Female	1144 (61.7)	1155 (99.1)			
Academic degree			759.495	P < 0.001	0.501
Doctor	137 (7.4)	0 (0)			
Master	727 (39.2)	13 (1.1)			
Undergraduate	828 (44.6)	831 (71.3)			
College and below	163 (8.8)	321 (27.6)			
Age			135.179	P < 0.001	−0.212
< 35 years old	1071 (57.7)	913 (78.4)			
≥ 35 years old	784 (42.3)	252 (21.6)			
Technical title			441.500	P < 0.001	0.382
Junior	815 (43.9)	948 (81.4)			
Intermediate	690 (37.2)	195 (16.7)			
Senior	350 (18.9)	22 (1.9)			
Monthly income			520.839	P < 0.001	0.415
< 5000 CNY	407 (21.9)	435 (37.3)			
5000–10000 CNY	683 (36.8)	689 (59.1)			
> 10000 CNY	765 (41.2)	41 (3.5)			
Years of service			92.146	P < 0.001	0.175
< 10 years	1172 (63.2)	837 (71.8)			
10–20 years	368 (19.8)	268 (23.0)			
> 20 years	315 (17.0)	60 (5.2)			
Hours worked per week			47.975	P < 0.001	0.126
< 45 h	1265 (68.2)	907 (77.9)			
45–55 h	421 (22.7)	218 (18.6)			
> 55 h	169 (9.1)	40 (3.4)			
Marital status			11.078	P = 0.011	0.061
Single	317 (17.1)	250 (21.5)			
Couple	226 (12.2)	133 (11.4)			
Married	1261 (68.0)	761 (65.3)			
Divorced or widowed	51 (2.7)	21 (1.8)			
Whether have children			1.159	P = 0.282	−0.020
No	753 (40.6)	496 (42.6)			
Yes	1102 (59.4)	669 (57.4)			
Daily visits			271.906	P < 0.001	0.300
< 10 patients	734 (39.6)	206 (17.7)			
10–20 patients	791 (42.6)	494 (42.4)			
20–30 patients	209 (11.3)	206 (17.7)			
> 30 patients	121 (6.5)	259 (22.2)			
Tube bed			4.940	P = 0.026	0.040
No	1662 (89.6)	1013 (87.0)			
Yes	193 (10.4)	152 (13.0)			
Organization type			44.514	P < 0.001	0.121
Stomatology hospitals	1130 (60.9)	845 (72.5)			
Dental departments in general hospitals	619 (33.4)	262 (22.5)			
Dental clinics	106 (5.7)	58 (5.0)			
Professional type			30.329	P < 0.001	0.100
General practice	774 (41.7)	557 (47.8)			
Oral medicine	428 (23.1)	234 (20.1)			
Maxillofacial surgery	184 (9.9)	155 (13.3)			
Prosthodontics	189 (10.2)	80 (6.9)			

(Continued)

TABLE 1 | (Continued)

Variables	Doctor	Nurse	χ²	P	Effect size
	N (%)	N (%)			
Implant dentistry	75 (4.0)	39 (3.3)			
Orthodontics	205 (11.1)	100 (8.6)			
Commute time			58.064	P < 0.001	0.139
< 15 min	401 (21.6)	143 (12.3)			
15–30 min	766 (41.3)	469 (40.3)			
30–45 min	359 (19.4)	256 (21.9)			
45–60 min	208 (11.2)	189 (16.2)			
> 60 min	121 (6.5)	108 (9.3)			
Undertake teaching tasks			152.041	P < 0.001	0.224
Yes	776 (41.8)	234 (20.1)			
No	1079 (58.2)	931 (79.9)			
Burnout			10.194	P = 0.001	−0.058
No	1319 (71.1)	890 (76.4)			
Yes	536 (28.9	275 (23.6)			
High job stress			25.182	P < 0.001	−0.091
No	1481 (79.8)	1013 (87.0)			
Yes	374 (20.2)	152 (13.0)			
Career choice regret			3.340	P = 0.068	0.033
Other	1410 (76.0)	851 (73.0)			
Won't be a doctor/nurse	445 (24.0)	314 (27.0)			
Sufficient personal time			64.639	P < 0.001	0.146
Yes	296 (16.0)	256 (22.0)			
Almost	827 (44.5)	612 (52.5)			
No	732 (39.5)	297 (25.5)			
Medical environment			213.801	P < 0.001	0.266
Good	252 (13.6)	384 (33.0)			
Normal	1181 (63.7)	681 (58.5)			
Bad	422 (22.7)	100 (8.5)			

P (probability, value according to Chi-square test).

psychological distress. The results revealed that the correlated factors of psychological distress for dentists were lower income, longer working hours per week, burnout, high job stress, lower job satisfaction, career-choice regret, don't wish their child to be a doctor, lack of sufficient personal time, poor medical environment, experiencing violent events at the hospital, and medical disputes. Psychological distress for dental nurses was associated with older age, lower income, longer working hours per week, types of medical major, commuting time, undertaking teaching tasks, burnout, high job stress, lower job satisfaction, career-choice regret, don't wish their child to be a doctor, lack of sufficient personal time, poor medical environment, experiencing violent events at the hospital, medical disputes, and operation accident (all P < 0.05; **Supplementary Table 1**). The results for univariate logistic regression are shown in **Supplementary Table 2**.

Multivariable Analysis of Psychological Distress

The multivariable analysis revealed that lower income, burnout, high job stress, career-choice regret and lack of sufficient

TABLE 2 | Prevalence of psychological distress.

Variables	Doctor	Nurse	χ²	P	Effect size
	N (%)	N (%)			
Psychological distress			9.097	P = 0.003	0.055
Yes	476 (25.7)	243 (20.8)			
No	1379 (74.3)	922 (79.2)			

P (probability, value according to Chi-square test).

personal time were the risk factors for psychological distress in dentists. For dental nurses, the risk factors were age (older than 35 years), lower income, longer working hours per week, burnout, high job stress, low job satisfaction, lack of sufficient personal time, and poor medical environment. Among them, high job stress was the risk factor with the highest odds ratio (OR) of psychological distress for both dentists and dental nurses. Additionally, lower income, burnout, high job stress, and lack of sufficient personal time were the common risk factors for both dentists and

TABLE 3 | Multivariable analysis of psychological distress.

Variables	Psychological distress			
	Doctor		Nurse	
	OR (95% CI)	P	OR (95% CI)	P
Age ≥ 35 years old	–	–	2.069 (1.429–2.995)	<0.001
Monthly income		0.001		0.006
<5,000 CNY	1 (Reference)	–	1 (Reference)	–
5,000–10,000 CNY	0.694 (0.516–0.933)	0.016	0.654 (0.469–0.913)	0.013
>10,000 CNY	0.558 (0.415–0.75)	<0.001	0.279 (0.101–0.768)	0.013
Hours worked per week		–		0.015
<45 h	–	–	1 (Reference)	–
45–55 h	–	–	1.493 (1.025–2.175)	0.037
>55 h	–	–	2.433 (1.127–5.253)	0.024
Burnout	2.171 (1.699–2.773)	<0.001	1.772 (1.238–2.536)	0.002
High job stress	3.017 (2.306–3.946)	<0.001	3.37 (2.233–5.086)	<0.001
Low job satisfaction	–	–	1.742 (1.05–2.892)	0.032
Career choice regret	2.05 (1.594–2.637)	<0.001	–	–
Sufficient personal time		0.003		0.001
Yes	1 (Reference)	–	1 (Reference)	–
Almost	1.225 (0.843–1.782)	0.288	1.37 (0.843–2.228)	0.204
No	1.735 (1.188–2.533)	0.004	2.347 (1.385–3.976)	0.002
Medical environment		–		0.009
Good	–	–	1 (Reference)	–
Normal	–	–	1.741 (1.18–2.57)	0.005
Bad	–	–	2.2 (1.209–4.004)	0.01

"–" indicates these variables were excluded in regression models, OR: odds ratio, P (probability, value according to logistic regression analysis).

dental nurses. With the increase in monthly income and personal time, the risk of psychological distress decreased (all $P < 0.05$; **Table 3**). The results for three types of logistic models and variance inflation factor (VIF) are shown in **Supplementary Table 3**.

DISCUSSION

Over 3,000 dental medical staff members across almost all provinces in Western China were involved in this survey, representing the largest study analyzing psychological distress of dental medical staff ever reported. The results demonstrated that 23.8% of responders exhibited psychological distress, which is higher than that reported in a previous study among dentists and dental hygienists in Israel (11.5%) (Shacham et al., 2020).

The rate of psychological distress among dentists was 25.7%, which was lower than that in other medical specialties, such as neurologists in China (37.8%) (Zhou et al., 2017), trainee general practitioners in Spain (40.4%) (Ovejas-López et al., 2020), pediatric critical care physicians in the United States (30.5%) (Shenoi et al., 2018). Our study revealed that lower income, burnout, high job stress, career-choice regret, and lack of sufficient personal time were the risk factors for psychological distress in dentists. According to previous studies, frequent and prolonged

night shifts, except for the above-mentioned factors, were also significant factors in other medical specialties, such as ICU physicians or psychiatrists (Zhou et al., 2017; Chen et al., 2021). These results indicated that more night shifts might greatly increase the incidence of mental illness in doctors. Dentists have little or no night shifts due to their professional characteristics, which may explain why dentists have a lower rate of psychological distress compared to other medical professions.

There are few studies that have focused on the prevalence of psychological distress among dentists. The studies have shown that dentists have a high prevalence of psychiatric symptoms, such as problematic depression (43.7%) and worry or anxiety (38%), which are mainly associated with the burden of acquiring new medical knowledge, conflicts with the patients, and the fear of medical accidents (Dunlap and Stewart, 1982; Song et al., 2017). It can be seen that the higher pursuit for medical technologies, poor doctor-patient relationships, and the occurrence of medical accidents can also affect the mental health of dentists.

Our research also showed that the rate of psychological distress in dental nurses was 20.8%, which was lower compared to previous studies. For example, the prevalence of psychological distress among nurses from a tertiary health institution in Nigeria was shown to be 44.1% (Okwaraji and Aguwa, 2014). Studies have also shown that marital status, level of

education, the title of technician, and working years have been significantly associated with psychological distress in nurses (Okwaraji and Aguwa, 2014; Ghawadra et al., 2019), which is not consistent with our findings. For marital status, some studies have reported that single and widowed nurses have a higher level of stress, anxiety, and depression, perhaps because of social support and emotional balance provided by a spouse or partner (Perry et al., 2015; Badil et al., 2017; Ghawadra et al., 2019). Due to the progress of industrialization and modernization, China improved marriage equality, social security, and policy support, reducing the importance of the effect marriage has on health (Fu and Noguchi, 2016). As a result, marital status is not a major influencing factor in our study compared with Nigeria (Tatangelo et al., 2017; Rindner et al., 2020). Equal pay for equal work focuses on workload, which may explain why the level of education, the title of technician, and working years have little impact on the mental health of dental nurses (Silbersdorff and Schneider, 2019; Tibber et al., 2022).

Dentists have a 4.9% higher prevalence of psychological distress than nurses ($P = 0.003$). In addition to working hours and stress, income, job burnout and career choice regret have a great impact on the psychological distress in dentists. Dentists tended to be more educated, work longer hours per week, undertake more teaching tasks, and have higher levels of seniority and income compared to dental nurses. Study has shown that longer weekly hours and a higher medical degree (Doctor of Medicine or Doctor of Osteopathic Medicine) may increase the risk of burnout (Shanafelt et al., 2012), which may seriously affect doctors' mental health. Additionally, dentists with higher education and job titles may have higher expectations for income, social status, and scientific research; hence, they may fail to keep their mental health when their expectations are not met (Lang-Runtz, 1984; Freeman et al., 1995; Rada and Johnson-Leong, 2004; Sancho and Ruiz, 2010). Compared to dentists, dental nurses are more susceptible to age and medical environment. Age of ≥ 35 years is a significant risk factor for psychological distress in dental nurses. Older nurses with abundant work experience may have a higher expectation for their personal value, while mismatched social status makes them feel that their efforts are not recognized, resulting in psychological imbalance (Almalki et al., 2012; Glerean et al., 2017). The slower acceptance for new knowledge and the insufficient opportunities for professional development may cause older nurses to feel anxious and disappointed and experience other undesirable emotions (Almalki et al., 2012; Asegid et al., 2014; Zhou et al., 2019). In clinical practice, doctors encourage a form of "teamwork" in which nurses are subordinates — nurses usually take the initiative to cooperate with doctors; this non-mutual collaborative work environment may have a greater impact on nurses (Campbell-Heider and Pollock, 1987; Chan and Huak, 2004). Moreover, some types of workplace stressors, such as the frequent rotation in nursing positions, patient care, and pressure from patients' relatives, can also have an impact on nurses' mental health (Lambert et al., 2004).

This study had several limitations. Firstly, there was selection bias in the study. Because we could not interview all dental staff, only 11 provinces were involved in this study, which may not be completely representative of the entire Chinese dental medical staff. Secondly, all data based on the analysis were derived from self-administered questionnaires. Some participants might not have been completely honest when reporting potential mental health issues; thus, the validity of the data collected might have been compromised. Thirdly, due to the cross-sectional nature of the survey, a causal relationship between the factors studied and the potential direction of influence for the associations we observed cannot be established. Fourthly, there may be many important factors related to psychological distress that were not shown in this survey. Therefore, further research on these factors in practice is needed. Eventually, the responsibilities between dentists and nurses who only work in hospitals or only work in dental clinics may be different, and more grouping analyzes are needed to solve this issue.

CONCLUSION

The prevalence of psychological distress was relatively high among dental medical staff, and dentists showed a higher respective prevalence than dental nurses. Nurses have more risk factors for psychological distress than dentists. All these results indicate that it is necessary to monitor the mental health status of dental medical staff and implement accurate strategies for dentists and dental nurses to promote their physical and mental health.

DATA AVAILABILITY STATEMENT

The original contributions presented in this study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding authors.

ETHICS STATEMENT

The questionnaire and study protocol were reviewed and approved by the Ethics Committee of Stomatological Hospital of Chongqing Medical University (No. 2021-5). The front page of the questionnaire introduced the background and purpose of the survey, the rights and potential risks were informed to participants as well. Participation was anonymous and voluntary. If the participants returned the questionnaires, informed consent of participants was presumed.

AUTHOR CONTRIBUTIONS

YZ and XJ proposed the concept and design. LiY, HL, LuY, and JW collected the data. YZ, XZ, and XJ analyzed and interpreted the data and wrote the manuscript. YL, JP, and LL edited the manuscript. XJ and XZ provided funding and supervised the

study. All authors reviewed and approved the manuscript prior to its submission.

FUNDING

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.923626/full#supplementary-material

REFERENCES

Almalki, M. J., Fitzgerald, G., and Clark, M. (2012). Quality of work life among primary health care nurses in the Jazan region, Saudi Arabia: a cross-sectional study. *Hum. Resour. Health* 10:30. doi: 10.1186/1478-4491-10-30

Asegid, A., Belachew, T., and Yimam, E. (2014). Factors Influencing Job Satisfaction and Anticipated Turnover among Nurses in Sidama Zone Public Health Facilities, South Ethiopia. *Nurs. Res. Pract.* 2014:909768. doi: 10.1155/2014/909768

Badil, H. S., Ali, S. A., and Siddiqui, M. A. (2017). Severity of stress in nurses everyday life in Karachi. *Pakistan. Age* 25:125.

Braczkowski, R., Zubelewicz, B., and Klakla, K. (1999). [Depression as a risk factor for cancer–is it still a hypothesis or a proven fact?]. *Przegl Lek* 56, 608–612.

Campbell-Heider, N., and Pollock, D. (1987). Barriers to physician-nurse collegiality: an anthropological perspective. *Soc. Sci. Med.* 25, 421–425. doi: 10.1016/0277-9536(87)90166-3

Caplan, R. P. (1994). Stress, anxiety, and depression in hospital consultants, general practitioners, and senior health service managers. *BMJ* 309, 1261–1263. doi: 10.1136/bmj.309.6964.1261

Chan, A. O., and Huak, C. Y. (2004). Influence of work environment on emotional health in a health care setting. *Occup. Med.* 54, 207–212. doi: 10.1093/occmed/kqh062

Chan, C. M., Wan Ahmad, W. A., Yusof, M. M., Ho, G. F., and Krupat, E. (2015). Patient-Centredness, Job Satisfaction and Psychological Distress: a Brief Survey Comparing Oncology Nurses and Doctors. *Asian Pac. J. Cancer. Prev.* 16, 6895–6898. doi: 10.7314/apjcp.2015.16.16.6895

Chen, W., He, W., Zeng, L., Li, X., Gong, R., Peng, T., et al. (2021). Mental health status of Chinese physicians working in intensive care unit. *J. Crit. Care* 61, 227–232. doi: 10.1016/j.jcrc.2020.11.005

Dunlap, J. E., and Stewart, J. D. (1982). Survey suggests less stress in group offices. *Dent. Econ.* 72, 46–48,51,53–44 passim.

Firth-Cozens, J., and Greenhalgh, J. (1997). Doctors' perceptions of the links between stress and lowered clinical care. *Soc. Sci. Med.* 44, 1017–1022. doi: 10.1016/s0277-9536(96)00227-4

Freeman, R., Main, J. R., and Burke, F. J. (1995). Occupational stress and dentistry: theory and practice. *Part I. Recognition. Br. Dent. J.* 178, 214–217. doi: 10.1038/sj.bdj.4808716

Fu, R., and Noguchi, H. (2016). Does Marriage Make Us Healthier? Inter-Country Comparative Evidence from China, Japan, and Korea. *PLoS One* 11:e0148990. doi: 10.1371/journal.pone.0148990

Ghawadra, S. F., Abdullah, K. L., Choo, W. Y., and Phang, C. K. (2019). Psychological distress and its association with job satisfaction among nurses in a teaching hospital. *J. Clin. Nurs.* 28, 4087–4097. doi: 10.1111/jocn.14993

Glerean, N., Hupli, M., Talman, K., and Haavisto, E. (2017). Young peoples' perceptions of the nursing profession: an integrative review. *Nurse Educ. Today* 57, 95–102. doi: 10.1016/j.nedt.2017.07.008

Grace, M. K., and VanHeuvelen, J. S. (2019). Occupational variation in burnout among medical staff: evidence for the stress of higher status. *Soc. Sci. Med.* 232, 199–208. doi: 10.1016/j.socscimed.2019.05.007

Grimsrud, A., Stein, D. J., Seedat, S., Williams, D., and Myer, L. (2009). The association between hypertension and depression and anxiety disorders: results from a nationally-representative sample of South African adults. *PLoS One* 4:e5552. doi: 10.1371/journal.pone.0005552

Hakanen, J. J., Perhoniemi, R., and Bakker, A. B. (2014). Crossover of exhaustion between dentists and dental nurses. *Stress Health* 30, 110–121. doi: 10.1002/smi.2498

Haoka, T., Sasahara, S., Tomotsune, Y., Yoshino, S., Maeno, T., and Matsuzaki, I. (2010). The effect of stress-related factors on mental health status among resident doctors in Japan. *Med. Educ.* 44, 826–834. doi: 10.1111/j.1365-2923.2010.03725.x

Hoeymans, N., Garssen, A. A., Westert, G. P., and Verhaak, P. F. (2004). Measuring mental health of the Dutch population: a comparison of the GHQ-12 and the MHI-5. *Health Qual Life Outcomes* 2:23. doi: 10.1186/1477-7525-2-23

Kapfhammer, H. P. (2011). [The relationship between depression, anxiety and heart disease - a psychosomatic challenge]. *Psychiatr. Danub.* 23, 412–424.

Kinley, D. J., Lowry, H., Katz, C., Jacobi, F., Jassal, D. S., and Sareen, J. (2015). Depression and anxiety disorders and the link to physician diagnosed cardiac disease and metabolic risk factors. *Gen. Hosp. Psychiatry* 37, 288–293. doi: 10.1016/j.genhosppsych.2015.03.022

Klersy, C., Callegari, A., Martinelli, V., Vizzardi, V., Navino, C., Malberti, F., et al. (2007). Burnout in health care providers of dialysis service in Northern Italy–a multicentre study. *Nephrol. Dial. Transplant* 22, 2283–2290. doi: 10.1093/ndt/gfm111

Kruk, J., and Aboul-Enein, H. Y. (2004). Psychological stress and the risk of breast cancer: a case-control study. *Cancer. Detect. Prev.* 28, 399–408. doi: 10.1016/j.cdp.2004.07.009

Lambert, V. A., Lambert, C. E., and Ito, M. (2004). Workplace stressors, ways of coping and demographic characteristics as predictors of physical and mental health of Japanese hospital nurses. *Int. J. Nurs. Stud.* 41, 85–97. doi: 10.1016/s0020-7489(03)00080-4

Lang-Runtz, H. (1984). Stress in dentistry: it can kill you. *J. Can. Dent. Assoc.* 50, 539–541.

Lawrence, J. M. (1989). Stress problems in the medical profession. *Aust. Fam. Physician* 18, 1379–1382.

Li, W. H., Chung, J. O., Chui, M. M., and Chan, P. S. (2009). Factorial structure of the Chinese version of the 12-item General Health Questionnaire in adolescents. *J. Clin. Nurs.* 18, 3253–3261. doi: 10.1111/j.1365-2702.2009.02905.x

Liang, Y., Wang, L., and Yin, X. (2016). The factor structure of the 12-item general health questionnaire (GHQ-12) in young Chinese civil servants. *Health Qual Life Outcomes* 14:136. doi: 10.1186/s12955-016-0539-y

Maslach, C., Schaufeli, W. B., and Leiter, M. P. (2001). Job burnout. *Annu. Rev. Psychol.* 52, 397–422. doi: 10.1146/annurev.psych.52.1.397

Mathé, G. (1996). Depression, stressful events and the risk of cancer. *Biomed. Pharmacother* 50, 1–2. doi: 10.1016/0753-3322(96)85089-x

Okwaraji, F. E., and Aguwa, E. N. (2014). Burnout and psychological distress among nurses in a Nigerian tertiary health institution. *Afr. Health Sci.* 14, 237–245. doi: 10.4314/ahs.v14i1.37

Ovejas-López, A., Izquierdo, F., Rodríguez-Barragán, M., Rodríguez-Benítez, J., Garcia-Batanero, M., Alonso-Martínez, M., et al. (2020). [Burnout and psychological distress among trainee General Practitioners]. *Aten. Primaria* 52, 608–616. doi: 10.1016/j.aprim.2020.02.014

Panagopoulou, E., Montgomery, A., and Benos, A. (2006). Burnout in internal medicine physicians: differences between residents and specialists. *Eur. J. Intern. Med.* 17, 195–200. doi: 10.1016/j.ejim.2005.11.013

Perry, L., Lamont, S., Brunero, S., Gallagher, R., and Duffield, C. (2015). The mental health of nurses in acute teaching hospital settings: a cross-sectional survey. *BMC Nurs.* 14:15. doi: 10.1186/s12912-015-0068-8

Rada, R. E., and Johnson-Leong, C. (2004). Stress, burnout, anxiety and depression among dentists. *J. Am. Dent. Assoc.* 135, 788–794. doi: 10.14219/jada.archive.2004.0279

Ramirez, A. J., Graham, J., Richards, M. A., Cull, A., and Gregory, W. M. (1996). Mental health of hospital consultants: the effects of stress and satisfaction at work. *Lancet* 347, 724–728. doi: 10.1016/s0140-6736(96)90077-x

Renzi, C., Di Pietro, C., and Tabolli, S. (2012). Psychiatric morbidity and emotional exhaustion among hospital physicians and nurses: association with perceived job-related factors. *Arch Environ. Occup. Health* 67, 117–123. doi: 10.1080/19338244.2011.578682

Rindner, L., Nordeman, L., Strömme, G., Svenningsson, I., Premberg, Å, Hange, D., et al. (2020). Prognostic factors for future mental, physical and urogenital health and work ability in women, 45-55 years: a six-year prospective longitudinal cohort study. *BMC Womens Health* 20:171. doi: 10.1186/s12905-020-01015-4

Rotenstein, L. S., Torre, M., Ramos, M. A., Rosales, R. C., Guille, C., Sen, S., et al. (2018). Prevalence of Burnout Among Physicians: a Systematic Review. *JAMA* 320, 1131–1150. doi: 10.1001/jama.2018.12777

Sancho, F. M., and Ruiz, C. N. (2010). Risk of suicide amongst dentists: myth or reality? *Int. Dent. J.* 60, 411–418.

Schaufeli, W. B., Bakker, A. B., Hoogduin, K., Schaap, C., and Kladler, A. (2001). on the clinical validity of the maslach burnout inventory and the burnout measure. *Psychol. Health* 16, 565–582. doi: 10.1080/08870440108405527

Senter, A., Morgan, R. D., Serna-McDonald, C., and Bewley, M. (2010). Correctional psychologist burnout, job satisfaction, and life satisfaction. *Psychol. Services* 7, 190–201. doi: 10.1037/a0020433

Shacham, M., Hamama-Raz, Y., Kolerman, R., Mijiritsky, O., Ben-Ezra, M., and Mijiritsky, E. (2020). COVID-19 Factors and Psychological Factors Associated with Elevated Psychological Distress among Dentists and Dental Hygienists in Israel. *Int. J. Environ. Res. Public Health* 17:2900. doi: 10.3390/ijerph17082900

Shanafelt, T. D., Boone, S., Tan, L., Dyrbye, L. N., Sotile, W., Satele, D., et al. (2012). Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Intern. Med.* 172, 1377–1385. doi: 10.1001/archinternmed.2012.3199

Shenoi, A. N., Kalyanaraman, M., Pillai, A., Raghava, P. S., and Day, S. (2018). Burnout and Psychological Distress Among Pediatric Critical Care Physicians in the United States. *Crit. Care Med.* 46, 116–122. doi: 10.1097/ccm.0000000000002751

Silbersdorff, A., and Schneider, K. S. (2019). Distributional Regression Techniques in Socioeconomic Research on the Inequality of Health with an Application on the Relationship between Mental Health and Income. *Int. J. Environ. Res. Public Health* 16:4009. doi: 10.3390/ijerph16204009

Song, K. W., Choi, W. S., Jee, H. J., Yuh, C. S., Kim, Y. K., Kim, L., et al. (2017). Correlation of occupational stress with depression, anxiety, and sleep in Korean dentists: cross-sectional study. *BMC Psychiatry* 17:398. doi: 10.1186/s12888-017-1568-8

Sorsdahl, K., Sewpaul, R., Evans, M., Naidoo, P., Myers, B., and Stein, D. J. (2018). The association between psychological distress, alcohol use and physical non-communicable diseases in a nationally representative sample of South Africans. *J. Health Psychol.* 23, 618–628. doi: 10.1177/1359105316642832

Tatangelo, G., McCabe, M., Campbell, S., and Szoeke, C. (2017). Gender, marital status and longevity. *Maturitas* 100, 64–69. doi: 10.1016/j.maturitas.2017.03.002

Teasdale, E., Drew, S., Taylor, C., and Ramirez, A. (2008). *Hospital Consultants'Job Stress and Satisfaction Questionnaire(HCJSSQ) User Manual.* London: Cancer Research UK London Psychosocial Group.

Thomas, M., Kohli, V., and Choi, J. (2014). Correlates of Job Burnout among Human Services Workers: implications for Workforce Retention. *J. Sociol. Soc. Welf.* 41, 69–90.

Tibber, M. S., Walji, F., Kirkbride, J. B., and Huddy, V. (2022). The association between income inequality and adult mental health at the subnational level-a systematic review. *Soc. Psychiatry Psychiatr. Epidemiol.* 57, 1–24. doi: 10.1007/s00127-021-02159-w

Wang, J. N., Sun, W., Chi, T. S., Wu, H., and Wang, L. (2010). Prevalence and associated factors of depressive symptoms among Chinese doctors: a cross-sectional survey. *Int. Arch Occup. Environ. Health* 83, 905–911. doi: 10.1007/s00420-010-0508-4

West, C. P., Tan, A. D., Habermann, T. M., Sloan, J. A., and Shanafelt, T. D. (2009). Association of resident fatigue and distress with perceived medical errors. *JAMA* 302, 1294–1300. doi: 10.1001/jama.2009.1389

Westman, M., Bakker, A. B., Roziner, I., and Sonnentag, S. (2011). Crossover of job demands and emotional exhaustion within teams: a longitudinal multilevel study. *Anxiety Stress Coping* 24, 561–577. doi: 10.1080/10615806.2011.558191

Xu, X., and Zhao, T. (2006). The psychological health survey of medical staff in general hospital. *J. China Clin. Psychol.* 14, 324–325.

Ye, S. (2009). Factor structure of the General Health Questionnaire (GHQ-12): the role of wording effects. *Personality Individual Diff,* 46, 197–201.

Zhong, X., Jin, X., Yan, L., Yang, L., Long, H., Wang, J., et al. (2021). Reliability and Validity of General Health Questionnaire-12 in Chinese Dental Healthcare Workers During the COVID-19 Pandemic. *Front. Psychiatry* 12:792838. doi: 10.3389/fpsyt.2021.792838

Zhou, C., Shi, L., Gao, L., Liu, W., Chen, Z., Tong, X., et al. (2018). Determinate factors of mental health status in Chinese medical staff: a cross-sectional study. *Medicine* 97:e0113. doi: 10.1097/md.0000000000010113

Zhou, H., Jiang, F., Rakofsky, J., Hu, L., Liu, T., Wu, S., et al. (2019). Job satisfaction and associated factors among psychiatric nurses in tertiary psychiatric hospitals: results from a nationwide cross-sectional study. *J. Adv. Nurs.* 75, 3619–3630. doi: 10.1111/jan.14202

Zhou, X., Pu, J., Zhong, X., Zhu, D., Yin, D., Yang, L., et al. (2017). Burnout, psychological morbidity, job stress, and job satisfaction in Chinese neurologists. *Neurology* 88, 1727–1735. doi: 10.1212/wnl.0000000000003883

Psychological Responses of Health Care Workers Are Strongly Associated With Pandemic Management

Veronika Pacutova[1,2]*, Andrea Madarasova Geckova[1,2,3], Peter Kizek[4], Martin Novotny[5], Andrea F. de Winter[2] and Sijmen A. Reijneveld[2]

[1] Department of Health Psychology and Research Methodology, Faculty of Medicine, P. J. Safarik University, Kosice, Slovakia, [2] Department of Community and Occupational Medicine, University Medical Center Groningen, University of Groningen, Groningen, Netherlands, [3] Institute of Applied Psychology, Faculty of Social and Economics Sciences, Comenius University Bratislava, Bratislava, Slovakia, [4] I. Stomatology Clinic, University Hospital of Louis Pasteur, Faculty of Medicine, P. J. Safarik University, Kosice, Slovakia, [5] Department of Infectious Disease and Travel Medicine, Faculty of Medicine, P. J. Safarik University, Kosice, Slovakia

Background: Globally, governments adopted protective measures to stabilize the worsening COVID-19 pandemic situation. These measures had a large impact on health care workers (HCWs) and could make the work environment more stressful for them. Therefore, we explored the associations of the psychological responses of HCWs and pandemic management among Slovak health care workers during the second wave of the pandemic.

Materials and Methods: We obtained data about psychological responses, COVID-19 experiences, information overload, non-adherence of the public, work stress and barriers and facilitators of health care provision from HCWs at the COVID-19-related departments of one hospital that mainly covered eastern Slovakia (215 health care professionals, 77.7% females, M/SD = 44.4). Data were analyzed using logistic regression models adjusted for gender.

Results: Pandemic management was most strongly associated with psychological responses, such as irritability, sadness, anxiety, dizziness, and back pain, in health care workers. The non-adherence of the public had the strongest associated psychological impact on HCWs, mostly affecting anxiety and irritability (odds ratios, ORs varying from 3.9 to 7.0). From the barriers and facilitators of health care provision, the use of personal protective equipment had the most impact psychologically, whereas efficient department management was most protective, with ORs around 0.3.

Conclusion: Pandemic management has a large impact on health care workers, and promoting resilience may seriously decrease job-related stress and associated psychological responses of HCWs.

Keywords: psychological responses, pandemic management, stress, COVID-19, health care workers, barriers and facilitative factors

INTRODUCTION

The world continues to deal with the COVID-19 pandemic, which in Slovakia started in March 2020 and has unexpectedly continued in a series of waves. During the second wave, we noticed a serious rise in the number of infected patients, hospitalizations and even deaths, which forced the government to adopt protective measures to stabilize the pandemic situation regardless of the psychological and occupational impact on health care workers (HCWs), who were the most affected by the measures.

During the pandemic, health care workers have experienced a particularly stressful situation due to extreme workload, physical exhaustion, high risk of infection and social isolation, all of which have potentially severe psychological consequences (Du et al., 2020; Marinaci et al., 2020; Shoja et al., 2020; Slama et al., 2021). Protective measures led to the creating of COVID-related departments at hospitals, where many HCWs were redeployed and had to take on new competencies, learn to use new equipment and adjust to new work layouts. HCWs sometimes even found themselves there without proper specialization or training. They often worked overtime with the limited possibility to take breaks (Slama et al., 2021). The perception of personal risk was exacerbated by uncertainty, which was affected by the change in protective measures day by day (Chong et al., 2004). Due to the need to take protective measures, i.e., to wear personal protective equipment (PPE), regular drinking, eating and using restrooms became more difficult and were minimized, as was face-to-face communication, not to mention the consequences of the body overheating, skin irritation and the reduction of touching and visual sensations (Abiakam et al., 2021; Duan et al., 2021). Working staff were also afraid of understaffing and workload due to quarantine obligations or the sick leaves of their colleagues (Maunder et al., 2003). Studies show that between 59 and 96% of HCWs report moderate to severe stress (Du et al., 2020; Aly et al., 2021). It is unclear how long this pandemic will last, but, for example, with the SARS epidemic, stress among HCWs still persisted 1 year after the end of the epidemic (McAlonan et al., 2007).

Previous research has shown that the psychological responses of HCWs to pandemics occur in regard to anxiety, fear, panic attacks, posttraumatic stress, psychological distress, depressive tendencies, insomnia, tiredness, loneliness, frustration, anger, and grief (Maunder et al., 2003; Chong et al., 2004; Chua et al., 2004; Chew et al., 2020; Du et al., 2020; Huang et al., 2021). Moreover, somatic responses, such as headache, stomach pain, neck and back pain, also seem likely, given the connections between body and mind, as represented in the biopsychosocial model. Such responses have been previously shown in the health care environment (Nicholson et al., 2007; Yang et al., 2016; Onigbogi and Banerjee, 2019; Marinaci et al., 2020; Mohsin et al., 2021).

To our knowledge, evidence is lacking on the psychological responses of HCWs in Central Europe and the association of these responses with pandemic management strategies. Strong responses seem to be likely, however, as disease load and mortality were high, and pandemic management was mostly strict but also rapidly changing in these countries. We therefore aimed to assess whether various measures related to COVID-19 and COVID-19-management, such as COVID-19 experiences, information overload, non-adherence of the public, work stress and barriers and facilitators of health care provision, were related to the psychological responses of the HCWs concerned.

MATERIALS AND METHODS

Sample and Procedure

We invited all practicing health care workers from the COVID-related departments (infection/anesthesiology and intensive care/pathology) of one hospital (covering Kosice region), one rescue service (covering Kosice region) and one dialysis services (covering all of Slovakia) through their employer, to participate in a cross-sectional survey administered during the second wave of COVID-19 pandemic, from May to September 2021 via an online or paper-based questionnaire. The questionnaire was specifically developed in cooperation with representatives of the participating HCWs and covered 11 areas (sociodemographic data, exposure to COVID-19, impacts on health care provision, adverse events, etc.), which were discussed as relevant. We arranged measurements based on their opinions, and the final version was piloted to assure clarity and suitability.

Measures

Psychological responses of HCWs were measured by asking respondents how many times they suffered from headache, stomach ache, back pain, sadness, irritability, anxiety, insomnia, and dizziness in the last 6 months. Answers were dichotomized as: every day/more than once in a week vs. every week/month/rarely/never.

Pandemic management regarded a series of issues related to COVID-19 and the public management of this pandemic. First, this was the **COVID-19 experience** of HCWs, measured by asking respondents if they themselves had a serious experience with COVID-19, i.e., regarding hospitalization or death, personally, among close relatives, or within their work team (yes vs. no). **Information overload** regarded how frequently respondents followed pandemic news during the second wave of the COVID-19 outbreak from January till March 2021, and how much they were concerned about it. Combining these two questions, we divided the respondents into those who did not follow the news and were not concerned vs. those who followed the news several times per day and/or were highly concerned. Similarly, we asked HCWs how frequently they saw other people not following the pandemic measures during this period and how much they were concerned about the **non-adherence of the public**. Combining these two questions, we divided the respondents into those who almost always/always saw the non-adherence of the public and/or were highly concerned about them vs. never/sometimes saw the non-adherence of the public and were little/not at all concerned about them. **Work stress** was measured by asking

Characteristic	N (%)
Gender	
Women	167 (77.7)
Men	48 (22.3)
Profession	
Nurses	112 (52.1)
Doctors	69 (32.1)
Rescuers	27 (12.5)
Other HCWs	7 (3.3)
Department of HCWs (dpt.)	
Hospital– local	
Infection dept.	46 (21.4)
Anesthesiology and Intensive Care dept.	25 (11.6)
Pathology dept.	22 (10.2)
Hospital– local and serving other hospitals	
Dialysis services	92 (42.8)
Emergency service	30 (14.0)
Psychological responses	
Headache	52 (24.3)
Stomach ache	20 (9.5)
Back pain	79 (36.9)
Sadness	36 (16.8)
Irritability	46 (21.6)
Anxiety	34 (16.0)
Insomnia	37 (17.3)
Dizziness	19 (8.9)
COVID-19 experience	
Had serious COVID-19 experience (due to hospitalization or death)	108 (50.2)
Information overload	
Did not follow the news and not concerned	127 (59.3)
Either followed the news or highly concerned	65 (30.4)
Followed the news and highly concerned	22 (10.3)
Non-adherence of the public	
Never or sometimes saw non-adherence and not concerned	81 (37.9)
Either almost always/always saw non-adherence or highly concerned	75 (35.0)
Almost always/always saw non-adherence and highly concerned	58 (27.1)
Work stress	
At least 1 stressor (patient triage, work order, emergency status, no specialization)	84 (40.0)
Barriers to health care provision	
Use of PPE	72 (33.5)
Lack of staff	75 (35.0)
Work exhaustion	101 (47.4)
Facilitators of health care provision	
Efficient department management	107 (50.0)
Colleagues' support	129 (60.3)
Public solidarity manifestation	50 (26.2)

HCWs if they were concerned about providing patient triage, applying work orders in handling patients, limitations due to emergency status and being delegated to perform their work without specialization. Responses were dichotomized as at least one vs. none. **Barriers and facilitators of health care provision** were factors that hindered and helped the HCWs, respectively, in providing health care during the second wave of the COVID-19 outbreak from January till March 2021. Potential barriers were (a) use of PPE, (b) lack of staff and (c) work exhaustion; these were dichotomized as partially/not limited vs. totally/significantly hindering for each factor. Potential facilitators were (a) efficient management at the department; (b) colleagues' support and (c) public solidarity manifestation. Answers were dichotomized as highly vs. slightly/a little/not at all (**Supplementary Appendix A**).

Statistical Analysis

First, we described psychological responses and the COVID-19 experience, information overload, non-adherence of the public, work stress, barriers, and facilitators of health care provision, which the Slovak HCWs reported as rates, means, and standard deviations (SDs). Second, we assessed the association of psychological responses with all COVID-19 pandemic management factors using logistic regression models adjusted for gender per each separate variable. We used IBM SPSS Statistics 23 for Windows for all analyses.

RESULTS

Background Characteristics

We received 233 responses, which make up around 8% of the total number of employees, from which we later excluded those who did not report their gender (*n* = 6) and those who did not specify their profession (*n* = 12). The final sample included 215 respondents (77.7% females, mean age/*SD* = 44.4/ ± 10.2) and more than a half were nurses (52.1%). Most HCWs worked at the dialysis department (42.3%). HCWs complained mainly about back pain (36.9%). Around 50% had serious COVID-19 experiences, and about 60% had major concerns and/or frequently saw the non-adherence of the public. More than 30% of HCWs reported work exhaustion, lack of staff and use of PPE as the highest barriers in health care provision, while around 50% perceived department management and colleagues' support as the most supportive facilitators (for more details, see **Table 1**).

Associations of Psychological Responses With COVID-19 Experience, Information Overload, Non-adherence of the Public and Barriers and Facilitators of Health Care Provision

Pandemic management was most strongly associated with psychological responses, such as irritability, sadness, anxiety, dizziness, back pain, headache, stomach ache, and insomnia

TABLE 2 | Associations of psychological responses with COVID-19 experience, information overload, non-adherence of the public, barriers, and facilitators of health care provision.

	Headache OR (95%CI)	Stomach ache OR (95%CI)	Back pain OR (95%CI)	Sadness OR (95%CI)	Irritability OR (95%CI)	Anxiety OR (95%CI)	Insomnia OR (95%CI)	Dizziness OR (95%CI)
COVID-19 experience								
Serious experience	1.0 (0.51–1.79)	1.5 (0.59–3.90)	1.5 (0.86–2.69)	1.1 (0.51–2.18)	1.5 (0.76–2.89)	1.9 (0.88–4.1)	1.3 (0.65–2.73)	1.3 (0.51–3.45)
Information overload								
Followed or concerned	1.2 (0.57–2.32)	2.2 (0.84–5.83)	1.5 (0.79–2.76)	**2.7 (1.18–6.01)***	1.7 (0.82–3.42)	2.1 (0.95–4.81)	1.6 (0.74–3.53)	**3.1 (1.03–9.17)***
Followed and concerned	1.2 (0.45–3.48)	0.6 (0.08–5.26)	1.4 (0.54–3.60)	**4.0 (1.38–11.7)****	1.3 (0.43–3.88)	2.5 (0.77–7.88)	1.8 (0.58–5.35)	**4.4 (1.12–17.0)***
Non-adherence of the public								
Non-adherence or concerned	**2.5 (1.10–5.59)***	**7.6 (1.67–36.0)****	1.1 (0.54–2.20)	**3.0 (1.06–8.17)***	**3.9 (1.45–10.5)****	**5.0 (1.57–16.1)****	1.4 (0.55–3.35)	**5.4 (1.12–25.9)***
Non-adherence and concerned	**3.1 (1.33–7.15)****	4.5 (0.88–23.29)	**2.9 (1.40–5.95)****	**4.4 (1.59–12.3)****	**7.0 (2.59–18.8)*****	**7.0 (2.13–22.3)*****	**2.5 (1.01–5.98)***	**5.4 (1.07–26.8)***
Work stress								
At least one stressor	1.8 (0.98–3.56)	2.4 (0.94–6.19)	**1.9 (1.07–3.47)***	**2.8 (1.32–6.04)****	**3.4 (1.68–6.73)*****	**3.0 (1.35–6.49)****	1.8 (0.89–3.80)	**5.4 (1.70–17.3)****
Barriers and facilitators of health care provision								
Use of PPE	**2.5 (1.32–4.76)****	2.2 (0.85–5.45)	**2.5 (1.37–4.55)****	**4.6 (2.15–9.81)*****	**3.0 (1.54–5.91)*****	**2.3 (1.08–4.85)***	1.1 (0.51–2.26)	**3.9 (1.45–10.3)****
Lack of staff	**1.9 (1.01–3.65)***	1.5 (0.60–3.90)	**2.0 (1.09–3.56)***	**2.4 (1.13–4.88)***	**2.2 (1.12–4.23)***	2.0 (0.94–4.23)	2.0 (0.95–4.02)	1.7 (0.65–4.38)
Work exhaustion	1.5 (0.77–2.75)	1.6 (0.62–4.17)	**2.1 (1.19–3.77)***	**2.9 (1.36–6.36)****	**2.2 (1.12–4.30)***	1.7 (0.80–3.59)	1.6 (0.75–3.25)	**4.7 (1.49–14.6)****
Efficient dept. management	0.6 (0.33–1.21)	0.7 (0.28–1.82)	0.7 (0.42–1.33)	**0.3 (0.13–0.62)****	**0.3 (0.12–0.53)*****	**0.3 (0.15–0.75)****	0.6 (0.29–1.25)	0.5 (0.19–1.35)
Colleagues' support	0.7 (0.38–1.34)	0.4 (0.16–1.04)	1.0 (0.54–1.72)	**0.5 (0.22–0.96)***	**0.3 (0.17–0.66)****	**0.4 (0.19–0.84)***	0.6 (0.28–1.16)	0.7 (0.27–1.82)
Public solidarity manifestation	0.5 (0.21–1.15)	0.8 (0.26–2.77)	1.1 (0.55–2.16)	0.6 (0.23–1.54)	0.5 (0.21–1.26)	0.6 (0.24–1.71)	**0.2 (0.07–0.82)***	0.2 (0.2–1.17)

***p < 0.001; **p < 0.01; *p < 0.05. Bold values are those which are significant.

(in order, **Table 2**). Sadness and irritability were most frequently associated with psychological responses. Regarding the importance of measures of pandemic management, a serious COVID-19 experience did not have any significant association, whereas the non-adherence of the public, use of PPE and work stress had the most significant associations, with the strongest associations in the psychological area of anxiety and irritability (odds ratio/95% confidence interval, OR/CI: 7.0/2.13–22.3 and 7.0/2.59–18.8, respectively). Regarding barriers and facilitators of health care provision, the use of PPE had the strongest association (OR/CI: 4.6/2.15–9.81), whereas efficient department management was protective (OR/CI: 0.3/0.12–0.53). Moreover, public solidarity manifestation had an only association with HCWs' insomnia (OR/CI: 4.2/1.21–14.6).

DISCUSSION

We found that psychological responses of a somatic nature, such as headache, stomach ache and back pain, were most strongly associated with the non-adherence of the public and use of PPE, while the other psychological responses were strongly associated with more factors. Only one of the pandemic management factors, COVID-19 experience, was not associated with any psychological response. Regarding facilitators, department management, and colleagues' support were most protective, while public solidarity manifestation was only associated with insomnia.

Psychological responses of a somatic nature, such as back pain, headache, and stomach ache, were associated with the non-adherence of the public and use of PPE (most strongly). They were also associated, less strongly, with a lack of staff, work exhaustion, and work stress. This confirms previous findings that somatic symptoms were highly associated with perceiving stress, especially in females, as well as with low job satisfaction, excessive workload, lack of staff, inadequate equipment/breaks, sleeping/eating problems or psychosocial stress (Hoogendoorn et al., 2002; Maleki et al., 2012; Tosunoz and Oztunc, 2017; Koyuncu and Karcioglu, 2018; Alnaami et al., 2019; Vinstrup et al., 2020). Moreover, headaches (new or worsening of pre-existing ones) develop demonstrably through the use of PPE for more than 4 h, when 61% admitted not removing masks until lunch break, which aligns with our results (Bharatendu et al., 2020; Hajjij et al., 2020; Ong et al., 2020; Contejean et al., 2021). Use of PPE may even cause "heat stress" (Moon et al., 2017; Lee et al., 2020). Perceiving stress from pandemic management can also affect contractions and movement of the gastrointestinal tract, and HCWs could recognize psychological responses more acutely (Harvard Health Publishing, 2021). HCWs from Saudi Arabia confirmed their feelings of nausea and stomach ache (62%) when thinking about the COVID-19 situation, as did American HCWs (56%) (Mental Health America, 2021; Mohsin et al., 2021). An explanation of our results might also be that HCWs were much more aware of the potential health consequences of COVID-19 disease on patients and were more likely to perceive stress when they saw that the public ignored measures that should basically

protect them. They might be afraid of an increasing number of patients because of non-adherence and as a result could feel symptoms like headache, stomach ache and back pain. Headache and back pain were also associated with use of PPE, which might mean that they experienced prolonged use of PPE, dehydration, exhaustion, excessive sweating or a desire to find a comfort zone. We learned that feeling job-related stress from pandemic management was more likely symptomized by back pain and headache, with the non-adherence of the public and use of PPE being the strongest stressors, and we did not confirm any facilitators to be related to these kinds of psychological responses.

Psychological responses, such as irritability, sadness, anxiety, dizziness, and insomnia, were associated with the non-adherence of the public, use of PPE and work stress (most strongly). They were also associated, less strongly, with work exhaustion, information overload, and lack of staff. This is in line with other studies, which showed that sadness emerged in HCWs when the perceived information was insufficient, and levels of anxiety were higher in those working with COVID-19 patients or using PPE (bad-fitting, discomfort, many layers), whereas irritability was one of the main symptoms of vicarious traumatization (Alenazi et al., 2020; Li et al., 2020; Savitsky et al., 2020; García-Fernández et al., 2021; Ruskin et al., 2021). Furthermore, many HCWs reported that public solidarity manifestations, such as gifts or clapping hands, were nice, but some of them felt embarrassed (Rees et al., 2021). An explanation might be that HCWs perceived psychological job-related stress from bad-fitting or uncomfortable respirators, which increased the work of breathing or irritated their skin (Malik et al., 2020), as well as from frequency and adequacy of pandemic information. Relocating or joining a different team/department, new daily duties, operating new equipment, even without proper training, might also increase stress leading to the observed psychological responses (d'Ettorre et al., 2021; García-Fernández et al., 2021; Ruskin et al., 2021). Watching people not adhering to protective measures (wearing a face mask, using disinfection, keeping distances…), work stress and uncomfortable use of PPE might even cause traumatization to them (Li et al., 2020). Prioritizing patients in providing patient triage, applying work order, limitations due to emergency status and no specialization cause significant irritabilities for them. In contrast, HCWs might not be concerned so much about their own possibility of experiencing COVID-19 because of their better prognosis and shorter hospitalization (Diéz-Manglano et al., 2021; Yang et al., 2021). Public appreciation of their emotional and physical workload may have a protective effect only on their insomnia. We learned that perceiving job-related stress from pandemic management was more significant for these types of psychological responses, with the non-adherence of the public and use of PPE being the strongest stressors, whereas information overload was so in the first wave of the pandemic (Pacutova et al., 2021). Pandemic management made our HCWs more irritated, sad and anxious, whereas only efficient department management and colleagues' support were sufficient to help them, and public solidarity manifestations were not enough.

Strengths and Limitations

The main strength of this study is that we had a representative sample of HCWs from COVID-related departments during the second wave of pandemic despite their constant high work effort. Based on that, we were able to gather information about their psychological responses, COVID-19 experience, information overload, non-adherence of the public, work stress, barriers and facilitators of health care provision.

However, some limitations should be also considered. HCWs during the ongoing pandemic represent a hard to reach population. We recruited them via their employer, while their working locations were frequently changed, and we could not assure that the invitation would reach all of them. Moreover, not all of them might be willing to participate in any additional tasks due to exhaustion. Our sample size was relatively small resulting in not very robust results; however, we might hypothesize that those more burdened are those less reachable via a survey, so the results are more an underestimation than an overestimation of the real problems. Moreover, our study was cross-sectional, making it hard to establish causal relations between psychological responses and pandemic management. We did not do biological examinations including saliva or blood samples to assess hormonal and other biological indicators of stressful experiences.

Implications for Practice

We found quite extensive psychological consequences of pandemic management, which implies that we should consider the impact of measures on HCWs, better account for their needs and strengthen psychological support. By increasing awareness that the non-adherence of the public significantly stresses our HCWs or by promoting better coping of HCWs with their negative feelings, we could assure fewer psychological responses related to this factor. Additionally regarding the use of PPE, we suggest that in regard to the challenges with breathing and prolonged use, short breaks during the day for drinking and eating, rest room visits to provide the comfort of breathing without a face mask or powered air purifying respirators for HCWs should be provided more often. Regarding potential dehydration, the consumption of sugary drinks and caffeine could be reduced and replaced by more moisture foods (fresh fruits, vegetables, yogurt, frozen food). Regarding skin irritation, PPE could be designed better and skin care simplified in various ways, such as the use of non-soap cleanser, mild fragrance-free moisturizers etc. (California Dental Association, 2020; Vidua et al., 2020).

We further found the strong association with work stress increased due to possible relocating, joining another team, new duties, new equipment and working without training/specialization, which implies that providing training and guidelines for HCWs on e.g., the proper use of PPE, patient triage and on duties after redeployment may help them fight job-related stress through better preparation (World Health Organization, 2020; U.S. Department of Veterans Affair, 2021). Our findings on the importance of department management and colleagues' support imply that building peer support or a "COVID-19 Battle Buddy Support Programme," sharing or

celebrating successes and providing regular debriefings after shifts may help (Albott et al., 2020; Bielicki et al., 2020; National Guardian Program, 2021; Rieckert et al., 2021). In summary, pandemic management has a large impact on health care workers, and promoting resilience may seriously decrease job-related stress and associated psychological responses of HCWs.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The study was appproved by the Ethics Committee of the Faculty of Medicine at P. J. Safarik University (14N/2020) and the Ethics Committee of Health Care Providers (2021/EK/05031; 813/2021). All data and information gathered from the documentation, including demographic and clinical data, were used in accordance with ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments

or comparable ethical standards. Written informed consent to participate in this study was provided by the participants.

AUTHOR CONTRIBUTIONS

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

FUNDING

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.902673/full#supplementary-material

REFERENCES

Abiakam, N., Worsley, P., Jayabal, H., Mitchell, K., Jones, M., Fletcher, J., et al. (2021). Personal protective equipment realted skin reactions in healthcare professionals during COVID-19. *Int. Wound J.* 18, 312–322. doi: 10.1111/iwj.13534

Albott, C. S., Wozniak, J. R., McGlinch, B. P., Wall, M. H., Gold, B. S., and Vinogradov, S. (2020). Battle buddies: rapid deployment of a psychological resilience intervention for health care workers during the COVID-19 pandemic. *Anesth. Analg.* 131, 43–54. doi: 10.1213/ANE.0000000000004912

Alenazi, T. H., BinDhim, N. F., Alenazi, M. H., Tamim, H., Almagrabi, R. S., Aljohani, S. M., et al. (2020). Prevalence and predictors of anxiety among healthcare workers in Saudi Arabia during the COVID-19 pandemic. *J. Infect. Public Health* 13, 1645–1651. doi: 10.1016/j.jiph.2020.09.001

Alnaami, I., Awadalla, N. J., Alkhairy, M., Alburidy, S., Alqarni, A., Algarni, A., et al. (2019). Prevalence and factors associated with low back pain among health care workers in southwestern Saudi Arabia. *BMC Musculoskelet. Disord.* 20:56. doi: 10.1186/s12891-019-2431-5

Aly, H. M., Nemr, N. A., Kishk, R. M., and Abu bakr Elsaid, N. M. (2021). Stress, anxiety and depression among healthcare workers facing COVID-19 pandemic in Egypt: a cross-sectional online-based study. *BMJ Open* 11:e045281. doi: 10.1136/bmjopen-2020-045281

Bharatendu, C., Ong, J. J. Y., Goh, Y., Tan, B. Y. Q., Chan, A. C. Y., Tang, J. Z. Y., et al. (2020). Powered air purifying respirator (PAPR) restores the N95 face mask induced cerebral hemodynamic alterations among Healthcare Workers during COVID-19 Outbreak. *J. Neurol. Sci.* 417:117078. doi: 10.1016/j.jns.2020.117078

Bielicki, J. A., Duval, X., Gobat, N., Goossens, H., Koopmans, M., Tacconelli, E., et al. (2020). Monitoring approaches for health-care workers during the COVID-19 pandemic. *Lancet Infect. Dis.* 20:e267. doi: 10.1016/S1473-3099(20)30458-8

California Dental Association (2020). *Side Effects of PPE: Tips to Relive Physical and Emotional Exhaustion. Side Effects of PPE: Tips to Relieve Physical and Emotional Exhaustion – CDA.* Sacramento, CA: California Dental Association.

Chew, Q. H., Wei, K. C., Vasoo, S., and Sim, K. (2020). Psychological and coping responses of health care workers towards emerging infectious disease outbreaks:a rapid review and practical implications for the COVID-19 pandemic. *J. Clin. Psychiatry* 81:20r13450. doi: 10.4088/JCP.20r13450

Chong, M. Y., Wang, W. C., Hsieh, W. C., Lee, C. Y., Chiu, N. M., Yeh, W. C., et al. (2004). Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. *Br. J. Psychiatry* 185, 127–133. doi: 10.1192/bjp.185.2.127

Chua, S. E., Cheung, V., Cheung, C., McAlonan, G. M., Wong, J. W. S., Cheung, E. P. T., et al. (2004). Psychological impact of the SARS outbreak in Hong Kong on high-risk health care workers. *Can. J. Psychiatry* 49, 391–393. doi: 10.1177/070674370404900609

Contejean, A., Leporrier, J., Canoui, E., Alby-Laurent, F., Lafont, E., Beaudeau, L., et al. (2021). Comparing dynamics and determinants of severe acute respiratory syndrome coronavirus 2 transmission among healthcare workers of adult and pediatric settings in central Paris. *Clin. Infect. Dis.* 72, 257–264. doi: 10.1093/cid/ciaa977

d'Ettorre, G., Ceccarelli, G., Santinelli, L., Vassalini, P., Innocenti, G. P., Alessandri, F., et al. (2021). L. post-traumatic stress symptoms in healthcare workers dealing with the COVID-19 pandemic: a systematic review. *Int. J. Environ. Res. Public Health* 18:601. doi: 10.3390/ijerph18020601

Diéz-Manglano, J., Solís-Marquínez, M. N., García, A. Á, Alcalá-Rivera, N., Riesco, I. M., Gericó Aseguinolaza, M. G., et al. (2021). Healthcare workers hospitalized due to COVID-19 have no higher risk of death than general population. Data from the Spanish SEMI-COVID-19 Registry. *PLoS One* 16:e0247422. doi: 10.1371/journal.pone.0247422

Du, J., Dong, L., Wang, T., Yuan, C., Fu, R., Zhang, L., et al. (2020). Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. *Gen. Hosp. Psychiatry* 67, 144–145. doi: 10.1016/j.genhosppsych.2020.03.011

Duan, X., Sun, H., He, X., Yang, J., Li, X., Taparia, K., et al. (2021). Personal protective equipment in COVID-19: impacts on health performance, work-related injuries, and measures for prevention. *J. Occup. Environ. Med.* 63, 221–225. doi: 10.1097/JOM.0000000000002123

García-Fernández, L., Romero-Ferreiro, V., Padilla, S., Lahera, G., and Rodriguez-Jimenez, R. (2021). Different emotional profile of health care staff and general population during the COVID-19 outbreak. *Psychol. Trauma* 14, 266–272. doi: 10.1037/tra0001024

Hajjij, A., Aasfara, J., Khalis, M., Ouhabi, H., Benariba, F. Jr., and Kettani, C. E. (2020). Personal protective equipment and headaches: cross-sectional study among Moroccan healthcare workers during COVID-19 pandemic. *Cureus* 12:e12047. doi: 10.7759/cureus.12047

Harvard Health Publishing (2021). *Diseases&Conditions. The Gut-Brain Connection – Harvard Health*. Boston, MA: Harvard Health Publishing.

Hoogendoorn, W. E., Bongers, P. M., de Vet, H. C. W., Ariens, G. A. M., Mechelen, W. V., and Bouter, L. M. (2002). High physical work load and low job satisfaction increase the risk of sickness absence due to low back pain: results of a prospective cohort study. *Occup. Environ. Med.* 59, 323–328. doi: 10.1136/oem.59.5.323

Huang, Q., Luo, L. S., Wang, Y. Y., Jin, Y. H., and Zeng, X. T. (2021). Gender differences in psychological and behavioral responses of infected and uninfected health-care workers during the early COVID-19 outbreak. *Front. Public Health* 9:638975. doi: 10.3389/fpubh.2021.638975

Koyuncu, N., and Karcioglu, O. (2018). Musculoskeletal complaints in healthcare personnel in hospital. *Medicine* 97:e12597. doi: 10.1097/MD.0000000000012597

Lee, J., Venugopal, V., Latha, P. K., Alhadad, S. B., Leow, C. H. W., De Goh, N. Y., et al. (2020). Heat stress and thermal perception amongst healthcare workers during the COVID-19 pandemic in India and Singapore. *Int. J. Environ. Res. Public Health* 17:8100. doi: 10.3390/ijerph17218100

Li, Z., Ge, J., Yang, M., Feng, J., Qiao, M., Jiang, R., et al. (2020). Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. *Brain Behav. Immun.* 88, 916–919. doi: 10.1016/j.bbi.2020.03.007

Maleki, N., Becerra, L., and Borsook, D. (2012). Migraine: maladaptive brain responses to stress. *Headache* 52(Suppl. 2), 102–106. doi: 10.1111/j.1526-4610.2012.02241.x

Malik, L. M., Ilyas, S., Hayat, W., Mukhtar, R., Rashid, S., and Rashid, T. (2020). Skin manifestations associated with personal protective eguipment (PPE) in health care professionals during COVID 19 pandemic. *Esculapio* 16, 61–65.

Marinaci, T., Carpinelli, L., Venuleo, C., Savarese, G., and Cavallo, P. (2020). Emotional distress, psychosomatic symptoms and their relationship with institutional responses: a survey of Italian frontline medical staff during the Covid-19 pandemic. *Heliyon* 6:e05766. doi: 10.1016/j.heliyon.2020.e05766

Maunder, R., Hunter, J., Vincent, L., Bennett, J., Peladeau, N., Leszcz, M., et al. (2003). The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ* 168, 1245–1251.

McAlonan, G. M., Lee, A. M., Cheung, V., Cheung, C., Tsang, K. W. T., Sham, P. C., et al. (2007). Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can. J. Psychiatry* 52, 241–247. doi: 10.1177/070674370705200406

Mental Health America (2021). *The Mental Health of Healthcare Workers In COVID-19. The Mental Health of Healthcare Workers in COVID-19*. Alexandria, VA: Mental Health America.

Mohsin, S. F., Agwan, M. A., Shaikh, S., Alsuwaydani, Z. A., and Alsuwaydani, S. A. (2021). COVID-19: fear and anxiety among healthcare workers in Saudi Arabia. a cross-sectional study. *Inquiry* 58:469580211025225. doi: 10.1177/00469580211025225

Moon, H. J., Seo, J. G., and Park, S. P. (2017). Perceived stress in patients with migraine: a case-control study. *J. Headache Pain* 18:73. doi: 10.1186/s10194-017-0780-8

National Guardian Program (2021). Available online at: https://nationalguardian.org.uk/ (accessed November 20, 2021).

Nicholson, R. A., Timothy, T. H., Rhudy, J. L., and Norton, P. J. (2007). Psychological risk factors in headache. *Headache* 47, 413–426. doi: 10.1111/j.1526-4610.2006.00716.x

Ong, J. J. Y., Bharatendu, C., Goh, Y., Tang, J. Z. Y., Sooi, K. W. X., Tan, Y. L., et al. (2020). Headaches associated with personal protective equipment – a cross-sectional study among frontline healthcare workers during COVID-19. *Headache* 60, 864–877. doi: 10.1111/head.13811

Onigbogi, C. B., and Banerjee, S. (2019). Prevalence of psychosocial stress and its risk factors among health-care workers in Nigeria: a systematic review and meta-analysis. *Niger. Med. J.* 60, 238–244. doi: 10.4103/nmj.NMJ_67_19

Pacutova, V., Madarasova Geckova, A., Kizek, P., de Winter, A. F., and Reijneveld, S. A. (2021). The impact of pandemic management on the quality of life of slovak dentists. *Int. J. Environ. Res. Public Health* 18:5484. doi: 10.3390/ijerph18105484

Rees, N., Smythe, L., Hogan, C., and Williams, J. (2021). Paramedic experiences of providing care in wales (UK) during the 2020 COVID-19 pandemic (PECC-19): a qualitative study using evolved grounded theory. *BMJ Open* 11:e048677. doi: 10.1136/bmjopen-2021-048677

Rieckert, A., Schuit, E., Bleijenberg, N., ten Cate, D., de Lange, W., de Man-van Ginkel, J., et al. (2021). How can we build and maintain the resilience of our health care professionals during COVID-19? Recommendations based on a scoping review. *BMJ Open* 11:e043718. doi: 10.1136/bmjopen-2020-043718

Ruskin, K. J., Ruskin, A. C., Musselman, B. T., Harvey, J. R., Nesthus, T. E., and O'Connor, M. (2021). COVID-19, personal protective equipment, and human performance. *Anesthesiology* 134, 518–525. doi: 10.1097/ALN.0000000000003684

Savitsky, B., Findling, Y., Ereli, A., and Hendel, T. (2020). Anxiety and coping strategies among nursing students during the covid-19 pandemic. *Nurse Educ. Pract.* 46:102809. doi: 10.1016/j.nepr.2020.102809

Shoja, E., Aghamohammadi, V., Bazyar, H., Moghaddam, H. R., Nasiri, K., Dashti, M., et al. (2020). Covid-19 effects on the workload of Iranian healthcare workers. *BMC Public Health* 20:1636. doi: 10.1186/s12889-020-09743-w

Slama, H., Kefi, H. E., Taamallah, K., Stambouli, N., Baffoun, A., Samoud, W., et al. (2021). Immmediate psychological responses, stress factors, and coping behaviours in military health-care professionals during the COVID-19 pandemic in Tunisia. *Front. Psychiatry* 12:622830. doi: 10.3389/fpsyt.2021.622830

Tosunoz, I. K., and Oztunc, G. (2017). Low back pain in nurses. *Int. J. Caring Sci.* 10, 1728–1732.

U.S. Department of Veterans Affair (2021). *PTSD: National Center for PTSD. Managing Health Care Workers' Stress Associated with the COVID-19 Virus Outbreak – PTSD: National Center for PTSD (va.gov)*. Washington, DC: U.S. Department of Veterans Affair.

Vidua, R. K., Chouksey, V. K., Bhargava, D. C., and Kumar, J. (2020). Problems arising from PPE when worn for long periods. *Med. Leg. J.* 88(Suppl. 1), 47–49. doi: 10.1177/0025817220935880

Vinstrup, J., Jakobsen, M. D., and Andersen, L. L. (2020). Perceived stress and low-back pain among healthcare workers: a multi-center prospective cohort study. *Front. Public Health* 8:297. doi: 10.3389/fpubh.2020.00297

World Health Organization (2020). *The COVID-19 Risk Communication Package for Healthcare Facilities. Risk communication for Healthcare editable (who.int)*. Geneva: World Health Organization.

Yang, H., Haldeman, S., Lu, M. L., and Baker, D. (2016). Low back pain prevalence and related workplace psychosocial risk factors: a study using data from the 2010 national health interview survey. *J. Manipulative Physiol. Ther.* 39, 459–472. doi: 10.1016/j.jmpt.2016.07.004

Yang, J. Y., Parkins, M. D., Canakis, A., Aroniadis, O. C., Yadav, D., Dixon, R. E., et al. (2021). Outcomes of COVID-19 among hospitalized health care workers in North America. *JAMA Netw. Open* 4:e2035699. doi: 10.1001/jamanetworkopen.2020.35699

Check for updates

Communal coping and its association with marital relations and psychological outcomes among healthcare professionals during the COVID-19 pandemic

Zainab Alimoradi[1], Mohammad Ali Soleimani[1],
Maryam Keramtkar[1], Nasim Bahrami[1]* and Mark D. Griffiths[2]

[1]Social Determinants of Health Research Center, Research Institute for Prevention of Non-communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran, [2]Department of Psychology, Nottingham Trent University, Nottingham, United Kingdom

Background: Communal coping is a type of interdependency in which couples dealing with a health threat share assessment of a threat and respond together to the stress. The present study investigated communal coping in the COVID-19 pandemic and its association with psychological and relational outcomes among healthcare professionals.

Methods: In the present cross-sectional survey study, 242 healthcare professionals from hospitals and health centers were recruited *via* convenience sampling between August and October 2020. Communal coping with working conditions during the COVID-19 pandemic, dyadic adjustment, psychological distress, and fear of COVID-19 along with demographic and professional characteristics were assessed *via* an online survey.

Results: Multivariable linear regression showed that dyadic adjustment (β = 0.73), psychological distress (β = 0.16), fear of COVID-19 (β = 0.11), and support gap (β = −0.04) were significant independent variables associated with communal coping among healthcare professionals.

Conclusion: Healthcare professionals coped communally within the family in dealing with working conditions during the COVID-19 pandemic. Dyadic adjustment was the strongest predictor of communal coping among healthcare professionals.

KEYWORDS

healthcare professionals, communal coping, COVID-19 pandemic, psychological distress, dyadic adjustment

Introduction

The world has faced the COVID-19 pandemic since early March 2020. The sharp rise in morbidity and mortality of COVID-19 resulted in high stress in the community as well as healthcare professionals who needed to cope with the healthcare of patients with COVID-19 (Wu et al., 2020). Coping has been predominantly examined from an individualistic approach (Afifi et al., 2006). Now, research on coping has shifted from considering coping as a primarily individual phenomenon toward a more interdependent process. According to systems theory, it is difficult to isolate and analyze individual coping from the coping of family members because coping takes place in an interpersonal context (Lyons et al., 1998). In addition, most life stressors are interpersonal, and coping requires interaction with others (Monnier and Hobfoll, 1997).

Relationship-focused coping refers to modes of coping with the aim of managing, preserving, and maintaining relationships during stressful periods. Past research supports the effectiveness of these strategies, particularly in the context of communal stressors (O'Brien and DeLongis, 1997). Individuals manage stress in the context of interpersonal relationships including family relationships (Lyons et al., 1998; Afifi et al., 2006). In addition, individual coping has a broader social impact including how it affects their families and partners (Monnier and Hobfoll, 1997). Studies have also shown that couples act as an interpersonal system in coping. Marriage is a dyadic relationship and couples have a mutual effect on each other's behavior (Durtschi et al., 2011). From this perspective, the social context of coping should be taken into consideration as no one is completely self-sufficient. Partners in a dyad must be considered as an interdependent whole in which each partner influences the other (Bodenmann et al., 2006).

When social groups experience shared stressors, communal coping can be an effective form of coping (Lyons et al., 1998). Communal coping is one of the interpersonal theoretical perspectives on coping developed by Lyons et al. (1998). Communal coping is considered one form of relationship-focused coping. Relationship-focused coping types are categorized by participants' appraisal of the stressor and the action taken in response to the stress. Communal coping is a type of interdependency in which couples dealing with a health threat share assessment of a threat and respond together to the stress (Lyons et al., 1998). Therefore, communal coping occurs along two dimensions of appraisal and action (Lyons et al., 1998; Afifi et al., 2006). For communal coping, individuals appraise stressors as a shared problem rather than the one to be dealt with alone and collaborate in managing the stressor (Lyons et al., 1998). Appraisal, which addresses ownership of the stressor, involves individuals' perception that the stressor is "our problem" to deal with rather than "your problem." Action addresses responsibility of the stressor in which individuals considered the stressor as "our responsibility"

(Lyons et al., 1998; Afifi et al., 2006). Therefore, communal coping involves shared appraisal and joint action rather than individual appraisal (Lyons et al., 1998) to manage the stressor in the context of both one's own and others' needs (Lawrence and Schiller Schigelone, 2002).

Individuals engage in communal coping because it has some benefits that are not gained by acting alone. Communal coping expands resources and capacity for coping with stress, social support, and quality of relationships (Lyons et al., 1998). Communal coping occurs when many individuals face the same stressor and engage in joint action to manage it. Stressful events that simultaneously affect the whole community may naturally induce the community to cope together (Lyons et al., 1998). Fino et al. (2021) reported that psychological distress was lower among nurses who tried to help patients with COVID-19 communicate with their families. Consequently, the COVID-19 pandemic may have affected the use of communal coping. Although some studies have examined communal coping with health-related issues in long-term conditions, no study has examined this coping pattern during a pandemic.

Aim of the present study

The present study examined how healthcare professionals consider the COVID-19 pandemic as a shared problem within their family relationships (and more specifically their spouse) and how they dealt with it. Given a variety of benefits of employing communal coping, the study investigated how this pattern was related to marital relations and psychological outcomes.

Methods

Design

The present study was a cross-sectional survey conducted from August to October 2020.

Participants

The participants comprised 245 healthcare professionals working at hospitals and health centers. Participants were recruited from six public hospital and three private hospitals and 12 comprehensive health centers. During the COVID-19 pandemic, one of these public hospitals was assigned as the referral center for COVID-19 patients. Two other hospitals also provided healthcare to patients with COVID-19 at the peak time. **Figure 1** describes the recruitment procedure. All married staff working at hospitals and health centers with at least 6 months of working experience were eligible to participate in

the study. Those who were single, divorced, or living away from their spouse were excluded from the study as the present study examines coping at the dyadic level.

Sampling and recruitment

Participants were selected by convenience sampling. The link of the study was sent to potential participants in which inclusion criteria and aim of the study were explained. After agreeing to participate in the study, the link to the online survey was sent to them. Sample size was calculated with two approaches. The minimum sample size for regression model should be 10 individuals per variable (Green, 1991). As 20 variables were entered into the model, at least 200 participants were required for an adequate sample size. In the second approach, considering $\alpha = 0.05$, power of 80%, and minimum correlation of 0.2 between variables, sample size was estimated to be 195 individuals.

Variables and measures

Data were collected using an online survey hosted on the *Porsline* platform. The link to the online survey was sent to potential participants *via* social media apps (*WhatsApp* and *Telegram*), SMS, and emails to the participants. Data were collected using the following measures and psychometric scales:

Socio-demographic characteristics

The following socio-demographic data were collected: age, educational level, spouse's age and educational level, working condition, work experience, and marital relationship duration.

Communal coping in the pandemic

This variable was assessed using the seven-item Communal Coping Scale (CCS; adjusted for working during the COVID-19 pandemic). The items (e.g., *"My spouse and I talk about how to deal with this situation"*) were adapted from Afifi et al. (2006). Participants were asked to think about the extent to which they and their partner coped communally with the COVID-19 pandemic on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The final score was calculated based on the total scores of the items and ranged from 7 to 35. Higher scores indicate a higher level of communal coping.

The scale was adapted to the study conditions (i.e., working during the COVID-19 pandemic in the healthcare system). Its validity was evaluated by qualitative face validity and content validity by 15 faculty members of the School of Nursing and Midwifery. Then, the construct validity was investigated using exploratory factor analysis (EFA). As the Kaiser-Meyer-Olkin (KMO) index of 0.75 with a significant correlation between pairs of variables based on Bartlett sphericity test ($p < 0.001$) was

acquired, EFA was performed (Kellar and Kelvin, 2013). EFA using varimax rotation and scree plot verified that the scale had two factors. These factors were named "Shared appraisal" and "Collaborative action," the same as the previous study of communal coping among couples with health problems (Rentscher, 2019). Based on EFA, the Communal Coping Scale (adjusted for working during the COVID-19 pandemic) with two factors explained 78.82% of variance. In the present study, the internal reliability of the scale was very good (Cronbach's alpha = 0.89).

Dyadic adjustment

This variable was assessed using the 14-item Dyadic Adjustment Scale comprising three subscales: dyadic satisfaction, dyadic cohesion, and dyadic consensus. The items (e.g., *"Have you ever regretted getting married?"*) are rated on a six-point scale (range from 0 to 5). The total scores range from 0 to 84 with a higher score indicating better marital adjustment. This scale has shown good content validity, criterion-related validity, and construct validity with high scale reliability (Busby et al., 1995). Good psychometric properties of the Persian version have been reported (Isanezhad et al., 2012). In the present study, the internal reliability of the scale was excellent (Cronbach's alpha = 0.91).

Support gap

This variable assessed five items adapted from the Emotional and Esteem subscales of Xu and Burleson's Spousal Support Measure (Xu and Burleson, 2001). Participants are asked to reflect on conversations with their partner and to estimate how often they received different types of reactions from him or her (e.g., *"Tells you that he loves you and is close to you"*). The items are rated on a five-point scale from 1 (*never*) to 5 (*all the time*). Participants are asked to rate how much they desired different reactions from their spouse, using the same scales. Support gap was calculated as the difference between participants' desired and received support. Support gaps included positive scores (desiring more than one received) and negative scores (receiving more than desired) (Xu and Burleson, 2001). Smith et al. (2018) reported the scale had good reliability. The scale was translated into Persian, and its qualitative face validity and content validity were verified based on comments from 15 faculty members of the School of Nursing and Midwifery. The construct validity was then investigated using EFA. As the KMO index of 0.92 with a significant correlation between pairs of variables based on Bartlett sphericity test ($p < 0.001$) was acquired, EFA was performed (Kellar and Kelvin, 2013). EFA using varimax rotation and scree plot verified that this scale had two factors of "perceived support" and "expected support." EFA confirmed that this scale explained 84% variance in support gap. In the present study, the internal reliability of the scale was excellent (Cronbach's alpha = 0.94).

FIGURE 1
Study recruitment procedure based on STROBE flow diagram.
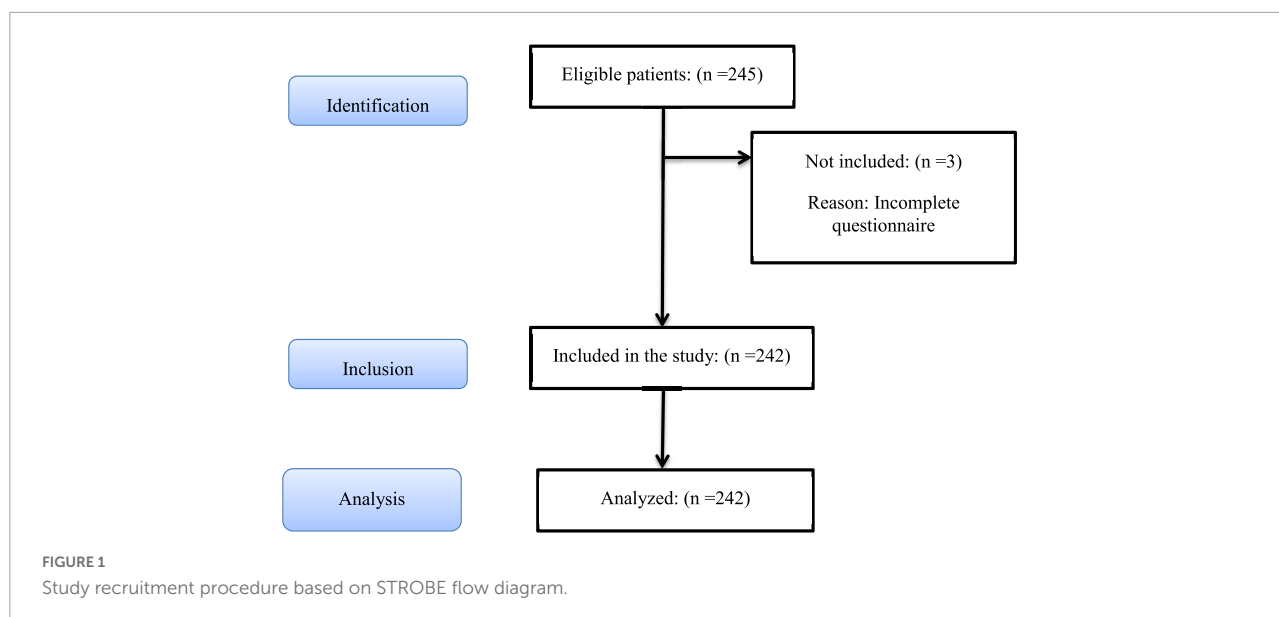
Psychological distress

This variable was assessed using the 10-item K-10 Psychological Distress Questionnaire (Drapeau et al., 2012). The items (e.g., *"During the past month, how often did you feel nervous?"*) are rated on a five-point scale from 1 (*never*) to 5 (*always or all the time*). The scores range from 10 to 50. Higher scores indicate greater levels of psychological distress (Kessler et al., 2003). Good psychometric properties of the Persian version have been reported (Yaghubi, 2016). In the present study, the internal reliability of the scale was excellent (Cronbach's alpha = 0.94).

Fear of COVID-19

This variable was assessed using the seven-item Fear of COVID-19 Scale (Ahorsu et al., 2020). The items (e.g., *"It make me uncomfortable to think about COVID-19"*) are rated on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The total scores range from 7 to 35. A higher score indicates greater fear of COVID-19. Good psychometric properties of the Persian version have been reported (Ahorsu et al., 2020). In the present study, the internal reliability of the scale was very good (Cronbach's alpha = 0.88).

Ethical considerations

The study protocol was approved by the institutional research review board and regional Ethics Committee of Biomedical Research affiliated with Qazvin University of Medical Sciences (reference code: IR.QUMS.REC.1399.174). After explaining the purpose of the study, and assuring the privacy and confidentiality of the data, written informed consent was obtained from all participants.

Data analysis

Data were analyzed using SPSS software version 24. Categorical variables were described with frequencies and percentages and continuous quantitative variables were described using means and standard deviations (SDs). Univariable and multivariable linear regression models were used to investigate the association between communal coping and psychological variables (e.g., psychological distress and fear of COVID-19), and spouse's relational variables (e.g., dyadic adjustment and support gap). In all regression models, the total score of communal coping was entered as a dependent variable and other variables were entered as independent variables. Independent variables that had a significant level of less than 0.05 in the univariable linear regression model were included in the multivariable model *via* a stepwise approach. Considerations of using linear regression method including normal distribution of dependent variable, outlier data, and collinearity between independent variables (based on VIF < 10) were controlled for. The significance level was considered to be $p < 0.05$.

Results

The mean age of participants in the present study was 37.40 years (SD = 7.80). The majority of participants were women (79.8%) and the mean age of their spouses was 39.14 years (SD = 8.41). The mean number of years' work experience was 12.80 years (SD = 7.36). Almost half of the participants had a bachelor's degree (52.9%). Among the participants, 28.5% were working in the inpatient COVID-19 wards and 8.7% in outpatient wards in which they visited suspected

COVID-19 patients or followed up those during treatment. Examining the relationship between communal coping with demographic characteristics showed that variables of having responsibility for caring for a patient with COVID-19, spouse's employment in health wards, and spouse's health status had a significant relationship with communal coping. Demographic characteristics are presented in **Table 1**.

The mean communal coping score on the CCS was 28.25 (SD = 5.58). Given the scores range from 7 to 35, the average score of the participants was more than 75% of the total score, it appears that communal coping was used a lot by the participants. The mean scale score was 18.43 out of 35 (SD = 6.61) for fear of COVID-19, 23.50 out of 50 (SD = 8.75) for psychological distress, 18.45 out of 25 (SD = 5.62) for received support, 20.57 out of 25 (SD = 5.32) for expected support, and 45.17 out of 84 (SD = 12.56) for dyadic adjustment. All of these variables had a significant relationship with the communal coping in the univariable linear regression model and were selected to enter the multivariable regression model (**Table 1**).

Results of multivariable regression showed that the independent variables of dyadic adjustment, psychological distress, fear of COVID-19, and support gap were significantly associated with communal coping. According to standardized beta coefficients in the multivariable model, dyadic adjustment (β = 0.73) was the strongest independent predictor of communal coping among healthcare professionals (with a direct moderate to large association). Psychological distress with a standardized beta coefficient of 0.16 (with a direct weak association), fear of COVID-19 with a coefficient of 0.11 (with a direct weak association) and support gap with a coefficient of −0.04 (with a very weak reverse association) also predicted communal coping. However, they had less power in predicting participants' communal coping. In total, the variables in this model explained 96% of variance of communal coping (**Table 2**).

Discussion

The present study examined communal coping among healthcare professionals and its relationship with psychological distress and relational characteristics during the COVID-19 pandemic. Results of the present study showed that participants have used communal coping in the COVID-19 pandemic situation. Dyadic adjustment, psychological distress, support gap, and fear of COVID-19 were independent variables that significantly predicted communal coping.

Communal coping has primarily been examined at the community level in natural disasters (Wlodarczyk et al., 2016) and at communal settings such as aging in retirement communities (Lawrence and Schiller Schigelone, 2002) and living in refugee camps (Afifi et al., 2019). It has also been investigated at the relational context of family experiencing

life events such as pregnancy (Monnier and Hobfoll, 1997) and divorce (Afifi et al., 2006). These studies have focused on coping with collective stressors in which many individuals face the same stressor and engage in joint action to manage it. Evidence suggests that communal coping is beneficial to individuals dealing with stressors. Studies have shown that communal coping enhances mental health among pregnant women (Monnier and Hobfoll, 1997) and adolescents dealing with uncertainty of living in refugee camps (Afifi et al., 2019); psychological adjustment to the genetic risk of cancer in family members (Koehly et al., 2008); and recovery (Afifi et al., 2012) and posttraumatic growth from natural disasters (Wlodarczyk et al., 2016). These studies have focused on the impact of communal coping on their own or others' adjustment, which are consistent with the findings of the present study. Although the majority of these studies have been conducted in both short-lived and long-term stressful situations, less research has been conducted on health issues including chronic conditions.

Dyadic adjustment was the strongest independent variable in relation to communal coping among healthcare professionals. Couple adjustment is a continuous and changing process (Manyam and Junior, 2014). Marital adjustment is a situation in which couples often feel happy and satisfied with each other and is formed through mutual interest, mutual care, acceptance, understanding, and satisfaction of each other's needs (NasrollahiMola et al., 2020). Having a sense of mutual care as one of the dimensions of dyadic adjustment helps explain the significant relationship between marital adjustment and communal coping among couples working in high-risk conditions during the COVID-19 pandemic.

Spouses' dyadic adjustment is an active process in which couples gradually find their role in the family and understand their responsibilities (Umberson et al., 2005). Since the mean marital duration was approximately 11 years among participants, it seems that they had enough time to achieve marital adjustment in cohabitation. The relationship between marital adjustment and duration of marriage was investigated in an exploratory manner using univariable regression in the present study. The results showed that each year of increase in marital duration, a 2.7 increase was observed in dyadic adjustment. Also, the average score of the participants on the Dyadic Adjustment Scale (45.17) was close to two-thirds of the maximum score (i.e., 46 out of 69). Therefore, it seems that the healthcare professionals in the present study did not consider working during the COVID-19 pandemic to be an individual problem. They talked about it together and tried to develop solutions to work-related problems with consequences such as psychological distress.

Psychological distress and fear of COVID-19 also predicted communal coping. Given the positive association between fear of COVID-19 and psychological distress and communal

coping, it seems that with increasing fear of COVID-19 and psychological distress, communal coping increased. Communal coping may have increased as a compensatory mechanism in

response to psychological distress. However, due to the cross-sectional nature of the study, it is not possible to determine the precedence or latency of the relationship between these

TABLE 1 Socio-demographic and main independent variables and univariable logistic regression analysis considering communal coping as a dependent variable.

Qualitative variables		No (%)	Univariable linear regression analysis		
			B	Std. error	p
Gender	Male	49 (20.2)	RG		
	Female	193 (79.8)	−0.58	0.9	0.52
Level of education	Technician	14 (5.8)	RG		
	B.Sc.	128 (52.9)	−2.06	1.57	0.19
	M.Sc.	60 (24.8)	−1.14	1.66	0.50
	Ph.D.	22 (9.1)	−0.97	1.91	0.61
	General/Specialist practitioner	18 (7.4)	−1.01	1.99	0.61
Spouses' level of education	Technician	51 (21.1)	RG		
	B.Sc.	110 (45.5)	0.61	0.95	0.21
	M.Sc.	45 (18.6)	0.76	1.14	0.51
	Ph.D.	18 (7.4)	2.11	1.53	0.17
	General/Specialist practitioner	18 (7.4)	2.62	1.53	0.09
Working health sector	Comprehensive health clinic	60 (24.8)	RG		
	COVID-19 ward-Hospital	69 (28.5)	0.001	0.99	0.99
	General ward-Hospital	92 (38)	−0.24	0.93	0.80
	Outpatient COVID-19 Clinic	21 (8.7)	−1.05	1.42	0.46
Spouses' job	Unemployed	27 (11.2)	RG		
	Employed	204 (84.3)	0.03	1.14	0.98
	Retired	11 (4.5)	2.53	1.10	0.21
Spouse working in health sectors	No	177 (73.1)	RG		
	Yes	65 (26.9)	1.42	0.80	0.11
Spouses' working health sector	Not applicable	185 (76.4)	RG		
	Comprehensive health clinic	14 (5.8)	1.30	1.54	0.40
	COVID-19 ward–hospital	18 (7.4)	2.84	1.37	0.04
	General ward–hospital	19 (7.9)	1.39	1.34	0.30
	Outpatient COVID-19 clinic	6 (2.5)	3.57	2.30	0.12
Health status	Weak	9 (3.7)	RG		
	Fair	73 (30.2)	−2.75	1.96	0.16
	Good	160 (66.1)	−1.22	1.90	0.52
Spouses' health status	Weak	7 (2.9)	RG		
	Fair	72 (29.8)	−4.06	2.17	0.06
	Good	163 (67.4)	−1.65	2.12	0.44
Exposure to patient with COVID-19	No	142 (58.7)	RG		
	Yes	100 (41.3)	1.50	0.72	0.04
History of COVID-19	Not infected	168 (69.4)	RG		
	Infected and recovered	53 (21.9)	0.97	0.88	0.27
	Infected and under treatment	5 (2.1)	−3.95	2.53	0.12
	Suspected	16 (6.6)	−0.52	1.46	0.72
Quantitative variables	Range	Mean (SD)	B	Std. Error	p
Age (year)	23–67	37.4 (7.80)	0.009	0.05	0.84
Spouse age (year)	24–68	39.14 (8.41)	−0.004	0.04	0.93

TABLE 1 (Continued)

Qualitative variables	No (%)	Univariable linear regression analysis		
		B	Std. error	p
Marital duration (year)	1–41	11.43 (7.94)	−0.04	0.05	0.33
Working experience (in years)	1–37	12.80 (7.36)	−0.006	0.05	0.90
Fear of COVID-19	7–35	18.43 (6.61)	1.34	0.04	<0.001
Psychological distress	10–50	23.50 (8.75)	1.04	0.03	<0.001
Dyadic adjustment	0–69	45.17 (12.56)	0.60	0.009	<0.001
Support gap (received–expected)		−2.13 (4.94)	−1.92	0.32	<0.001
Received support	5–25	18.45 (5.62)			
Expected support	5–25	20.57 (5.32)			
Communal coping	7–35	28.25 (5.58)			

RG, reference group.

TABLE 2 Results of multivariable logistic regression analysis considering communal coping as a dependent variable.

	Unstandardized coefficients		Standardized coefficients	Sig.	95.0% confidence interval for B	
	B	Std. error	Beta		Lower bound	Upper bound
Dyadic adjustment	0.45	0.02	0.73	<0.001	0.41	0.48
Psychological distress	0.18	0.04	0.16	<0.001	0.10	0.26
Fear of COVID-19	0.16	0.06	0.11	0.006	0.05	0.27
Support gap	−0.20	0.07	−0.04	0.009	−0.34	−0.05
Model summary	R: 0.98; R^2: 0.96; Adjusted R^2: 0.96; Durbin-Watson: 2.08					

variables. In communal coping, individuals deal with the shared appraisal of the current situation and then try to cope with the situation with collaborative action. Working during the COVID-19 pandemic among healthcare professionals can lead to increased psychological distress due to increased exposure to COVID-19 and an increased risk of personal injury.

The sudden onset of the COVID-19 pandemic put considerable pressure on healthcare professionals (Liu et al., 2012). Studies have also shown an increase in psychological distress, depression, anxiety, and stress among healthcare professionals during the COVID-19 pandemic (Levin, 2019; Wang et al., 2020). In addition to high stress associated with constant exposure to COVID-19 patients, healthcare professionals have also been concerned about maintaining their own and their families' health (Medic et al., 2017). Despite extensive research, no previous study has examined the status of marital variables among healthcare professionals during the COVID-19 pandemic. In previous studies, an inverse relationship was reported between communal coping and psychological distress (Berg et al., 2008; Karan et al., 2019), which was inconsistent with the results of the present study. The main difference between the present study and these studies may be that in previous studies, participants' psychological distress was due to one of the types of chronic diseases that have no cure and the individual may be affected for the rest of their life. However, in the present study, psychological distress

was likely caused by a person's work conditions that were not stable. According to the results of the present study, it appears that when individuals have higher dyadic adjustment, in the face of critical situations such as the COVID-19 pandemic, which in particular increases the risk of disease for healthcare professionals and their families, receive more support from their spouses and show better coping.

The present study showed a negative and significant relationship between support gap by the spouse and communal coping. This means that with increasing support gap from the spouse, communal coping decreased significantly. Existence of a significant inverse relationship between spouses' support gap and communal coping in line with other findings of present study point to the importance of intimate relationships between spouses to achieve a better situation in communal coping during a crisis.

Strengths and limitations

To the best of the present authors' knowledge, the study here is one of the first to examine communal coping of healthcare workers working during the COVID-19 pandemic. Some of strengths of the current study are appropriate sample size, variation in participants based on the working status as healthcare professionals, and application of both univariable

and multi-variable statistical analyses. In interpreting the findings of the present study, its limitations should be considered. Using self-report measures and lack of dyadic data collection are among the limitations of the present study. Having a cross-sectional design means the precedence and latency of the relationship between the variables are unclear. Due to the pandemic, the aim of the present study was to evaluate the status of communal coping among healthcare professionals, but due to the cross-sectional nature of the study, the causal relationship between the variables cannot be assessed. Another limitation was that in the present study, dyadic adjustment was examined only among married couples and relationships with a partner other than the spouse could not be examined due to the cultural conditions of the Iranian community.

Conclusion

Results of the present study indicated that healthcare professionals coped communally in the family in dealing with working during the COVID-19 pandemic. Dyadic adjustment was the strongest independent variable that predicted communal coping among healthcare professionals working during the pandemic of COVID-19. Given that marital adjustment was the strongest predictor of communal coping, it seems that preventive interventions to promote marital relationships by family consultants or psychologists can act as a positive reinforcer to promote communal coping. The stress of healthcare professionals was exacerbated by special circumstances such as the COVID-19 pandemic. Even in non-pandemic situations, the nature of work related to providing health services is stressful, and strengthening couples' relationships as a buffer will help individuals in the face of adversity. The present study showed that social domain of coping should be taken into consideration in the context of collective stressors.

Data availability statement

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

Ethics statement

The studies involving human participants were reviewed and approved by the Ethical committee affiliated with Qazvin University of Medical Sciences. The participants provided their written informed consent to participate in this study.

Author contributions

Funding

Acknowledgments

Conflict of interest

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

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Afifi, T. D., Afifi, W. A., Acevedo Callejas, M., Shahnazi, A., White, A., and Nimah, N. (2019). The functionality of communal coping in chronic uncertainty environments: the context of palestinian refugees in lebanon. *Health Commun.* 34, 1585–1596. doi: 10.1080/10410236.2018.1514682

Afifi, T. D., Hutchinson, S., and Krouse, S. (2006). Toward a theoretical model of communal coping in postdivorce families and other naturally occurring groups. *Commun. Theory* 16, 378–409.

Afifi, W. A., Felix, E. D., and Afifi, T. D. (2012). The impact of uncertainty and communal coping on mental health following natural disasters. *Anxiety Stress Coping* 25, 329–347. doi: 10.1080/10615806.2011.603048

Ahorsu, D. K., Lin, C.-Y., Imani, V., Saffari, M., Griffiths, M. D., and Pakpour, A. H. (2020). The fear of COVID-19 scale: development and initial validation. *Int. J. Mental Health Addict.* 2020, 1–9.

Berg, C. A., Wiebe, D. J., Butner, J., Bloor, L., Bradstreet, C., Upchurch, R., et al. (2008). Collaborative coping and daily mood in couples dealing with prostate cancer. *Psychol. Aging* 23:505.

Bodenmann, G., Pihet, S., Shantinath, S. D., Cina, A., and Widmer, K. (2006). Improving dyadic coping in couples with a stress-oriented approach: a 2-year longitudinal study. *Behav. Modificat.* 30, 571–597. doi: 10.1177/0145445504269902

Busby, D. M., Christensen, C., Crane, D. R., and Larson, J. H. (1995). A revision of the dyadic adjustment scale for use with distressed and nondistressed couples: construct hierarchy and multidimensional scales. *J. Marit. Family Ther.* 21, 289–308.

Drapeau, A., Marchand, A., and Beaulieu-Prévost, D. (2012). Epidemiology of psychological distress. *Mental Illnesses Understand. Predict. Control* 69, 105–106.

Durtschi, J. A., Fincham, F. D., Cui, M., Lorenz, F. O., and Conger, R. D. (2011). Dyadic processes in early marriage: attributions, behavior, and marital quality. *Family Relat.* 60, 421–434. doi: 10.1111/j.1741-3729.2011.00655.x

Fino, E., Fino, V., Bonfrate, I., Russo, P. M., and Mazzetti, M. (2021). Helping patients connect remotely with their loved ones modulates distress in healthcare workers: tend-and-befriend hypothesis for COVID-19 front liners. *Eur. J. Psychotraumatol.* 12:1968141. doi: 10.1080/20008198.2021.1968141

Green, S. B. (1991). How many subjects does it take to do a regression analysis. *Multiv. Behav. Res.* 26, 499–510. doi: 10.1207/s15327906mbr2603_7

Isanezhad, O., Ahmadi, S.-A., Bahrami, F., Baghban-Cichani, I., Farajzadegan, Z., and Etemadi, O. (2012). Factor structure and reliability of the revised dyadic adjustment scale (RDAS) in iranian population. *Iran J. Psychiatry Behav. Sci.* 6, 55–61.

Karan, A., Rosenthal, R., and Robbins, M. L. (2019). Meta-analytic evidence that we-talk predicts relationship and personal functioning in romantic couples. *J. Soc. Personal Relat.* 36, 2624–2651.

Kellar, S. P., and Kelvin, E. A. (2013). *Munro's Statistical Methods For Health Care Research*. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., et al. (2003). Screening for serious mental illness in the general population. *Arch. General Psychiatry* 60, 184–189.

Koehly, L. M., Peters, J. A., Kuhn, N., Hoskins, L., Letocha, A., Kenen, R., et al. (2008). Sisters in hereditary breast and ovarian cancer families: communal coping, social integration, and psychological well-being. *Psychoncology* 17, 812–821. doi: 10.1002/pon.1373

Lawrence, A. R., and Schiller Schigelone, A. R. (2002). Reciprocity beyond dyadic relationships: aging-related communal coping. *Res. Aging* 24, 684–704.

Levin, J. (2019). Mental health care for survivors and healthcare workers in the aftermath of an outbreak. *Psychiatry Pand.* 2019, 127–141. doi: 10.1056/NEJMoa0903326

Liu, X., Kakade, M., Fuller, C. J., Fan, B., Fang, Y., Kong, J., et al. (2012). Depression after exposure to stressful events: lessons learned from the severe acute respiratory syndrome epidemic. *Comprehensive psychiatry* 53, 15–23. doi: 10.1016/j.comppsych.2011.02.003

Lyons, R. F., Mickelson, K. D., Sullivan, M. J. L., and Coyne, J. C. (1998). Coping as a communal process. *J. Soc. Personal Relationships* 15, 579–605.

Manyam, S. B., and Junior, V. Y. (2014). Marital adjustment trend in Asian Indian families. *Journal of Couple & Relationship Therapy.* 13, 114–132.

Medic, G., Wille, M., and Hemels, M. E. (2017). Short-and long-term health consequences of sleep disruption. *Nat. Sci. Sleep* 9:151.

Monnier, J., and Hobfoll, S. E. (1997). Crossover effects of communal coping. *J. Soc. Personal Relationships* 14, 263–270.

NasrollahiMola, N., Bahrami, N., Ranjbaran, M., and Alimoradi, Z. (2020). Predictors of sexual assertiveness in a sample of Iranian married women of reproductive age. *Sexual Relat. Ther.* 2020, 1–13.

O'Brien, T. B., and DeLongis, A. (1997). "Coping with chronic stress," in *Coping with Chronic Stress*, ed. B. H. Gottlieb (Boston, MA: Springer), 161–190. doi: 10.1007/978-1-4757-9862-3_6

Rentscher, K. E. (2019). Communal coping in couples with health problems. *Front. Psychol.* 10:398.

Smith, R. A., Sillars, A., Chesnut, R. P., and Zhu, X. (2018). Investigating married adults' communal coping with genetic health risk and perceived discrimination. *Commun. Monogr.* 85, 181–202. doi: 10.1080/03637751.2017.1404618

Umberson, D., Williams, K., Powers, D. A., Chen, M. D., and Campbell, A. M. (2005). As good as it gets? A life course perspective on marital quality. *Soc. Forces* 84, 493–511. doi: 10.1353/sof.2005.0131

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., et al. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int. J. Environ. Res. Public Health* 17:1729. doi: 10.3390/ijerph17051729

Wlodarczyk, A., Basabe, N., Páez, D., Reyes, C., Villagrán, L., Madariaga, C., et al. (2016). Communal coping and posttraumatic growth in a context of natural disasters in spain, chile, and colombia. *Cross Cult. Res.* 50, 325–355.

Wu, W., Zhang, Y., Wang, P., Zhang, L., Wang, G., Lei, G., et al. (2020). Psychological stress of medical staffs during outbreak of COVID-19 and adjustment strategy. *J. Med. Virol.* 92, 1962–1970.

Xu, Y., and Burleson, B. R. (2001). Effects of sex, culture, and support type on perceptions of spousal social support: an assessment of the "support gap" hypothesis in early marriage. *Hum. Commun. Res.* 27, 535–566.

Yaghubi, H. (2016). Psychometric properties of the 10 questions version of the kessler psychological distress scale (K-10). *Appl. Psychol. Res. Quart.* 6, 45–57.

Check for updates

Relations among perceived stress, fatigue, and sleepiness, and their effects on the ambulatory arterial stiffness index in medical staff: A cross-sectional study

Xiaorong Lang[1,2†], Quan Wang[1,2†], Sufang Huang[2]*, Danni Feng[1], Fengfei Ding[3] and Wei Wang[2]

[1]School of Nursing, Tongji Medical College of Huazhong University of Science and Technology; Tongji Hospital Affiliated with Tongji Medical College of Huazhong University of Science and Technology, Wuhan, China, [2]Tongji Hospital Affiliated with Tongji Medical College of Huazhong University of Science and Technology, Wuhan, China, [3]Department of Pharmacology, Fudan University Basic Medicine College, Shanghai, China

Objective: To explore the relations among perceived stress, fatigue, sleepiness, and the pathway of their effects on the ambulatory arterial stiffness index (AASI) among medical staff.

Methods: This cross-sectional study was conducted at a tertiary hospital in Wuhan, China. Perceived stress, fatigue, and sleepiness were measured using the perceived stress scale (PSS), Fatigue assessment scale (FAS), and Epworth Sleepiness Scale (ESS), respectively. AASI was obtained from 24-h ambulatory blood pressure monitoring. Path analysis was used to clarify the relations among the PSS, FAS, and ESS scores, and their relations to AASI values.

Results: A total of 153 participants were included herein. The PSS and FAS correlated with the ESS ($r=0.424$, $p<0.001$), and the PSS correlated with the FAS ($r=0.614$, $p<0.001$). In addition, the ESS correlated with the AASI ($r=0.225$, $p=0.005$). According to the path analysis results, the PSS and FAS had no direct effect on the AASI, but did have an indirect effect on this index ($\beta=0.059$, 95% confidence interval [CI]$=0.017−0.128$, $p=0.005$; $\beta=0.059$, 95%CI$=0.016−0.135$, $p=0.006$, respectively) by influencing the ESS ($\beta=0.263$, $\beta=0.262$, $p=0.004$).

Conclusion: Sleepiness was a mediator of the effects of perceived stress and fatigue on AASI.

Introduction

As the main providers of medical services, medical staff have primary responsibility for patient recovery. The coronavirus disease of 2019 (COVID-19), which initially broke out in December 2019, has negatively impacted many countries, dramatically changed people's lives, and increased work challenges for medical staff (Haleem et al., 2020). Social and work environment risk factors can have profound adverse effects on mental health among hospital staff (Greenberg et al., 2020; Kapetanos et al., 2021; Saeed et al., 2021). One epidemiological survey showed that medical workers in China displayed significant psychological disturbance including anxiety symptoms, depression symptoms, stress-related symptoms, and sleep problems, with aggregate prevalence rates of 27.0, 26.2, 42.1, and 34.5%, respectively, during the COVID-19 outbreak (Zhang et al., 2021). Moreover, the COVID-19 pandemic can now also be considered a chronic stressor for medical staff, with multiple negative effects that include an unsustainable workload, excessive financial hardship, and fear of uncertainty regarding continued impact (Gupta et al., 2021). Therefore, psychological disorders among medical staff may be persistent, and attention should be paid to their mental health.

Perceived stress, defined as "the degree to which situations in one's life are appraised as stressful," refers to feelings of unpredictability, uncontrollability, and overload (Lehrer et al., 2020). One study found a prevalence of high perceived stress as high as 56% among medical staff in the COVID-19 context (Yan et al., 2021). Physiologically, high stress levels activate the autonomic nervous system and hypothalamic–pituitary–adrenal axis, reduce immunity, and increase inflammatory cytokines, which can lead to physiological changes, including cardiovascular system and sleep behavior alterations (Kemeny, 2003). Furthermore, higher perceived stress is associated with sleepiness and can lead to risk for adverse cardiovascular outcomes (Cummings et al., 2016; Valente et al., 2019).

Sleepiness, a consequence of disordered, poor, and insufficient sleep, is defined in the MeSH database as a compelling urge to sleep. The main causes of sleepiness are social environment (e.g., the COVID-19 pandemic), psychological distress, poor mental health, insufficient sleep, and disease (e.g., obstructive sleep apnea) (Becerra et al., 2022; Thorarinsdottir et al., 2022). A link between daytime sleepiness and cardiovascular diseases, including hypertension and stroke—which are related to arterial stiffness—is well established (Yang et al., 2022).

The ambulatory arterial stiffness index (AASI), defined as 1 minus the regression slope of blood pressure (BP) values obtained by 24-h ambulatory BP monitoring (ABPM), is a relatively new indicator of arterial stiffness (Li et al., 2006). In addition to reflecting degree of atherosclerosis, AASI can predict subclinical left ventricular (LV) systolic dysfunction and is an independent predictor of major adverse cardiovascular events (Ahmed et al.,

2020; Boos et al., 2021). It is thus considered an important and promising risk prediction tool.

Fatigue, defined as "a subjectively unpleasant symptom that incorporates total body feelings ranging from tiredness to exhaustion, creating an unrelenting overall condition which interferes with individuals' ability to function at normal capacity" (Ream and Richardson, 1996), is common among medical staff due to their work environment and pressures. Chronic fatigue and adverse cardiovascular events are associated (Naess et al., 2005) and fatigue is linked to sleepiness (Kim et al., 2019), which indicates poor health (Becerra et al., 2022). Thus, fatigue may also lead to a decline in work quality among medical staff. Moreover, the positive association between higher perceived stress and greater fatigue symptoms is also well-established (Wang et al., 2021). Cumulatively, fatigue may moderate the relation between perceived stress and sleepiness; it may also moderate the indirect effects of perceived stress on AASI, through sleepiness.

Although numerous studies have examined perceived stress, fatigue, and drowsiness among health professionals, to our knowledge none have linked these factors to AASI. Therefore, our aim was to clarify the associations among perceived stress, fatigue, and drowsiness, and their relations to AASI. We proposed the following hypotheses: (1) perceived stress, fatigue, and sleepiness are intercorrelated; (2) perceived stress and fatigue affect sleepiness; (3) sleepiness affects AASI; (4) perceived stress and fatigue directly and/or indirectly affect AASI; and (5) sleepiness mediates the effects of perceived stress and fatigue on AASI.

Materials and methods

Study design

This cross-sectional study was conducted at two large general hospitals in Wuhan, China. This study was approved by the Ethics Committee of the Tongji Medical College of Huazhong University of Science and Technology, with IRB approval number 2021S141.

Participants and procedures

Participants, selected by convenience sampling, were asked to fill out questionnaires and scales through the Research Electric Data Capture platform. They were invited to participate if they: (1) did not have any plans to leave their current position within 6 months; (2) had no serious medical condition (e.g., cancer, stroke); and (3) were willing to participate and sign the informed consent form. All participants were informed of the study aims and methods to maintain authenticity and anonymity before they signed informed consent.

Sample size calculation

We used an online site[1] based on Andrew Fisher's formula to estimate the required sample size for sufficient power. According to a previous study, the average standard deviation of AASI values ranges from 0.06 to 0.22 in the general population (i.e., those with or without cardiovascular diseases) (Kollias et al., 2012). Based on this, we calculated the needed sample size as between 86 and 264 using the formula (sample size= $\frac{Z_\alpha^2 * SD * (1 - SD)}{d^2}$) and a 95% confidence level [CI].

Questionnaires

A structured, standard questionnaire was used to collect medical staff demographics, including age, gender, educational level, marital status, job station, working years, and number of hours worked per week. Body mass index (BMI) was calculated based on participants' self-reported weight and height, and clinically diagnosed diseases and subjective health status were assessed by specific questions.

Perceived stress scale

The perceived stress scale (PSS) is a widely used 14-item instrument that assesses stress levels in young people and adults aged 12 and above. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The questions in the PSS ask about feelings and thoughts during the last month. The overall score ranges from 0 to 56. A score of ≥28 indicates at least moderate stress and higher scores indicate greater perceived stress (Rebello et al., 2018). The Cronbach's α for this scale is 0.830 among a Chinese population (Huang et al., 2020). Herein, the Cronbach's α was 0.835.

Fatigue assessment scale

The Fatigue assessment scale (FAS) is a 10-item self-report scale evaluating symptoms of chronic fatigue. The FAS treats fatigue as a unidimensional construct and does not separate its measurement into different factors. However, to ensure that the scale evaluates all aspects of fatigue, it measures both physical and mental symptoms. The total score ranges from 10 to 50 and higher scores indicate worse fatigue. Scores between 22 and 35 are classified as moderate fatigue, and those >35 indicate substantial fatigue (De Vries et al., 2004; Hendriks et al., 2018). The Cronbach's α for the Chinese version of the FAS is 0.71–0.82 (Ho et al., 2021).

Herein, the Cronbach's α was 0.883, indicating highly satisfactory internal reliability.

Epworth sleepiness scale

The Epworth sleepiness scale (ESS), developed at Epworth Hospital in Melbourne, Australia, is an 8-item self-administered questionnaire. Its psychometric properties have been widely investigated. With a score range of 0–24, higher ESS scores indicate greater daytime sleepiness, or a higher sleep propensity, in daily life. A score of >6 points indicates daytime sleepiness and >10 points indicates excessive daytime sleepiness (Johns and Hocking, 1997). The Cronbach's α for the Mandarin version of the ESS is 0.80 (Wu et al., 2012). Herein, the Cronbach's α was 0.768, confirming its reliability.

Ambulatory arterial stiffness index

The AASI is defined as 1 minus the regression slope of diastolic on systolic BP values obtained from 24-h ABPM. ABPM was performed using a noninvasive ABPM instrument manufactured by a durable medical supply company in Beijing, China. BP readings were obtained at 30-min intervals during the daytime (6:30–22:00) and at 60-min intervals during the nighttime (22:00–6:30 the next day). Of the total readings, ≥80% were considered valid. AASI was computed using the formula:

$$AASI = 1 - slope\left(systolic\ BP\ /\ diastolic\ BP\right)$$

Statistical analysis

SPSS version 26.0 was used to calculate descriptive statistics and run correlation analyses. A value of $p < 0.05$ (two-tailed) was considered statistically significant. AMOS version 26.0 was used to run path analyses, a subset of structural equation modeling (SEM) used to estimate and assess direct, indirect, and mediation effects among variables, with maximum likelihood estimations for testing our hypothesis. Multiple fit indicators were used to evaluate the model, with the qualified criteria: $\chi^2/df < 3$, GFI > 0.90, RMSEA < 0.05, RMR < 0.05, CFI > 0.90, NFI > 0.90, and NNFI > 0.90 (Xia and Yang, 2019). The bias-corrected bootstrap confidence interval with 5,000 bootstrap samples was used to evaluate the significance of indirect effects.

Results

Participant characteristics

A total of 153 participants were included in the study. Their mean age was 30.46 ± 10.46 years and the sample

---

1 https://www.geopoll.com/blog/sample-size-research/

included 88 (57.52%) nurses, 37 (24.18%) physicians, and 28 (18.30%) other health workers. Table 1 shows detailed characteristics.

Descriptive data, correlations, and multi-collinearity

According to Table 2, average scores were 31.16 ± 6.83 for the PSS, 30.42 ± 5.95 for the FAS, and 8.84 ± 3.99 for the ESS. The AASI values were 0.38 ± 0.19. As presented in Table 3, both the PSS and FAS were correlated with the ESS ($r = 0.424$, $p < 0.001$) and the PSS was correlated with the FAS ($r = 0.614$, $p < 0.001$). In addition, the ESS was correlated with the AASI ($r = 0.225$, $p = 0.005$). Though intercorrelations were strong, VIF values were < 5 and tolerance values were > 0.2, indicating no multi-collinearity between variables.

TABLE 1 Participant characteristics.

Characteristic	Category	N (mean)	% (SD)
Age		30.46	10.46
Gender	Male	38	24.84
	Female	115	75.16
Educational level	Undergraduate or below	15	9.80
	Postgraduate or above	138	90.20
Marital status	Unmarried	43	28.10
	Married	110	71.90
Station	Nurse	88	57.52
	Physician	37	24.18
	Other healthcare workers	28	18.30
Years working		9.67	6.38
Weekly working hours		46.55	11.49
Working night shift	No	15	9.80
	Yes	138	90.20
BMI		19.87	6.81
Diagnosed illness	No	128	83.66
	Yes	25	16.34
Self-perceived health level	Poor	33	21.57
	So-so	101	66.01
	Good	19	12.42

TABLE 2 PSS, FAS, ESS, and AASI values.

Variable	Mean	SD
PSS	31.16	6.83
FAS	30.42	5.95
ESS	8.84	3.99
AASI	0.38	0.19

Path analysis

We first considered a model with the ESS as a partial mediator, that is, that the PSS and FAS affect the AASI both directly and through the ESS. However, the analysis showed that neither the PSS ($\beta = 0.121$, $p = 0.235$) nor the FAS ($\beta = -0.151$, $p = 0.139$) had a significant effect on the ESS, which was represented by dashed lines in Figure 1, indicating a lack of support for the partial mediation model. Thus, the analysis was repeated with the ESS as a full mediator. The level of fit for this mediating model was satisfactory: $\chi^2/df = 1.199$; GFI = 0.992; RMSEA = 0.036; RMR = 0.028; CFI = 0.997; NFI = 0.980; and NNFI = 0.927. The final model diagram and effects estimate are shown in solid lines in Figure 1 and Table 4. The PSS and FAS directly affected the ESS ($\beta = 0.263$, $\beta = 0.262$, respectively, both $p = 0.004$). The ESS directly affected the AASI ($\beta = 0.225$, $p = 0.004$). The PSS and FAS had indirect effects on the AASI ($\beta = 0.059$, 95%CI = 0.017–0.128, $p = 0.005$; $\beta = 0.059$, 95%CI = 0.016–0.135, $p = 0.006$, respectively), and the ESS mediated the PSS and FAS.

Discussion

Herein, we found that perceived stress, fatigue, and sleepiness are common among medical staff. About 58.17% of our sample had at least moderate stress, and 36.64% had excessive daytime sleepiness, similar to previous reports (Busch et al., 2021; Kowalczuk et al., 2021). Furthermore, 92.16% reported at least moderate fatigue, which may be due to the fact that 75.16% of our study was female. Certain sex-specific physiologic factors (e.g., menstruation, contraception) and social background combined with living conditions (e.g., balancing employment and childcare) can cause women to report fatigue more often compared with men (Bensing et al., 1999). Hence it is important to focus on mental health among medical staff, especially in the COVID-19 context.

Perceived stress, fatigue, and sleepiness were significantly intercorrelated, and perceived stress and fatigue were both positively related to sleepiness, supporting our first two hypotheses. These findings are also theoretically sound. According to Hans Selye, stress is the non-specific response to environmental stimuli, including general adaptation syndrome and local adaptation syndrome (Selye, 1976). General adaptation disorders include several common symptoms and signs, including fatigue, sleep problems, and gastrointestinal syndrome (Selye, 1998). The effect of fatigue on sleepiness might be *via* inhibition of the central nervous system. An accumulation of brain adenosine causes tiredness, which, with further sleep deprivation, can manifest as mental exhaustion. This feedback loop can lead to the central nervous system activating protective mechanisms to avoid further damage from excessive fatigue, activating movement and nerve inhibition and a decline in physical vitality, or a tired response (Martin et al., 2018). Fatigue has an inhibitory effect on neurons, leading to

TABLE 3 Correlations and multi-collinearity values for PSS, FAS, ESS, and AASI.

Variables	PSS	*p*-Value	FAS	*p*-Value	ESS	*p*-Value	VIF	Tolerance
PSS	1						1.695	0.590
FAS	0.614	< 0.001	1				1.695	0.590
ESS	0.424	< 0.001	0.424	< 0.001	1		1.287	0.777
AASI	0.129	0.111	0.024	0.765	0.225	< 0.001	–	–

FIGURE 1
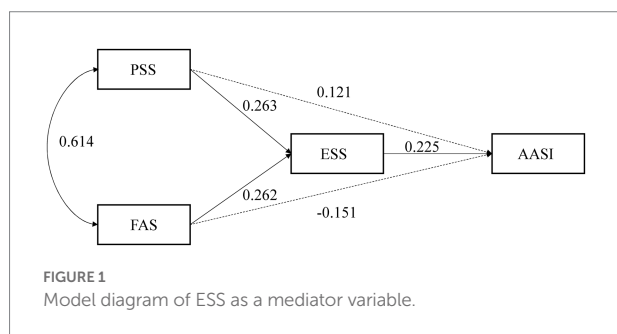Model diagram of ESS as a mediator variable.

TABLE 4 Effects estimate of hypothesized model (standardized coefficients).

Structural path	Direct effect	*p*-Value	Indirect effect (95%CI)	*p*-Value
PSS → ESS	0.263	0.004	–	–
FAS → ESS	0.262	0.004	–	–
ESS → AASI	0.225	0.004	–	–
PSS → AASI	–	–	0.059 (0.017–0.128)	0.005
FAS → AASI	–	–	0.059 (0.016–0.135)	0.006

difficulty with maintaining active cognitive regulation; consequently, neuroendocrine interactions help systematically reallocate cognitive resources in response to stress (Hermans et al., 2014). This leads to the long-term experience of negative emotions; the significant burden of stress on cognitive emotion regulation may thus increase stress-related emotional sensitivity and intensity (Weymar et al., 2012).

Moreover, the mean ESS score among our participants was 8.84 points; that it was >6 indicates common daytime sleepiness among these medical staff. Daytime sleepiness is associated with development of cardiometabolic disease (Qureshi et al., 1997; Newman et al., 2000; Jia et al., 2022), consistent with our result and supporting our third hypothesis. In terms of mechanism of action, sleep disorders diminish nitric oxide bioavailability to impair nitric oxide-mediated endothelial-dependent vasodilation, leading to a hardening of the arteries and increased risk of cardiovascular disease (Bain et al., 2017).

However, we did not find direct effects of either perceived stress or fatigue on AASI. Previous studies have also found inconsistent relations between perceived stress and cardiovascular reactivity (Klatzkin et al., 2019). For example, Steptoe and Kivimäki reviewed the literature to find an inconclusive relation between stress and stroke; in particular, self-reported stress was not a strong predictor of stroke (Steptoe and Kivimäki, 2013). Yet it is worth noting that there is a gender difference in the association between fatigue and cardiovascular disease, with a stronger causal relation in males than in females (Honkonen et al., 2006), which might explain why fatigue did not directly affect AASI in our study.

Though the average PSS score herein was 31.16, representing moderate stress, we believe the lack of association with AASI may be due to the fact that our participants are relatively young and thus have some regulatory flexibility to reduce the cumulative

burden of stress, so that it did not translate directly to cardiovascular risk. Another possibility is that, consistent with Dienstbier's model of physiological resilience, exposure to moderate life stress may cause individuals to adapt or 'toughen' and show an adaptive physiological response to acute challenges, and then recover relatively quickly (Dienstbier, 1989). Although the average FAS score herein was 30.42, indicating moderate fatigue among these medical staff, most participants were women. The effects of fatigue on the cardiovascular system is due to a chronic, long-term process (i.e., unexplained fatigue lasting at least 6 months) (Natelson et al., 2021), possibly explaining why fatigue in our sample did not have a significant direct effect on AAS. Thus, the current perceived stress and fatigue among this sample may not pose a health threat.

Nevertheless, the effect of a stress–fatigue interaction on health should not be ignored. According to our SEM analysis, fatigue played a moderating role between perceived stress and sleepiness, and also influenced AASI indirectly *via* sleepiness symptoms. If we consider AASI as a predictor of LV systolic dysfunction, medical staff who are both stressed and fatigued may be at higher risk for developing cardiovascular disease. Therefore, hospital administrators and managers should consider monitoring stress and fatigue symptoms among their medical staff, and then implementing effective interventions.

There were some study limitations. First, ours was a single-center study at a tertiary hospital, which may limit its generalizability. It will therefore be necessary to carry out multicenter studies, including multi-level hospitals, to draw more accurate conclusions. Second, this was a cross-sectional study, so that causation will need to be established with future prospective studies. Finally, though based on an *a priori* power analysis, our

sample size was still relatively small and future studies should include larger samples.

Conclusion

The findings herein indicate that perceived stress, fatigue, and sleepiness are significantly intercorrelated, and that fatigue has a positive effect on perceived stress. Furthermore, while sleepiness has a significant effect on AASI, neither perceived stress nor fatigue have direct effects on AASI. Cumulatively, sleepiness is an intermediate variable between AASI and both perceived stress and fatigue.

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 Tongji Medical College of Huazhong University of Science and Technology. The patients/participants provided their written informed consent to participate in this study.

Author contributions

XL performed the data analysis, drafted the initial manuscript, and made subsequent revisions. QW designed the study and revised the manuscript. SH reviewed and provided feedback on the manuscript. DF was involved in data collection. FD and WW led the development and advancement of the research project. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that this study received funding from HUAWEI Technologies Terminal Co., Ltd. The funder had the following involvement with the study: device support.

Other funders were not involved in the study design, collection, analysis, interpretation of data, the writing of this article or the decision to submit it for publication.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Ahmed, T., Shams-Eddin, H., Fathy, M. A., El-Naggar, H. M., and Kishk, Y. T. (2020). Subclinical left ventricular systolic dysfunction by two-dimensional speckle-tracking echocardiography and its relation to ambulatory arterial stiffness index in hypertensive patients. *J. Hypertens.* 38, 864–873. doi: 10.1097/HJH.0000000000002330

Bain, A. R., Weil, B. R., Diehl, K. J., Greiner, J. J., Stauffer, B. L., and DeSouza, C. A. (2017). Insufficient sleep is associated with impaired nitric oxide-mediated endothelium-dependent vasodilation. *Atherosclerosis* 265, 41–46. doi: 10.1016/j.atherosclerosis.2017.08.001

Becerra, M. B., Gumasana, R. J., Mitchell, J. A., Truong, J. B., and Becerra, B. J. (2022). COVID-19 pandemic-related sleep and mental health disparities among students at a hispanic and minority-serving institution. *Int. J. Environ. Res. Public Health* 19, 1–10. doi: 10.3390/ijerph19116900

Bensing, J. M., Hulsman, R. L., and Schreurs, K. M. (1999). Gender differences in fatigue: biopsychosocial factors relating to fatigue in men and women. *Med. Care* 37, 1078–1083. doi: 10.1097/00005650-199910000-00011

Boos, C. J., Thiri-Toon, L., Steadman, C. D., Khambekar, S., Jordan, A., and Carpenter, J. P. (2021). The relationship between ambulatory arterial stiffness index and cardiovascular outcomes in women. *Cardiol Res.* 12, 161–168. doi: 10.14740/cr1189

Busch, I. M., Moretti, F., Mazzi, M., Wu, A. W., and Rimondini, M. (2021). What we have learned from two decades of epidemics and pandemics: a systematic review and meta-analysis of the psychological burden of frontline healthcare workers. *Psychother. Psychosom.* 90, 178–190. doi: 10.1159/000513733

Cummings, D. M., Kirian, K., Howard, G., Howard, V., Yuan, Y., Muntner, P., et al. (2016). Consequences of comorbidity of elevated stress and/or depressive symptoms and incident cardiovascular outcomes in diabetes: results from the reasons for geographic and racial differences in stroke (regards) study. *Diabetes Care* 39, 101–109. doi: 10.2337/dc15-1174

De Vries, J., Michielsen, H., Van Heck, G. L., and Drent, M. (2004). Measuring fatigue in sarcoidosis: the fatigue assessment scale (fas). *Br. J. Health Psychol.* 9, 279–291. doi: 10.1348/1359107041557048

Dienstbier, R. A. (1989). Arousal and physiological toughness: implications for mental and physical health. *Psychol. Rev.* 96, 84–100. doi: 10.1037/0033-295x.96.1.84

Greenberg, N., Docherty, M., Gnanapragasam, S., and Wessely, S. (2020). Managing mental health challenges faced by healthcare workers during COVID-19 pandemic. *BMJ* 368:m1211. doi: 10.1136/bmj.m1211

Gupta, N., Dhamija, S., Patil, J., and Chaudhari, B. (2021). Impact of COVID-19 pandemic on healthcare workers. *Ind. Psychiatry J.* 30, S282–S284. doi: 10.4103/0972-6748.328830

Haleem, A., Javaid, M., and Vaishya, R. (2020). Effects of COVID-19 pandemic in daily life. *Curr. Med. Res. Pract.* 10, 78–79. doi: 10.1016/j.cmrp.2020.03.011

Hendriks, C., Drent, M., Elfferich, M., and De Vries, J. (2018). The fatigue assessment scale: quality and availability in sarcoidosis and other diseases. *Curr. Opin. Pulm. Med.* 24, 495–503. doi: 10.1097/MCP.0000000000000496

Hermans, E. J., Henckens, M. J., Joëls, M., and Fernández, G. (2014). Dynamic adaptation of large-scale brain networks in response to acute stressors. *Trends Neurosci.* 37, 304–314. doi: 10.1016/j.tins.2014.03.006

Ho, L., Lai, C., and Ng, S. (2021). Measuring fatigue following stroke: the chinese version of the fatigue assessment scale. *Disabil. Rehabil.* 43, 3234–3241. doi: 10.1080/09638288.2020.1730455

Honkonen, T., Ahola, K., Pertovaara, M., Isometsä, E., Kalimo, R., Nykyri, E., et al. (2006). The association between burnout and physical illness in the general population--results from the finnish health 2000 study. *J. Psychosom. Res.* 61, 59–66. doi: 10.1016/j.jpsychores.2005.10.002

Huang, F., Wang, H., Wang, Z., Zhang, J., Du, W., Su, C., et al. (2020). Psychometric properties of the perceived stress scale in a community sample of Chinese. *BMC Psychiatry* 20:130. doi: 10.1186/s12888-020-02520-4

Jia, Y., Guo, D., Sun, L., Shi, M., Zhang, K., Yang, P., et al. (2022). Self-reported daytime napping, daytime sleepiness, and other sleep phenotypes in the development of cardiometabolic diseases: a mendelian randomization study. *Eur. J. Prev. Cardiol.* 1–10. doi: 10.1093/eurjpc/zwac123

Johns, M., and Hocking, B. (1997). Daytime sleepiness and sleep habits of australian workers. *Sleep* 20, 844–847. doi: 10.1093/sleep/20.10.844

Kapetanos, K., Mazeri, S., Constantinou, D., Vavlitou, A., Karaiskakis, M., Kourouzidou, D., et al. (2021). Exploring the factors associated with the mental health of frontline healthcare workers during the COVID-19 pandemic in Cyprus. *PLoS One* 16:e258475. doi: 10.1371/journal.pone.0258475

Kemeny, M. E. (2003). The psychobiology of stress. *Curr. Dir. Psychol. Sci.* 12, 124–129. doi: 10.1111/1467-8721.01246

Kim, S. J., Kim, S., Jeon, S., Leary, E. B., Barwick, F., and Mignot, E. (2019). Factors associated with fatigue in patients with insomnia. *J. Psychiatr. Res.* 117, 24–30. doi: 10.1016/j.jpsychires.2019.06.021

Klatzkin, R. R., Baldassaro, A., and Rashid, S. (2019). Physiological responses to acute stress and the drive to eat: the impact of perceived life stress. *Appetite* 133, 393–399. doi: 10.1016/j.appet.2018.11.019

Kollias, A., Stergiou, G. S., Dolan, E., and O'Brien, E. (2012). Ambulatory arterial stiffness index: a systematic review and meta-analysis. *Atherosclerosis* 224, 291–301. doi: 10.1016/j.atherosclerosis.2012.03.039

Kowalczuk, K., Krajewska-Kułak, E., and Sobolewski, M. (2021). Relationships between sleep problems and stress coping strategies adopted by nurses including socio-occupational factors. *Front. Psych.* 12:660776. doi: 10.3389/fpsyt.2021.660776

Lehrer, H. M., Steinhardt, M. A., Dubois, S. K., and Laudenslager, M. L. (2020). Perceived stress, psychological resilience, hair cortisol concentration, and metabolic syndrome severity: a moderated mediation model. *Psychoneuroendocrino.* 113:104510. doi: 10.1016/j.psyneuen.2019.104510

Li, Y., Wang, J. G., Dolan, E., Gao, P. J., Guo, H. F., Nawrot, T., et al. (2006). Ambulatory arterial stiffness index derived from 24-hour ambulatory blood pressure monitoring. *Hypertension* 47, 359–364. doi: 10.1161/01.HYP.0000200695.34024.4c

Martin, K., Meeusen, R., Thompson, K. G., Keegan, R., and Rattray, B. (2018). Mental fatigue impairs endurance performance: a physiological explanation. *Sports Med.* 48, 2041–2051. doi: 10.1007/s40279-018-0946-9

Naess, H., Nyland, H. I., Thomassen, L., Aarseth, J., and Myhr, K. M. (2005). Fatigue at long-term follow-up in young adults with cerebral infarction. *Cerebrovasc. Dis.* 20, 245–250. doi: 10.1159/000087706

Natelson, B. H., Brunjes, D. L., and Mancini, D. (2021). Chronic fatigue syndrome and cardiovascular disease: jacc state-of-the-art review. *J. Am. Coll. Cardiol.* 78, 1056–1067. doi: 10.1016/j.jacc.2021.06.045

Newman, A. B., Spiekerman, C. F., Enright, P., Lefkowitz, D., Manolio, T., Reynolds, C. F., et al. (2000). Daytime sleepiness predicts mortality and cardiovascular disease in older adults. The cardiovascular health study research group. *J. Am. Geriatr. Soc.* 48, 115–123. doi: 10.1111/j.1532-5415.2000.tb03901.x

Qureshi, A. I., Giles, W. H., Croft, J. B., and Bliwise, D. L. (1997). Habitual sleep patterns and risk for stroke and coronary heart disease: a 10-year follow-up from nhanes i. *Neurology* 48, 904–910. doi: 10.1212/wnl.48.4.904

Ream, E., and Richardson, A. (1996). Fatigue: a concept analysis. *Int. J. Nurs. Stud.* 33, 519–529. doi: 10.1016/0020-7489(96)00004-1

Rebello, C. R., Kallingappa, P. B., and Hegde, P. G. (2018). Assessment of perceived stress and association with sleep quality and attributed stressors among 1(st)-year medical students: a cross-sectional study from Karwar, Karnataka, India. *Ci Ji Yi Xue Za Zhi.* 30, 221–226. doi: 10.4103/tcmj.tcmj_85_17

Saeed, R., Amin, F., Talha, M., Randenikumara, S., Shariff, I., Durrani, N., et al. (2021). COVID-19 pandemic prevalence and risk factors for depression among health care workers in south asia. *Asia Pac. J. Public Health* 33, 935–939. doi: 10.1177/10105395211002324

Selye, H. (1976). "Stress without distress" in *Psychopathology of Human Adaptation*. ed. G. Serban. *Reprinted* ed (Boston, MA: Springer US), 137–146.

Selye, H. (1998). A syndrome produced by diverse nocuous agents. 1936. *J. Neuropsychiatry Clin. Neurosci.* 10, 230–231. doi: 10.1176/jnp.10.2.230a

Steptoe, A., and Kivimäki, M. (2013). Stress and cardiovascular disease: an update on current knowledge. *Annu. Rev. Public Health* 34, 337–354. doi: 10.1146/annurev-publhealth-031912-114452

Thorarinsdottir, E. H., Janson, C., Aspelund, T., Benediktsdottir, B., Júlíusson, S., Gislason, T., et al. (2022). Different components of excessive daytime sleepiness and the change with positive airway pressure treatment in patients with obstructive sleep apnea: results from the icelandic sleep apnea cohort (isac). *J. Sleep Res.* 31:e13528. doi: 10.1111/jsr.13528

Valente, F., Batista, C., Simões, V., Tomé, I., and Carrilho, A. (2019). Quality of sleep among portuguese anaesthesiologists: a cross-sectional study. *Acta Medica Port.* 32, 641–646. doi: 10.20344/amp.11468

Wang, J., Li, D., Bai, X., Cui, J., Yang, L., Mu, X., et al. (2021). The physical and mental health of the medical staff in Wuhan huoshenshan hospital during COVID-19 epidemic: a structural equation modeling approach. *Eur. J. Integr. Med.* 44:101323. doi: 10.1016/j.eujim.2021.101323

Weymar, M., Schwabe, L., Löw, A., and Hamm, A. O. (2012). Stress sensitizes the brain: increased processing of unpleasant pictures after exposure to acute stress. *J. Cogn. Neurosci.* 24, 1511–1518. doi: 10.1162/jocn_a_00174

Wu, S., Wang, R., Ma, X., Zhao, Y., Yan, X., and He, J. (2012). Excessive daytime sleepiness assessed by the Epworth sleepiness scale and its association with health related quality of life: a population-based study in China. *BMC Public Health* 12:849. doi: 10.1186/1471-2458-12-849

Xia, Y., and Yang, Y. (2019). Rmsea, cfi, and tli in structural equation modeling with ordered categorical data: the story they tell depends on the estimation methods. *Behav. Res. Methods* 51, 409–428. doi: 10.3758/s13428-018-1055-2

Yan, H., Ding, Y., and Guo, W. (2021). Mental health of medical staff during the coronavirus disease 2019 pandemic: a systematic review and meta-analysis. *Psychosom. Med.* 83, 387–396. doi: 10.1097/PSY.0000000000000922

Yang, M. J., Zhang, Z., Wang, Y. J., Li, J. C., Guo, Q. L., Chen, X., et al. (2022). Association of nap frequency with hypertension or ischemic stroke supported by prospective cohort data and mendelian randomization in predominantly middle-aged european subjects. *Hypertension* 79, 1962–1970. doi: 10.1161/HYPERTENSIONAHA.122.19120

Zhang, H., Li, W., Li, H., Zhang, C., Luo, J., Zhu, Y., et al. (2021). Prevalence and dynamic features of psychological issues among Chinese healthcare workers during the COVID-19 pandemic: a systematic review and cumulative meta-analysis. *Gen. Psychiatr.* 34:e100344. doi: 10.1136/gpsych-2020-100344

Check for updates

How to minimize adverse effects of physical workplace violence on health sector workers: A preliminary study

Jingjing Lu[1], Jingjing Cai[1], Wenchen Shao[2] and Zhaocheng Wang[1]*

[1]School of Public Health, School of Medicine, Zhejiang University, Hangzhou, Zhejiang, China,
[2]Department of Anatomy and Cell Biology, McGill University, Montreal, QC, Canada

Purpose: This paper is an exploratory study to investigate possible remedial measures accounting for a relatively favorable prognosis of health sector workers who have experienced physical WPV in Zhejiang province, China.

Methods: Following a proportionate stratified sampling strategy, five tertiary hospitals (in the developed capital city of Hangzhou and other prefecture-level cities), eight secondary hospitals (in counties), and thirty-two primary care facilities (16 urban community health centers and 16 rural township health centers) were conveniently selected. Among 4,862 valid respondents out of 6,089 self-conducted questionnaires, 224 health sector workers who have been directly exposed to physical WPV in the past year were included in the present study.

Results: The present study has three major findings: (1) Victims' satisfaction with the resolution of the physical WPV conflict was directly associated with the favorable prognosis. (2) Taking days off from work after the violence can promote victims' satisfaction with the resolution of the physical WPV conflict. (3) Knowing that relevant departments investigated the case can promote victims' satisfaction with the resolution of the physical WPV conflict.

Conclusion: We propose a combined gesture of "offering adequate days off work after physical WPV" and "every physical violence must be investigated" that should be taken by all medical institutions in China. Health sector workers who get involved in physical WPV incidents should prioritize their safety and avoid any behavior that may intensify the conflicts.

KEYWORDS

health sector worker, workplace violence, physical violence, medical institution, mental health

Introduction

Workplace violence (WPV) is defined as "incidents where staff is abused, threatened or assaulted in circumstances related to their work, involving an explicit or implicit challenge to their safety, well-being, or health" (Wynne et al., 1997), including physical and verbal violence, psychological abuse, sexual harassment and assault, and homicide (Di Martino, 2002). Being recognized as a global public health problem, WPV has affected the health sector disproportionately and become a major problem (Phillips, 2016). Health sector workers include doctors, nurses, and other staff who may be in direct contact with patients and visitors. According to one meta-analysis of 331,544 health sector workers from all over the world (Liu et al., 2019), 61.9% of these participants were exposed to any form of WPV, and 24.4% of them experienced physical violence in the past year.

The prevalence of WPV varies across nations and regions. For example, the prevalence of WPV in the health sector was reported to be higher in Asian countries than in European countries (Liu et al., 2019). Possible reasons were generated to account for this difference, including healthcare systems, numbers of health sector workers per 1,000 population, and government health expenditure in the health sector (Bandara, 2006). Yang and her colleagues' study showed that differences in culturally afforded scapegoating can also influence patients' violence against health sector workers (Yang et al., 2021).

The detrimental effects of WPV on health sector workers have been well reported. According to a recent systematic review (Mento et al., 2020), reduced quality of life seems to be a general consequence of WPV among physicians and nurses. Exposure to WPV, either physically or verbally, was associated with depression (Wang et al., 2021), declined work enthusiasm (Li et al., 2017), and high levels of stress (Rayan et al., 2019) in health sector workers. Additionally, one study conducted in India pointed out the fact that exposure to WPV can not only exert negative effects on doctors but also influence doctors' patient management (Kaur et al., 2020). Moreover, the widespread WPV against health sector workers can also make the general public harder to access primary health care resources. WPV can boost health sector workers' intention to quit the profession, especially in developing countries, which may exacerbate the shortage of medical professionals (Kaur et al., 2020). All these consequences of WPV can eventually lead to a decrease in the productivity and quality of medical care and subsequently cause damage to health equality for the general public.

China has been no exception to this terrible torment. As noted by a national study conducted by the Chinese Hospital Association among 316 hospitals from different levels (Yao et al., 2014), the proportion of WPV against health sector workers rose from 90% in 2008 to 96% in 2012 with the proportion of physical WPV increased from 47.7% in 2008 to 67.7% in 2012. And other two regional studies (Zhang et al., 2018; Duan et al., 2019)showed that about 66 to 75% of health sector workers experienced different forms of WPV in the past year. Due to the high prevalence of WPV in the health sector, medical professionals in China have been considered as working in high-risk environments in recent decades (Xing et al., 2016; Guan, 2017). In one meta-analysis, it was reported that the estimated prevalence of physical violence, psychological violence, verbal abuse, threats and sexual harassment were 13.7, 50.8, 61.2, 39.4, and 6.3%, respectively, among Chinese health-care professionals (Lu et al., 2020). The prevalence of WPV in China varies from province to province, from hospital to hospital, and from department to department (Ma et al., 2021). A recent survey noted that about two thirds of Chinese physicians experienced doctor-patient conflicts, and in 2018, 3,308 people were prosecuted for intentionally harming medical personnel and causing disturbances in hospitals (Zhang et al., 2021).

Among different forms of WPV, physical WPV usually happens suddenly and can cause serious damages immediately. As noted, the vast majority of cases of serious WPV reported by mass media in China were physical in nature and were often committed with weapons (Ma et al., 2021). A growing number of researchers propose that Chinese legislation system should include the acts of injuring and killing health sector workers into the statutory aggravation of the crimes of intentional injury and intentional homicide to protect health sector workers' rights (Xie and Wang, 2022). Interventions to prevent WPV against health sector workers can be divided into primary prevention, secondary prevention, and tertiary prevention (Hall et al., 2018). Primary prevention focuses on structural and social factors that may reduce WPV, for example, efforts from legislation system. Secondary prevention involves early actions to avoid the onset or worsening of mental health problems among victims of WPV. Tertiary prevention ensures victims of WPV can get timely and proper care and report the incident to relative authorities. We should realize that there are certain remedial measures, which prevent victims from getting severely mentally affected by the WPV incident, that medical institutions can adopt from the perspective of secondary and tertiary prevention. While it is urgent to shied health sector workers from physical WPV, comforting victims in time and helping them heal from trauma as quickly as possible are also significantly important. However, no empirical studies across multiple medical institutions focusing on secondary and tertiary prevention of physical WPV of health sector workers in China can be identified. This paper is an exploratory study to investigate possible remedial measures accounting for a relatively favorable prognosis of victims of physical WPV in medical institutions in Zhejiang province, China.

Materials and methods

This study was a cross-sectional survey to explore possible remedial measures that could be taken by medical institutions after their employees experienced physical WPV in Zhejiang Province, China.

TABLE 1 Model fit statistics for each of the fitted latent class analysis models.

Model	BIC	Entropy	LMR	Prevalence N(%)				
				1	2	3	4	5
1	2018.165			224(100.0)				
2	1733.737	0.897	366.778***	50(22.32)	174(77.68)			
3	1760.001	0.931	59.634***	174(77.68)	1(0.45)	49(21.88)		
4	1793.703	0.887	52.281*	154(68.75)	1(0.45)	22(9.82)	47(20.98)	
5	1859.360	0.832	20.690	57(25.45)	19(8.48)	1(4.45)	22(9.82)	125(55.80)

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

Data collection

This survey was conducted from July 2016 to July 2017. A proportionate stratified sampling strategy was adopted to cover health sector workers from tertiary hospitals, secondary hospitals, and primary care facilities in both urban and rural areas. Five tertiary hospitals (in the developed capital city of Hangzhou and other prefecture-level cities), eight secondary hospitals (in counties), and thirty-two primary care facilities (16 urban community health centers and 16 rural township health centers) were conveniently selected. Then, in each facility, one specified administrator was designated as the research assistant to perform the survey after permissions from hospital managers or primary care facility directors was obtained. On the days of the survey, all health workers on duty were invited to participate with the help of these research assistants. A statement of consent was offered on the first page of the questionnaire. Participants were informed that this survey was fully voluntary, and anonymity was assured.

We distributed 6,089 questionnaires in total, of which 5,145 were completed. Then, 4,862 of them were identified as valid, representing a valid response rate of 79.8%. Among them, 224 respondents experienced physical workplace violence in the past year and were subsequently included in this study for further analysis.

Study variables

This questionnaire comprised five sections: (1) Social demographic characteristics and professional background of health sector workers. (2) Individual responses during the incident. (3) Institutional attitudes and responses toward the incident. (4) Aftermaths of the incident. (5) Impacts of the incident on health sector workers.

Social demographic characteristics and professional background of health sector workers included gender, age, level of hospitals, types, and the title of health workers.

The impact of the incident on health sector workers was assessed with eight items describing different types of negative prognoses victims may have after the exposure to WPV.

Possible remedial measures accounting for a relatively favorable prognosis of victims of physical WPV in medical institutions, which were extracted from our previous qualitative interviews with health sector workers (unpublished), included (1) Does the medical institution you are working for encourage tolerating violence? (2) Did the medical institution you are working at offer you days off work after the violence? (3) Was the case investigated by relevant departments? (4) Were the perpetrators punished in any way? (5) Were you satisfied with how the incident was handled?

Ethics

The ethics committee of our university reviewed and approved this study. We informed participants that the survey was voluntary and obtained verbal consent before the commencement of the survey.

Data analysis

A latent class analysis (LCA) was conducted among health sector workers who experienced physical workplace violence in the past year ($n = 224$) based on the impact of the incident on them using Mplus Version 8.3. LCA creates groups based on the similarity of participants' patterns of responses to a set of dichotomous variables. To identify the optimal number of classes, we examined the Bayesian information criterion (BIC), Lo–Mendell–Rubin (LMR) likelihood ratio test, and entropy. A model is considered as fitting with a relatively lower BIC, a value of p <0.05 of the LMR, and relatively higher entropy. Optimal models were chosen based on goodness of fit and parsimony (Table 1).

After the optimal model was identified from the LCA, we stratified participants into two groups: 1) the slightly affected and 2) the severely affected (Table 2). Then, participants' social demographic characteristics were compared using Chi-squared tests and t-tests (Table 3). Binary logistic regression models were applied to examine the associations between the impact of physical WPV incidents on health sector workers and potential remedial measures. Analyses were adjusted for gender, age, level of hospitals, types, and the title of health workers. All analyses were performed using SPSS 20.0 version and assumed a statistical significance level of $p < 0.05$.

TABLE 2 Impacts of workplace violence on health workers stratified by group *N*(%).

	Slightly affected (*N* = 50)	Severely affected (*N* = 174)	*p*
Repeated, disturbing memories, thoughts, or images of the attack			<0.001
Yes	13(7.69)	156(92.31)	
No	37(67.27)	18(32.73)	
Made you trust less in patients as a whole			<0.001
Yes	9(5.59)	152(94.41)	
No	41(65.08)	22(34.92)	
Avoiding thinking about or talking about the attack			<0.001
Yes	5(4.00)	120(96.00)	
No	45(45.45)	54(54.55)	
Be more cautious when dealing with patients			<0.001
Yes	30(14.71)	174(85.29)	
No	2(100.00)	0(0.00)	
Being 'super-alert' or watchful and on guard when dealing with patients			<0.001
Yes	27(13.43)	174(86.57)	
No	23(100.00)	0(0.00)	
Fearful of dealing with urgent or severe cases			<0.001
Yes	7(4.29)	156(95.71)	
No	43(70.49)	18(29.51)	
Often consider how to protect yourself while dealing with patients			<0.001
Yes	25(13.23)	164(86.77)	
No	25(71.43)	10(28.57)	
Wanting to quit the current post			<0.001
Yes	5(3.82)	126(96.18)	
No	45(48.39)	48(51.61)	

Results

Correlates of class membership were investigated with the optimal number of classes identified (Table 1). Both the Model 2 and the Model 3 showed a relatively lower BIC with a value of p of the LMR lower than 0.05 and a relatively higher entropy. However, one class in the Model 3 only accounted for 0.45 0f the total sample (1 individual), which might not provide reliable estimates of class-specific parameters in later analyses. Therefore, we chose the Model 2 as the final model.

Descriptive statistics of each class and comparisons are summarized in Table 2.

Table 3 shows differences in participants' social demographic and professional background characteristics between the slightly affected and the severely affected group. These two groups didn't show any differences in gender, age, level of hospitals, types, and the title of health workers.

As Table 4 shows, with adjustments to gender, age, level of hospitals, types, and the title of health workers, victims who were not satisfied with how the incident was handled were more likely to be severely affected by the physical WPV incident (OR = 3.50, 95%CI = (1.59, 7.69), *p* = 0.002).

As Table 5 shows, with adjustments with gender, age, level of hospitals, types, and the title of health workers, victims who didn't take days off after the violence (OR = 0.39, 95%CI = (0.17, 0.88),

p = 0.024) and whose cases were not investigated by relevant departments (OR = 0.45, 95%CI = (0.21, 0.95), *p* = 0.036) were less likely to be satisfied with how the incident was handled.

Discussion

This study is an exploratory study to investigate possible remedial measures accounting for a relatively favorable prognosis for victims of physical workplace violence against health sector workers. We have three major findings: (1) Victims' satisfaction with the resolution of the physical WPV conflict was directly associated with the favorable prognosis. (2) Taking days off from work after the violence can promote victims' satisfaction with the resolution of the physical WPV conflict. (3) Knowing that the case was investigated by relevant departments can promote victims' satisfaction with the resolution of the physical WPV conflict.

Based on binary logistic analyses, this study proposed that medical institutions should offer health sector workers, who are the victims of physical WPV conflicts, days off from work to promote their satisfaction with the resolution of the physical WPV conflict, which may lead to a favorable prognosis for those victims. As noted, psychological distress is a substantial contributor to work re-entry efforts for victims of WPV (de Koning et al., 2017). And days off work will allow those victims to seek professional help to

TABLE 3 Characteristics and potential remedial measures of health workers who experienced workplace violence in the past year stratified by group *N*(%).

	Slightly affected (*N* = 50)	Severely affected (*N* = 174)	*p*
Gender			0.518
Male	24(24.24)	75(75.76)	
Female	25(20.33)	98(79.67)	
Age Mean(SD)	36.06(9.78)	34.57(8.09)	0.285
Level of hospitals			0.887
Tertiary hospitals	15(22.39)	52(77.61)	
Secondary hospitals	27(22.50)	93(77.50)	
Urban community health facilities	4(17.39)	19(82.61)	
Rural community health facilities	4(28.57)	10(71.43)	
Types of health workers			0.146
Doctors	22(18.64)	96(81.36)	
Nurses	18(23.08)	60(76.92)	
Others	10(35.71)	18(64.29)	
Title			0.408
Junior	18(19.15)	76(80.85)	
Intermediate	18(21.43)	66(78.57)	
Senior	11(33.33)	22(66.67)	
Other	3(23.08)	10(76.92)	
Does the medical institution you are working for encourage tolerating violence?			0.737
No	19(24.05)	60(75.95)	
Yes/ I don't know	31(21.38)	114(78.62)	
Did the medical institution you are working offer you days off work after the violence?			1.000
Yes	10(21.74)	36(78.26)	
No	40(22.47)	138(77.53)	
Was the case investigated by relevant departments?			0.459
Yes	10(17.86)	46(82.14)	
No/ I don't know	40(23.81)	128(76.19)	
Were the perpetrators punished in any way?			0.132
Yes	16(30.19)	37(69.81)	
No	34(19.88)	137(80.12)	
Were you satisfied with how the incident was handled?			0.005
Yes	24(34.29)	46(65.71)	
No	26(16.88)	128(83.12)	

meet their unique and specific psychological needs. It is recommended that an early de-briefing model employing counselors with specialist skills can minimize the psychological effects following a WPV incident (Caldwell, 2006). Based on a randomized controlled explorative and comparative study, Tarquinio and his colleagues (Tarquinio et al., 2016) found that Shapiro's Eye Movement Desensitization and Repreprocessing Recent Events Protocol (EMDR-RE; Shapiro, 2001) and delayed EMDR-RE can protect victims of WPV from PTSD symptoms. Additionally, tabletop scenario exercises can provide a context specific approach at low cost to improving medical institutions' ability to correctly assess the risks of WPV and the comprehensiveness of the response (Brunero et al., 2021). While most tertiary and secondary medical institutions in China have set specialized departments to collect and process complaints of patients, it is frustrating that little has been done for their employees.

This study also noted that it is important to let those victims know that the case was investigated by relevant departments. Defending their rights after the violence when they may still be shocked, angry, and frustrated is a torment for those victims of WPV against health sector workers. The majority of health sector workers in China chose to be silent after the WPV, considering it's fruitless to report the incident (Wang et al., 2018). In the present study, only 56 out of 224 health sector workers reported that their cases were investigated. In China, it is an alarming fact that law enforcement professionals and administrators of medical institutions generally tend to treat WPV against health sector workers as doctor-patient disputes rather than criminal behaviors. Those perpetrators were regarded as the weak and vulnerable side due to the information asymmetry by law enforcement and the general public (Yao et al., 2014). Most of these incidents were never seriously investigated (Zheng et al., 2007), let alone valid punishment of the perpetrators by law enforcement professionals.

TABLE 4 Regression coefficients for the impact of physical WPV on health sector workers and potential remedial measures with adjustment for social demographic characteristics.

	Severely affected		p
	OR	95%CI	
Does the medical institution you are working for encourage tolerating violence?			
No	1.00		
Yes/ I don't know	1.02	(0.44,2.31)	0.978
Did the medical institution you are working offer you days off work after the violence?			
Yes	1.00		
No	1.32	(0.49,3.55)	0.583
Was the case investigated by relevant departments?			
Yes	1.00		
No/ I don't know	0.56	(0.23,1.39)	0.213
Were the perpetrators punished in any way?			
Yes	1.00		
No	0.54	(0.22,1.34)	0.184
Were you satisfied with how the incident was handled?			
Yes	1.00		
No	3.50	(1.59,7.69)	0.002

Adjusted with gender, age, level of hospitals, types, and the title of health workers.

TABLE 5 Regression coefficients for the health sector workers' satisfaction and potential remedial measures with adjustment for social demographic characteristics.

	Health sector workers' satisfaction		p
	OR	95%CI	
Does the medical institution you are working for encourage tolerating violence?			
No	1.00		
Yes/ I don't know	0.91	(0.43,1.92)	0.803
Did the medical institution you are working offer you days off work after the violence?			
Yes	1.00		
No	0.39	(0.17,0.88)	0.024
Was the case investigated by relevant departments?			
Yes	1.00		
No/ I don't know	0.45	(0.21,0.95)	0.036
Were the perpetrators punished in any way?			
Yes	1.00		
No	0.64	(0.28,1.48)	0.293

Adjusted with gender, age, level of hospitals, types, and the title of health worker.

Counterintuitively, while the case investigation was associated with victims' satisfaction with the resolution of the physical WPV conflict, whether or not the perpetrators got punished showed no correlations with the satisfaction A possible explanation is that these victims regarded the case investigation as a closure of the incident; and their good nature as health sector workers makes them forgive those perpetrators. However, the impunity of perpetrators won't help in controlling WPV against health sector workers. As international experience suggests, we should ensure that there are laws to abide by; those laws are observed and strictly enforced; and those lawbreakers are prosecuted to contain the widespread of WPV against health sector workers (Sun et al., 2016). Instead of being considered as legal rights protection by health sector workers, those laws should be considered as warnings to potential perpetrators.

Attacks from organizational outsiders like patients are unpredictable (Grandey et al., 2007). Aside from preventing WPV incidents, it is equally important for healthcare professionals to know how to react to a WPV incident. One of the important things for the safety of health sector workers during a WPV incident is to avoid intensification of the conflict. Behaviors like fighting back and swearing can lead the incident to a more unwanted violent situation, which may increase the odds of getting physical injures. One recent systematic review (Raveel and Schoenmakers, 2019) suggested that health sector workers should stay calm and apply de-escalation

techniques to guarantee their safety during a WPV incident. De-escalation generally takes the form of a verbal loop (Price and Baker, 2012) and may not be suitable for physical workplace violence settings, especially when the patients are furious. When the de-escalation is not effective, as suggested by this review, health sector workers may better go away and take self-defense techniques or call security staff for help.

A public health crisis such as coronavirus disease 2019 (COVID-19) can influence the relationship between health sector workers and patients rapidly. The media's reports and praise of health sector workers who fight against the COVID-19 enhanced the public's support of health sector workers, which in turn can improve the relationship between health sector workers and patients (Zhou et al., 2021). Thus, we may infer that health sector workers may feel more upset based on their mixed experience of fighting against the COVID-19 and suffering from patients' violence. With the layout and construction of normalized nucleic acid test sites in communities, we should pay extra attention to the well-being of health sector workers working at nucleic acid test site overtime.

Several limitations should be considered when interpreting these findings. First, the present study only included 224 health sector workers who experienced physical violence in the past year out of the 4,862 valid questionnaires. While the findings from the present study can provide new insights for health sector workers and medical institutions, these findings should be interpreted with caution, considering the limited generalizability. Second, the present study only involved health sector workers. Data from other direct key stakeholders, including medical institution managers, law enforcement agencies, and security staff can greatly enrich the present study. Third, the data collection date back to 6 years ago and by no means can we ignore the effects of the COVID-19 pandemic on doctor-patient relationships. Although it may be impossible for us to trace those every health sector worker who participated the current study, we are able to survey all these medical institutions enrolled in the present study again to explore potential changes and mechanisms.

Conclusion

The present study explored possible remedial measures accounting for a relatively favorable prognosis of health sector workers who have experienced physical WPV. Based on our data analysis, we propose a combined gesture of "offering adequate days off work after physical WPV" and "every physical violence must be investigated" that should be taken by all medical institutions in China. Health sector workers who get involved in physical WPV incidents should prioritize their safety and avoid any behavior that may intensify the conflicts.

Data availability statement

The data-sets analyzed in this study are available from the corresponding author on reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of our university. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JL: analyzed and interpreted the data, drafted the manuscript, and participated in the coordination of the study. ZW: participated in the coordination of the study, participated in critical review of the manuscript, and participated in the conception and design of the study. JC: drafted the manuscript and participated in the coordination of the study. WS: participated in critical review of the manuscript and participated in the conception and design of the study. All authors contributed to the article and approved the submitted version.

Acknowledgments

Conflict of interest

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

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Bandara, A. (2006). Emerging health issues in Asia and the pacific: implications for public health policy. *Asia-Pacific Develop. J.* 12, 33–58. doi: 10.18356/9dbe1347-en

Brunero, S., Dunn, S., and Lamont, S. (2021). Development and effectiveness of tabletop exercises in preparing health practitioners in violence prevention

management: A sequential explanatory mixed methods study. *Nurse Educ. Today* 103:104976. doi: 10.1016/j.nedt.2021.104976

Caldwell, M. F. (2006). Incidence of PTSD among staff victims of patient violence. *Hosp. Community Psychiatry* 43, 838–839. doi: 10.1176/ps.43.8.838

de Koning, M. E., Scheenen, M. E., van der Horn, H. J., Timmerman, M. E., Hageman, G., Roks, G., et al. (2017). Prediction of work resumption and sustainability up to 1 year after mild traumatic brain injury. *Neurology* 89, 1908–1914. doi: 10.1212/WNL.0000000000004604

Di Martino, V. (2002). Workplace violence in the health sector: Country case studies Brazil, Bulgaria, Lebanon, Portugal, South Africa, Thailand and an additional Australian study [Synthesis report]. Available at: https://www.who.int/violence_injury_prevention/injury/en/WVsynthesisreport.pdf

Duan, X. J., Ni, X., Shi, L., Zhang, L. J., Ye, Y., Mu, H. T., et al. (2019). The impact of workplace violence on job satisfaction, job burnout, and turnover intention: the mediating role of social support. *Health Qual. Life Outcomes* 17:93. doi: 10.1186/s12955-019-1164-3

Grandey, A. A., Kern, J., and Frone, M. R. (2007). Verbal abuse from outsiders versus insiders: Comparing frequency, impact on emotional exhaustion, and the role of emotional labor. *J. Occup. Health Psychol.* 12, 63–79. doi: 10.1037/1076-8998.12.1.63

Guan, J. (2017). Origin and Prevention of Workplace Violence in HealthCare in China: Legal and Ethical Considerations. *Chin. Med. J.* 130, 1731–1736. doi: 10.4103/0366-6999.209888

Hall, B. J., Xiong, P., Chang, K., Yin, M., and Sui, X. R. (2018). Prevalence of medical workplace violence and the shortage of secondary and tertiary interventions among healthcare workers in China. *J. Epidemiol. Community Health* 72, 516–518. doi: 10.1136/jech-2016-208602

Kaur, A., Ahamed, F., Sengupta, P., Majhi, J., and Ghosh, T. (2020). Pattern of workplace violence against doctors practising modern medicine and the subsequent impact on patient care, in India. *PLoS One* 15:e0239193. doi: 10.1371/journal.pone.0239193

Li, Z., Yan, C. M., Shi, L., Mu, H. T., Li, X., Li, A. Q., et al. (2017). Workplace violence against medical staff of Chinese children's hospitals: A cross-sectional study. *PLoS One* 12:e0179373. doi: 10.1371/journal.pone.0179373

Liu, J., Gan, Y., Jiang, H., Li, L., Dwyer, R., Lu, K., et al. (2019). Prevalence of workplace violence against healthcare workers: a systematic review and meta-analysis. *Occup. Environ. Med.* 76, 927–937. doi: 10.1136/oemed-2019-105849

Lu, L., Dong, M., Wang, S. B., Zhang, L., Ng, C. H., Ungvari, G. S., et al. (2020). Prevalence of Workplace Violence Against Health-Care Professionals in China: A Comprehensive Meta-Analysis of Observational Surveys. *Trauma Violence Abuse* 21, 498–509. doi: 10.1177/1524838018774429

Ma, J., Chen, X., Zheng, Q., Zhang, Y., Ming, Z., Wang, D., et al. (2021). Serious Workplace Violence Against Healthcare Providers in China Between 2004 and 2018. *Front. Public Health* 8:574765. doi: 10.3389/fpubh.2020.574765

Mento, C., Silvestri, M. C., Bruno, A., Muscatello, M., Cedro, C., Pandolfo, G., et al. (2020). Workplace violence against healthcare professionals: A systematic review. *Aggress. Violent Behav.* 51:101381. doi: 10.1016/j.avb.2020.101381

Phillips, J. P. (2016). Workplace violence against health care workers in the United States reply. *N. Engl. J. Med.* 374, 1661–1669. doi: 10.1056/NEJMra1501998

Price, O., and Baker, J. (2012). Key components of de-escalation techniques: A thematic synthesis. *Int. J. Ment. Health Nurs.* 21, 310–319. doi: 10.1111/j.1447-0349.2011.00793.x

Raveel, A., and Schoenmakers, B. (2019). Interventions to prevent aggression against doctors: a systematic review. *BMJ Open* 9:e028465. doi: 10.1136/bmjopen-2018-028465

Rayan, A., Sisan, M., and Baker, O. (2019). Stress, Workplace Violence, and Burnout in Nurses Working in King Abdullah Medical City During Al-Hajj Season. *J. Nurs. Res.* 27:e26. doi: 10.1097/jnr.0000000000000291

Shapiro, F. (2001). *Eye movement desensitization and reprocessing: Basic Principles, Protocols, and Procedures* (*2nd Edn.*). New York, NY: Guilford Press.

Sun, T., Zhang, X., Yi, M., Jin, L., Xu, W., and Song, X. (2016). Foreign Experience of the Hospital Violence Prevention and its Enlightenment to China. *Chinese Hospital Manag.* 36, 52–53.

Tarquinio, C., Rotonda, C., Houllé, W. A., et al. (2016). Early Psychological Preventive Intervention For Workplace Violence: A Randomized Controlled Explorative and Comparative Study Between EMDR-Recent Event and Critical Incident Stress Debriefing. *Issues Ment. Health Nurs.* 37, 787–799. doi: 10.1080/01612840.2016.1224282

Wang, N., Yang, S., Wu, D., Li, L., Zhou, X., and Yang, Q. (2018). Prevalence and under-reporting of workplace violence against nurses in Zhejiang province. *J. Nurs. Sci.* 33, 65–68. doi: 10.3870/j.issn.1001-4152.2018.17.065

Wang, H. P., Zhang, Y. X., and Sun, L. (2021). The effect of workplace violence on depression among medical staff in China: the mediating role of interpersonal distrust. *Int. Arch. Occup. Environ. Health* 94, 557–564. doi: 10.1007/s00420-020-01607-5

Wynne, R., Clarkin, N., Cox, T., and Griffiths, A. 1997. *Guidance on the Prevention of Violence at Work*. Luxembourg: European Commision, DG-V.

Xie, J., and Wang, H. (2022). A brief discussion on the causes of hospital workplace violence and the construction of its prevention mechanism. *China Health Law* 30, 20–25. doi: 10.19752/j.cnki.1004-6607.2022.02.005

Xing, K., Zhang, X., Jiao, M. L., Cui, Y., Lu, Y., Liu, J. H., et al. (2016). Concern about Workplace Violence and Its Risk Factors in Chinese Township Hospitals: A Cross-Sectional Study. *Int. J. Environ. Res. Public Health* 13:811. doi: 10.3390/ijerph13080811

Yang, Q., Young, I. F., Wan, J., and Sullivan, D. (2021). Culturally Grounded Scapegoating in Response to Illness and the COVID-19 Pandemic. *Front. Psychol.* 12:632641. doi: 10.3389/fpsyg.2021.797459

Yao, S. K., Zeng, Q., Peng, M. Q., Ren, S. Y., Chen, G., and Wang, J. J. (2014). Stop violence against medical workers in China. *J. Thoracic Disease* 6, E141–E145. doi: 10.3978/j.issn.2072-1439.2014.06.10

Zhang, X., Li, Y. Z., Yang, C. S., and Jiang, G. (2021). Trends in Workplace Violence Involving Health Care Professionals in China from 2000 to 2020: A Review. *Med. Sci. Monit.* 27:393. doi: 10.12659/MSM.928393

Zhang, S. E., Liu, W. H., Wang, J. H., Shi, Y., Xie, F. Z., Cang, S., et al. (2018). Impact of work place violence and compassionate behaviour in hospitals on stress, sleep quality and subjective health status among Chinese nurses: a cross-sectional survey. *BMJ Open* 8:e019373. doi: 10.1136/bmjopen-2017-019373

Zheng, X., Wei, L., Zhang, B., Wang, X., and Wang, X. (2007). Medical dispute survey in China and medical dispute solution overseas. *Chinese Hospitals* 07, 2–4.

Zhou, Y., Chen, S., Liao, Y., Wu, Q., Ma, Y., Wang, D., et al. (2021). General Perception of Doctor–Patient Relationship From Patients During the COVID-19 Pandemic in China: A Cross-Sectional Study. *Front. Public Health* 9:646486. doi: 10.3389/fpubh.2021.646486

Frontiers in Psychology

Paving the way for a greater understanding of human behavior

The most cited journal in its field, exploring psychological sciences - from clinical research to cognitive science, from imaging studies to human factors, and from animal cognition to social psychology.

Discover the latest Research Topics

See more →

frontiers | Research Topics