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How Involvement in COVID-19-Related Work Changed Nurses' Job Demands, Job Resources, and Their Associations with Burnout: Evidence from China[1]

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Abstract

China adopted a "Zero-COVID" policy for nearly three years, making Chinese healthcare workers constantly involved in COVID-19-related work. However, little is known about how involvement in COVID-19-related work shaped Chinese nurses' burnout. This study explores how nurses' job demands and job resources are associated with their burnout by considering high and low frequent involvements in COVID-19-related work in China. This study employed a cross-sessional design. Guided by Job Demands-Resources (JDR) model, we developed hypotheses and tested them using regression analysis with a sample of 336 nurses working in

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four public hospitals in Guangdong, China. Overall sample results revealed: 1) frequency of involvement in COVID-19-related work was related to a higher level of workload; 2) nurses' burnout was positively associated with workload, emotional demands, and work-family conflict, and negatively associated with a relationship with supervisor, remuneration, and independence of work; 3) emotional intelligence mitigated the positive relationship between workload and burnout. Comparison analysis showed significant differences due to the frequency of involvement in COVID-19 work. In the high-frequency group (N = 108), 1) emotional demands were related to a higher level of burnout, and emotional intelligence moderately accentuates the positive relationship between the two variables; 2) remuneration was related to a lower level of burnout; 3) nurses reported higher levels of workload and relationship with the supervisor. In the low-frequency group (N = 147), independence of work was related to a lower level of burnout; We found some evidence that nurses' job demands and job resources and their associations with burnout differed due to their frequency of involvement in COVID-19-related work. Implications for policy-making and theoretical contribution are discussed.

Keywords
Burnout; zero COVID-19 policy; nurses; job demands-resources model

1. Introduction

The COVID-19 pandemic has posed a huge challenge to healthcare professionals with a higher risk of mental health problems [1]. A study of front-line nurses revealed that half of the respondents reported moderate and high levels of burnout during COVID-19 in Wuhan [2]. Nurses' job burnout has negative impacts on their mental health [3], quality of patient care [4, 5], and intention to quit [6].

From March 2020 to December 2022, China implemented a pandemic containment policy termed a dynamic "Zero-COVID" policy characterized by pervasive public surveillance, contact tracing, extensive COVID-19 tests, and strict quarantine. The policy aimed to quickly identify and isolate cases of infection, which resulted in the temporary lockdown of residential buildings, neighborhoods, and even entire cities. The frontline healthcare professionals (e.g., nurses) who shouldered the responsibilities of implementing these COVID-19 preventive and control work. Thus, under the Zero-COVID policy, Chinese frontline healthcare professionals needed to keep the healthcare routine operation running and engaged in task-team to deal with COVID tests and occasional lockdowns when local infection cases were reported.

Indeed, some nurses were more frequently involved in the COVID-19 preventive and control work while others handled the daily work as the non-pandemic period. Studies have documented the changes in nurses' job demands and resources brought about by the COVID-19 outbreak, and the risks associated with such changes. (1) increased workload [7]. The workload was identified as one of the major job demands associated with burnout [8]. (2) higher work intensity and more night shifts. These factors were positively related to job burnout in healthcare workers during the COVID-19 pandemic [9]. (3) long-time wearing of personal protective equipment [2]. This might increase

nurses' physical exhaustion and mental stress [10]. (4) higher risk of infection due to working exposure [11], and worry about family members' infection due to their work exposure or isolation from family for safety reasons [9, 11-13]. (5) pandemic-related emotional demands such as feelings of uncertainty, anxiety, depression, and fear [2, 14]. (6) shortage of experienced staff and medical resources supplies like face masks, and personal protective equipment [7].

In short, the COVID-19 pandemic resulted changed nurses' job demands (e.g., increased workload) and job resources (e.g., lack of resources). However, few studies examine how the job demands and resources associated with frequent involvement in COVID-19-related work may impact nurses' burnout during the pandemic in China, a country pursuing a Zero-COVID policy for nearly three years.

Guided by the Job Demands-Resources (JD-R) model [15-17], the current study was designed to examine how nurses' job demands and resources are associated with burnout under the extraordinary circumstance in China's Zero-COVID setting and whether the associations between job demands, job resources, and burnout differ due to the high or low frequency of involvement in COVID-19 work. In addition, given the constraints of job resources available during the pandemic, we are interested in understanding the possible protective role of emotional intelligence as a personal resource in the relationship between job demands and burnout.

2. Literature Review

2.1 JD-R Model

The JD-R model [16] has two dimensions: job demands and job resources. Job demands refer to the physical or mental efforts that individuals make at work, including any emotional, physical, social, or organizational demands, such as workload, time pressure, recipient contact, and role conflict [8, 16]. Job resources refer to the physical, mental, social, or organizational aspects of work that may be associated with one of the following: (1) useful in achieving their work goals; (2) counteract job demands and associated costs; (3) promote individual development, such as performance feedback, rewards, job control, participation, job security, and supervisor support [16].

The influence of job demands and job resources has been concluded as a dual process [18, 19]. In the energy-driven process, job demands exhaust individuals' mental and physical resources and energy at work and can lead to health problems (e.g., burnout). Second, in the motivation-driven process, job resources have a motivational effect and are positively related to work engagement and organizational outcomes. This study will examine how job demands and resources predict nurses' burnout by considering high and low involvement in COVID-19-related work.

2.2 Nurse Job Demands and Job Resources

2.2.1 Nurse Job Demands

The workload is the most frequently examined factor in predicting nurses' burnout [20]. It refers to the quantitative number of tasks in a given time, and inadequate nurse staffing and time pressure are the sub-aspects of work overload [21]. Nurses' workload significantly increased due to China's zero-COVID policy, and receiving new patients was more complex [22, 23]. More importantly, the number of tasks increased among healthcare workers during the pandemic [7, 9].

The COVID-19-related emotional demands experienced by nurses have been widely documented

[2, 11, 14]. Hu et al. [2] interviewed front-line nurses working in Wuhan, China, and concluded that 14.3%, 10.7%, and 91.2% of nurses reported moderate and high levels of anxiety, depression, and fear, respectively. Zhu et al. [11] found that 79.74% of interviewed nurses feared infection due to work exposure in China.

In literature, work-family conflict is considered one of the job demands in nursing that can lead to burnout [24, 25]. It refers to role conflict where role pressure at work can influence role commitment in the family [26]. Indeed, during the COVID-19 pandemic, work-family conflict is considered a primary job demand for healthcare workers [27]. For example, most nurses have concerns and fear of infection of family members due to their work exposure [9, 12, 13, 28]. A study revealed that 91.53% of interviewers feared infecting family members [11]. Some nurses were isolated from family for months for safety reasons [9]. The feeling of guilt widely exists when they cannot spend time with their family [29].

2.2.2 Nurses Job Resources

Job resources refer to the aspects that can be useful in achieving job goals, offsetting job demands, and encouraging individuals' development [16]. In literature, nurses' major job resources are as follows: (1) social support, including support from supervisors and co-workers [30, 31]; (2) remuneration [32]; (3) decision latitude, including aspects related to autonomy, control, and independence [30, 33].

2.3 Job Demands, Job Resources, and Burnout

The COVID-19-related studies observed nurses' higher burnout and psychological distress (see [1, 34]). Moreover, compared with other healthcare groups, the higher levels of depression and anxiety among nursing professionals were alarming [28, 35, 36].

Previous studies have linked the JD-R model with burnout and established the relationships between job demands, job resources, and burnout [16, 37]. Schaufeli & Bakker [38] asserted that burnout is mainly related to job demand and a lack of resources. Given the well-established relationship between job demands, job resources, and burnout, we proposed the following hypotheses:

H1.1. Nurses' workload is positively related to their burnout.

H1.2. Nurses' emotional demands for COVID-19 are positively related to their burnout.

H1.3. Nurses' work-family conflict is positively related to their burnout.

H2.1. Nurses' relationship with colleagues is negatively related to their burnout.

H2.2. Nurses' relationship with supervisors is negatively related to their burnout.

H2.3. Nurses' remuneration is negatively related to their burnout.

H2.4. Nurses' independence of work is negatively related to their burnout.

Overall, we expected that nurses frequently involved in COVID-19 work would report a higher level of job demands, resulting in a stronger association with burnout.

2.4 Protective Role of Emotional Intelligence

Emotional intelligence is recognizing, absorbing, understanding, and managing emotions [39, 40]. It is argued that emotional intelligence is a mixed ability for adaptive personal functioning and coping

with environmental demands, including motivation, personal traits, temperament, character, and social skills [41]. Individuals have different levels of ability to manage their emotions and use these emotions to achieve goals [42].

According to the Conservation of Resources (COR) theory [43], humans are motivated to obtain, retain, foster, and protect resources when they are threatened or lost. We argue that emotional intelligence as a personal resource may mitigate the positive relationship between job demands and burnout, as those individuals with a higher emotional intelligence are less vulnerable to resource loss. Chen and Chen [44] found that emotional intelligence moderates the relationship between job demands and burnout but does not moderate the relationship between job resources and burnout. Thus, we proposed the following hypothesis:

H3. Emotional intelligence moderates the relationship between job demands and burnout, in such a way, the relationship between job demands and burnout is weaker for those nurses with higher emotional intelligence than those with a lower one.

The research hypotheses are summarized in the research model (Figure 1).

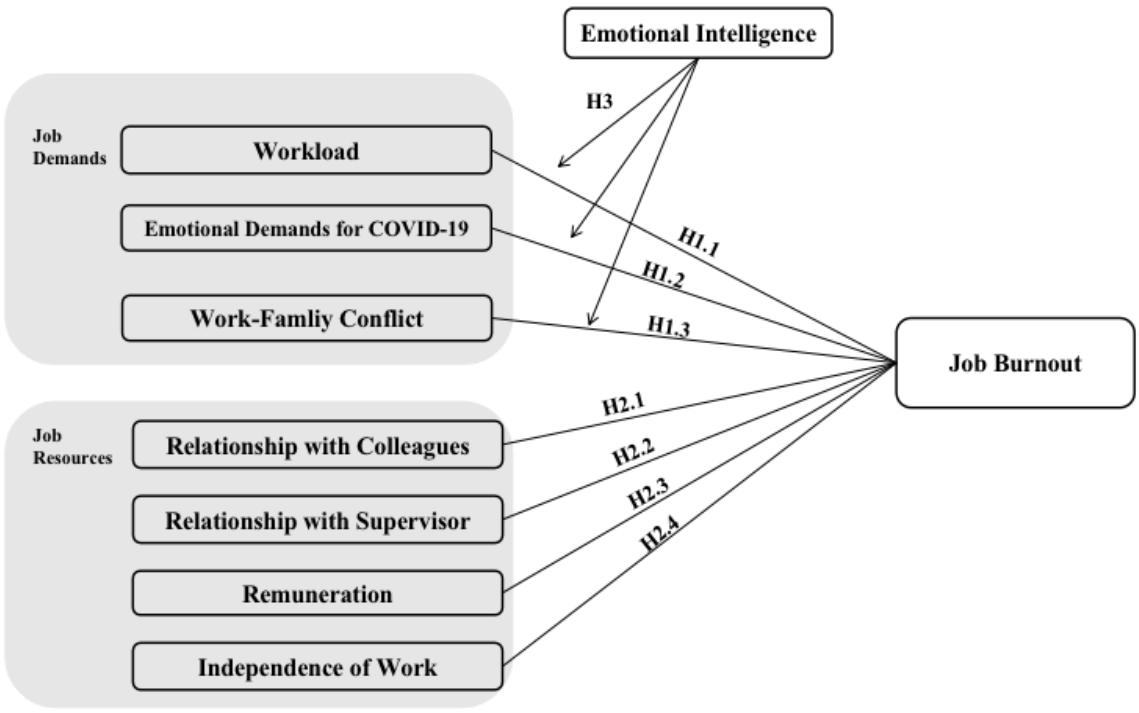

Figure 1 Research Model.

3. Methodology

3.1 Procedure and Sample

The research targets of this study were registered nurses working in public hospitals that implemented the Chinese government's Zero-COVID policy. In February and March 2022, registered nurses in four public hospitals in Guangdong China were invited through our professional networks to participate in an online survey. Specifically, participants voluntarily completed the questionnaires through a Chinese web-based survey platform called “Wenjuanxing” without compensation. Of the 366 registered nurses who completed the questionnaire, 30 questionnaires were excluded for

answering all the items with a completion time significantly different from the average survey completion time. The remaining 336 valid questionnaires were used for analysis in this study. The participants worked in the four hospitals: the Affiliated Traditional Chinese Medicine Hospital of Guangzhou Medical University, the Fifth Affiliated Hospital of Southern Medical University, Yuebei People's Hospital, and Renhua County People's Hospital.

3.2 Measurement Scale

We selected matured scales from the literature to measure the key variables. To ensure the validity of all nine measurements, we took great care to review the translations. We invited a dozen nurses from one of the authors' hospitals to complete a pilot survey. Based on the feedback from the participants, we made some improvements to the wording of the questionnaires. The highest correlation coefficient among the nine variables was 0.60, between work-family conflict and burnout. This result indicates that the key variables are statistically independent.

3.2.1 Job Demands

This study examined three job demands, namely workload, emotional demands for COVID-19, and work-family conflict. The workload was rated on a 6-point scale, ranging from 1 = never to 6 = every day. Emotional demands for COVID-19 and work-family conflict were rated on a 6-point scale from 1 = strongly disagree to 6 = strongly agree.

The workload was measured with three items of the Questionnaire on the Experience and Assessment of Work (QEAW) adopted by Lequeurre et al. [45]. An example item is "*I have too much work to do*."

Emotional demands for COVID-19 were measured with three items of the COVID-19 Perceived Risk Scale (CPRS) developed by Yıldırım & Güler [46]. An example item is "*Worry about myself contracting COVID-19*".

Work-family conflict was measured with the 5-item scale of Work-family Conflict Scale (WFC) by Netemeyer et al. [47]. An example item is "*The demands of my work interfere with my home and family life*."

The Cronbach's α of workload, emotional demands for COVID-19, and work-family conflict were 0.85, 0.88, and 0.94 respectively.

3.2.2 Job Resources

This study examined four job resources: relationship with colleagues, relationship with superior, remuneration, and independence in the work. All items were assessed with the QEAW adopted from Lequeurre et al. [45], using a 6-point scale from 1 = strongly disagree to 6 = strongly agree.

Relationship with colleagues was measured with four items (e.g., "*In my work, I feel appreciated by my colleagues*"). Relationship with superior was measured with four items (e.g., "*In my work, I feel appreciated by my superior*"). Remuneration was measured with four items (e.g., "*I think my organization pays good salaries*"). Independence in work was measured with four items (e.g., "*I influence the pace of work*").

The Cronbach's α of relationship with colleagues, relationship with supervisor, remuneration, and work independence were 0.85, 0.94, 0.93, and 0.86 respectively.

3.2.3 Emotional Intelligence

Emotional intelligence was assessed with Wong and Law Emotional Intelligence Scale (WLEIS) [42]. The WLEIS is composed of four dimensions: self-emotions appraisal (4-item, e.g., "*I have a good understanding of my own emotions*"), others-emotions appraisal (4-item, e.g., "*I am sensitive to the feelings and emotions of others*"), use of Emotion (4-item, e.g., "*I am a self-motivated person*"), and regulation of Emotions (4-item, e.g., "*I have good control of my own emotions*"). All responses were rated on a 6-point Likert scale from 1 = strongly disagree to 6 = strongly agree. Cronbach's α of emotional intelligence was 0.94.

3.2.4 Burnout

In this study, we measured emotional exhaustion only because it is considered the most significant dimension of burnout [48]. Emotional exhaustion was measured with five items from the Chinese version of the Maslach Burnout Inventory-General Survey translated by Li & Shi [49] (e.g., "*I feel emotionally drained from my work*."). All items were rated on a 6-point Likert scale from 1 = never to 6 = always. The Cronbach's α of burnout was 0.94.

3.2.5 Social Demographics

Demographic variables in this research included age, gender, department, employment category, position, marital status, and education level. In addition, the tenure of service in the hospital, work content, and frequency of involvement in COVID-19 work were collected.

3.3 Data Analysis

The data analysis was conducted using IBM SPSS Statistics software (version 26 for Mac). The level of significance for all analyses was $p < 0.05$. Means, standard deviations, correlations, and coefficient alpha internal consistency reliabilities were computed before testing hypotheses. Following the preliminary analysis, *t*-tests and one-way ANOVA were conducted to investigate the differences among different subject groups concerning demographics and the frequency of involvement in the COVID-19 work. Lastly, regression analysis was conducted to test the hypotheses.

4. Findings

4.1 Demographics

As reported in Table 1, most participants were involved in COVID-19 work in the last 3 months (85.2%) when they participated in the study, and 32.1% were involved daily. The major work contents about COVID-19 included nucleic acid testing (62.5%), epidemiological investigation (42.9%), and pairing assistance (23.8%) to assist other cities in need of help to control the COVID-19 outbreak. The nurses in the research were mainly working in the surgical department (17.9%), internal medicine department (16.4%), emergency department (14.9%), and obstetrics and gynecology department (10.1%). Nurses' average age was 32 years old and 96.4% were female, mostly junior nurses (65.4%), and 46.7% had worked in the present hospital above 8 years. Of the participants, 51.5% had a college degree or below, and 47.3% had a bachelor's degree. The mean of

burnout was 3.73 (SD = 1.17).

Table 1 Sample Profile (N = 336).

variable	N (%)	variable	N (%)
Gender		**Length of service in your hospital (years)**	
male	12 (3.6)	≤1	31 (9.2)
female	324 (96.4)	1-2	50 (14.9)
Age		3-4	35 (10.4)
18-29	165 (49.1)	5-6	44 (13.1)
30-39	87 (25.9)	7-8	19 (5.7)
40-49	61 (18.2)	≥8	157(46.7)
≥50	23 (6.8)	**Hospital where you work**	
Marital Status		hospital A (number of beds, ≥2000)	42 (12.5)
married	204 (60.7)	hospital B (number of beds, 1001-2000)	65 (19.3)
unmarried	115 (34.2)	hospital C (number of beds, ≤500)	134 (39.9)
other	17 (5.1)	hospital D (number of beds, ≤500)	73 (21.7)
Professional position		other	22 (6.6)
primary nurses	101 (30.1)	**Frequency of involvement in COVID-19 work in the last 3 months**	
junior nurses	220 (65.4)	never	24 (7.1)
senior nurses	15 (4.5)	rarely	26 (7.7)
Education		occasionally	97 (28.9)
college degree or below	173 (51.5)	frequently (Several times a month)	52 (15.5)
bachelor degree	159 (47.3)	usually (Several times a week)	29 (8.6)
master degree or above	4 (1.2)	everyday	108 (32.1)
Working department		**Work content changes from COVID-19**	
surgical department	60 (17.9)	nucleic acid testing	210 (62.5)
internal medicine	55 (16.4)	epidemiological investigation	144 (42.9)
obstetrics and gynecology department	34 (10.1)	isolated hotel	17 (5.1)
pediatrics department	14 (4.2)	pairing assistance	80 (23.8)
emergency department	50 (14.9)	COVID-19 vaccination	40 (11.9)
operating room	17 (5.1)	other	82 (24.4)
intensive care unit (ICU)	24 (7.1)		
other	82 (24.4)		

4.2 Variance Analysis

4.2.1 T-Test Results on Frequency Involvement in COVID-19 Work

In this study, the high and low frequency of involvement in COVID-19 work were arbitrarily defined based on the 75th and 25th score percentiles, respectively. Specifically, the high-frequency group corresponded to 108 cases with a score higher than or equal to the 75th percentile while the low-frequency group corresponded to 147 cases with a score lower than or equal to the 25th

percentile of the sample. A *t*-test revealed that nurses in the high-frequency group reported higher workloads (M = 5.35, SD = 0.84, $p < 0.001$), and a higher level of relationship with supervisor (M = 4.71, SD = 0.84, $p < 0.01$).

4.2.2 Comparison of Demographic Groups for Burnout

Significant differences in nurses' burnout were observed in groups of age ($p = 0.04$), marital status ($p < 0.001$), an education level ($p = 0.02$), and the hospitals they worked for ($p < 0.001$). Burnout among nurses aged from 18 to 29 (M = 3.85, SD = 1.19) was significantly higher than among nurses aged above 30 years old ($p < 0.05$). Significant differences in the level of burnout existed among the three marital status groups (unmarried, married and others) ($p < 0.001$). And nurses with a college degree or below (M = 3.55, SD = 1.14) had a significantly lower level of burnout than those with a bachelor's degree (M = 3.92, SD = 1.18) ($p < 0.05$).

4.3 Correlation Analysis

Table 2 reported correlation results. Frequency of involvement in COVID-19-related work was positively related to workload (r = 0.23, $p < 0.001$), and relationship with supervisor (r = 0.19, $p < 0.001$). The result is consistent with the variance analysis. Nurses' burnout was positively related to three job demands, including the workload (r = 0.24, $p < 0.001$), the emotional demands for COVID-19 (r = 0.14, $p = 0.01$), and work-family conflict (r = 0.60, $p < 0.001$). In addition, burnout was negatively related to three job resources, namely relationship with supervisor (r = -0.15, $p = 0.007$), remuneration (r = -0.24, $p < 0.001$), and independence of work (r = -0.19, $p < 0.001$). Emotional intelligence was negatively related to burnout (r = -0.16, $p = 0.004$).

Table 2 Means, Standard Deviations, Correlations, and Cronbach's α (in the Diagonal) (N = 336).

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. frequency of involvement	/	/																		
2. gender	/	/	-0.06																	
3. age	/	/	0.17**	0.18**																
4. marital status	/	/	-0.02	-0.19**	-0.41**															
5. position	/	/	0.17**	0.15**	0.64**	-0.48**														
6. education	/	/	0.06	-0.02	-0.03	-0.19**	0.26**													
7. department	/	/	0.12*	-0.04	0.27**	-0.02	0.14*	-0.16**												
8. length of service	/	/	0.06	0.21**	0.76**	-0.53**	0.70**	0.17**	0.16**											
9. hospital	/	/	-0.10	-0.06	-0.12*	0.03	-0.05	0.19**	-0.14**	-0.11*										
10. workload	5.05	1.00	0.23**	0.00	0.11*	0.02	0.02	0.02	0.00	0.03	-0.01	**(0.85)**								
11. emotional demands for COVID-19	3.83	1.57	-0.02	-0.01	0.00	0.02	-0.05	-0.07	0.00	0.03	0.02	-0.01	**(0.88)**							
12. work-family conflict	3.57	1.35	-0.06	-0.03	0.06	-0.15**	0.11*	0.28**	-0.06	0.13*	0.22**	-0.04	0.03	**(0.94)**						
13. relationship with colleague	4.71	.77	0.08	-0.05	0.23**	-0.12*	0.24**	-0.02	0.13*	0.23**	-0.01	0.12*	-0.03	-0.02	**(0.85)**					
14. relationship with supervisor	4.57	0.90	0.19**	-0.08	0.13*	0.00	0.11*	0.08	0.04	0.09	-0.07	0.09	0.01	-0.14*	0.10	**(0.94)**				
15. remuneration	3.64	1.09	0.02	0.10	0.05	0.01	0.02	-0.05	0.03	0.00	0.05	0.02	-0.12*	-0.25**	-0.03	-0.04	**(0.93)**			

160. independence of work	40.14	0.96	0.02	0.05	0.07	-0.01	0.05	-0.16**	-0.01	0.11*	-0.01	0.04	0.13*	-0.20**	0.03	0.08	0.06	**(0.86)**	
17. emotional intelligence	4.50	0.68	0.10	0.07	0.19**	-0.11*	0.15**	-0.09	0.02	0.20**	-0.06	0.16**	0.05	-0.16**	0.36**	0.27**	0.09	0.57**	**(0.94)**
18. burnout	3.73	1.17	-0.02	-0.13*	-0.13*	0.08	-0.13*	0.15**	-0.12*	-0.09	0.25**	0.24**	0.14*	0.60**	-0.07	-0.15**	-0.24**	-0.19**	-0.16** **(0.94)**

**p < 0.05. **p < 0.01.*

4.4 Hypothesis Testing

4.4.1 Relationships between Job Demands, Job Resources, and Burnout

A multiple linear regression analysis was performed to analyze nurses' burnout based on the three variables of job demands and four variables of job resources after controlling demographic variables, namely gender, age, marital status, education, and hospital (Table 3). Regression results indicated that the seven key variables explained 51.8% of the variance ($p < 0.001$).

Table 3 Result of Multiple Linear Regression of Burnout (N = 336).

	Model 1 (control variables)				Model 2 (independent variables)				Model 3 (moderator)			
	B	SE B	*p*	β	B	SE B	*p*	β	B	SE B	*p*	β
gender	-0.46	0.29	0.11	-0.09	-0.33	0.21	0.12	-0.06	-0.39	0.21	0.06	-0.07
age	-0.08	0.06	0.15	-0.08	-0.13	0.04	0	-0.12	-0.13	0.04	0	-0.12
marital status	0.05	0.1	0.59	0.03	0.12	0.07	0.1	0.07	0.12	0.07	0.08	0.07
education	0.22	0.11	0.03	0.12	-0.06	0.08	0.47	-0.03	-0.05	0.08	0.56	-0.02
hospital	0.12	0.03	0	0.19	0.06	0.03	0.02	0.09	0.06	0.03	0.02	0.09
workload					0.31	0.04	0	0.31***	0.31	0.04	0	0.31
emotional demands for COVID-19					0.14	0.04	0	0.14***	0.12	0.04	0	0.12
work-family conflict					0.52	0.04	0	0.52***	0.52	0.04	0	0.52
relationship with colleagues					-0.07	0.04	0.09	-0.07	-0.08	0.04	0.05	-0.08
relationship with supervisor					-0.13	0.04	0	-0.13***	-0.1	0.04	0.02	-0.1
remuneration					-0.12	0.04	0	-0.12***	-0.1	0.04	0.02	-0.1
independence of work					-0.09	0.04	0.03	-0.09*	-0.1	0.04	0.02	-0.1
EI X Workload									-0.09	0.04	0.03	-0.09*
EI X Emotional demands for COVID-19									0.06	0.04	0.12	0.06
EI X Work-family conflict									-0.01	0.04	0.8	-0.01
R^2	0.08				0.54				0.56			
Adjusted R^2	0.07				0.52				0.51			
F value	*F* (5, 330) = 5.87, *p* < 0.001				*F* (12,323) = 31.05, *p* < 0.001				*F* (19,316) = 20.98, *p* < 0.001			
Δ R^2	0.08				0.45				0.02			
Δ F value	5.87				45.12				2.26			

Note. Dependent variable: Burnout. EI = emotional intelligence.

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

As expected, nurses' workload (β = 0.31, $p < 0.001$), emotional demands for COVID-19 (β = 0.14, $p = 0.001$), and work-family conflict (β = 0.52, $p < 0.001$) were positively related to burnout. These results supported the following hypothesis: *"H1.1. Nurses' workload is positively related to their burnout.", "H1.2. Nurses' emotional demands for COVID-19 are positively related to their burnout." and "H1.3. Nurses' work-family conflict is positively related to their burnout."*

Three job resources variables were negatively related to nurses' burnout, namely, relationship with supervisor (β = -0.13, $p = 0.001$), remuneration (β = -0.12, $p = 0.004$), and independence of work (β = -0.09, $p = 0.03$). These results supported hypothesis 2.2. *"Nurses' relationship with supervisor is negatively related to their burnout."* hypothesis 2.3. "*Nurses' remuneration is negatively related to their burnout.",* and hypothesis 2.4. *"Nurses' independence of work is negatively related to their burnout*." However, contrary to expectation, relationship with colleagues was not significantly related to burnout. Thus, hypothesis 2.1 "*Nurses' relationship with colleagues is negatively related to their burnout*." was not supported.

The interaction between emotional intelligence and workload (β = -0.09, $p = 0.03$) was significantly associated with burnout. This supports hypothesis 3 that emotional intelligence moderates the relationship between workload and burnout, in such a way, the relationship between workload and burnout is weaker for those nurses with higher emotional intelligence than those with a lower one. The regression coefficients are summarized in Figure 2.

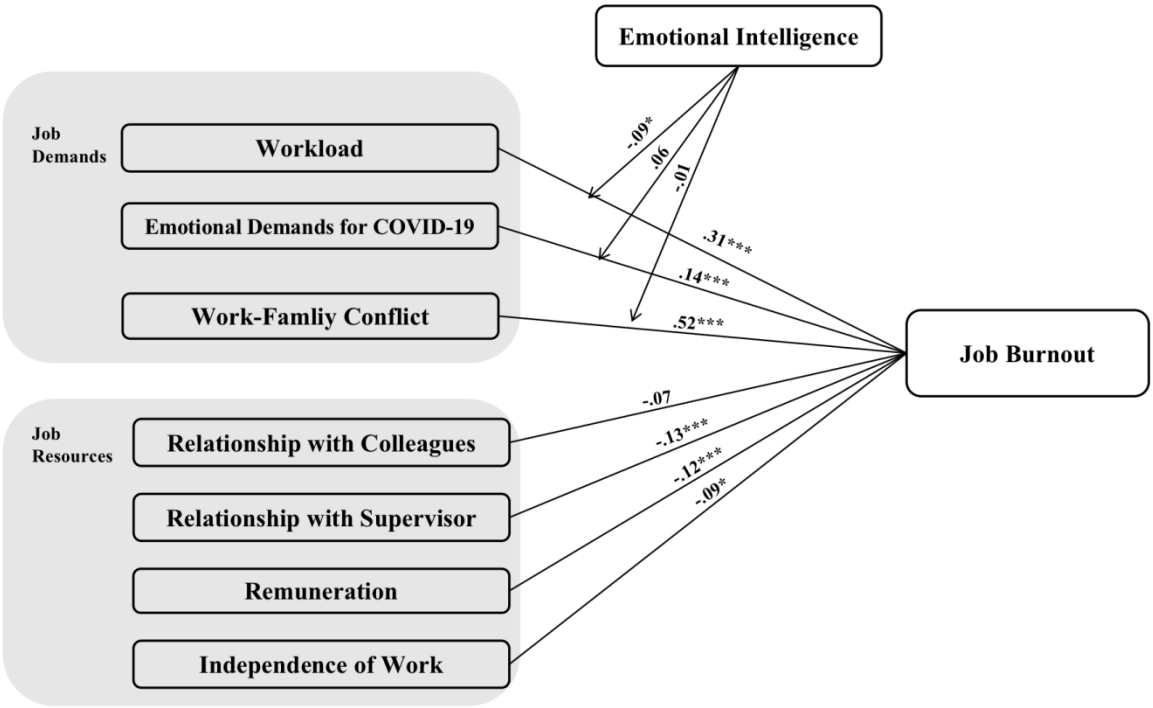

Figure 2 Results of Regression Analyses. Note: *$p < 0.05$. **$p < 0.01$.

4.4.2 Hypothesis Testing for High-Frequency and Low-Frequency Groups

To explore how the relationship between nurses' job demands and burnout may vary depending on the frequency of involvement in COVID-19 work, multiple linear regression analysis was performed with control variables for two groups of nurses: one for high-frequency (Table 4), the other for low-frequency (Table 5).

Table 4 Result of Multiple Linear Regression of Burnout among High-frequency Group (N = 108).

	Model 1 (control variables)				Model 2 (independent variables)				Model 3 (moderator)			
	B	SE B	*p*	β	B	SE B	*p*	β	B	SE B	*p*	β
gender	-0.59	0.51	0.25	-0.11	-0.04	0.39	0.92	-0.01	-0.28	0.4	0.49	-0.05
age	-0.09	0.11	0.41	-0.09	-0.16	0.08	0.06	-0.15	-0.14	0.09	0.1	-0.13
marital status	0.08	0.18	0.66	0.05	0.01	0.13	0.96	0	-0.07	0.14	0.59	-0.04
education	0.04	0.22	0.84	0.02	-0.06	0.17	0.74	-0.03	-0.07	0.17	0.7	-0.03
hospital	0.16	0.07	0.03	0.22	0.09	0.05	0.1	0.12	0.09	0.05	0.11	0.12
workload					0.37	0.1	0	0.28***	0.35	0.1	0	0.27
emotional demands for COVID-19					0.19	0.07	0.01	0.18**	0.14	0.08	0.07	0.14
work-family conflict					0.52	0.09	0	0.50***	0.52	0.09	0	0.5
relationship with colleagues					-0.09	0.08	0.24	-0.09	-0.08	0.08	0.31	-0.08
relationship with supervisor					-0.09	0.09	0.29	-0.08	-0.05	0.09	0.59	-0.04
remuneration					-0.24	0.08	0.01	-0.22**	-0.2	0.09	0.03	-0.19
independence of work					-0.02	0.08	0.77	-0.02	-0.02	0.09	0.83	-0.02
EI X workload									-0.08	0.09	0.36	-0.07
EI X emotional demands for COVID-19									0.15	0.07	0.05	0.17*
EI X work-family conflict									0.02	0.1	0.81	0.02
R^2	0.09				0.56				0.51			
Adjusted R^2	0.04				0.5				0.51			
F value	*F* (5, 102) = 1.94, *p* = 0.09				*F* (12,95) = 9.89, *p* < 0.001				*F* (19,88) = 6.83, p < 0.001			
Δ R^2	0.09				0.47				0.04			
Δ F value	1.94				14.29				1.26			

Note. Dependent variable: Burnout. EI = emotional intelligence. *p < 0.05. **p < 0.01, ***p < 0.001.

Table 5 Result of Multiple Linear Regression of Burnout among Low-frequency Group (N = 147).

	Model 1 (control variables)				Model 2 (independent variables)				Model 3 (moderator)			
	B	SE B	*p*	β	B	SE B	*p*	β	B	SE B	*p*	β
gender	-0.4	0.51	0.43	-0.06	-0.3	0.41	0.47	-0.05	-0.43	0.41	0.31	-0.07
age	-0.06	0.09	0.53	-0.05	-0.08	0.08	0.29	-0.07	-0.07	0.08	0.37	-0.06
marital status	0.11	0.14	0.42	0.07	0.28	0.11	0.01	0.17	0.32	0.11	0.01	0.2
education	0.24	0.14	0.09	0.13	-0.05	0.12	0.66	-0.03	-0.02	0.12	0.87	-0.01
hospital	0.2	0.05	0	0.34	0.07	0.04	0.08	0.12	0.07	0.04	0.11	0.11
workload					0.27	0.05	0	0.33***	0.28	0.05	0	0.33
emotional demands for COVID-19					0.05	0.06	0.43	0.05	0.04	0.06	0.58	0.04
work-family conflict					0.46	0.07	0	0.49***	0.48	0.07	0	0.5
relationship with colleagues					-0.09	0.06	0.14	-0.09	-0.09	0.06	0.17	-0.09
relationship with supervisor					-0.07	0.06	0.26	-0.07	-0.07	0.06	0.25	-0.08
remuneration					-0.07	0.06	0.29	-0.07	-0.05	0.06	0.42	-0.06
independence of work					-0.14	0.06	0.02	-0.15*	-0.13	0.06	0.04	-0.14
EI X Workload									-0.14	0.06	0.01	-0.17**
EI X Emotional demands for COVID-19									0.05	0.06	0.42	0.05
EI X Work-family conflict									-0.03	0.06	0.57	-0.04
R^2	0.15				0.49				0.53			
Adjusted R^2	0.12				0.45				0.46			
F value	*F* (5, 141) = 5.02, *p* < 0.001				*F* (12,134) = 10.80, *p* < 0.001				*F* (19,127) = 7.54, p < 0.001			
Δ R^2	0.15				0.34				0.04			
Δ F value	5.02				12.82				1.48			

Note. Dependent variable: Burnout. EI = emotional intelligence. *p < 0.05. **p < 0.01, ***p < 0.001.

In the high-frequency group, burnout was positively related to workload (β = 0.28, p = 0.001). And different from the low-frequency group, emotional demands for COVID-19 were positively associated with burnout (β = 0.18, p = 0.01). Work-family conflict (β = 0.50, p < 0.001) was equally related to burnout in both groups. Remuneration was negatively related to burnout in the high-frequency group (β = -0.22, $p = 0.01$), but not in the low-frequency group (β = -0.07, $p = 0.29$). On the contrary, the independence of work and burnout were not significantly associated in the high-frequency group (β = -0.02, $p = 0.77$). At the same time, a significant negative association was observed in the low-frequency group (β = -0.15, $p < 0.05$). For nurses with frequent low involvement in COVID-19 work, burnout was positively related to workload (β = 0.33, p < 0.001), and work-family conflict (β = 0.49, p < 0.001). However, emotional demands for COVID-19 (β = 0.05, p = 0.43) were not associated with burnout among this group.

Emotional intelligence mitigates the positive relationship between workload and burnout in the low-frequency group (β = -0.17, p = 0.01), but not in the high-frequency group (β = -0.07, p = 0.36). However, emotional intelligence marginally accentuates the positive relationship between emotional demands for COVID-19 and burnout in the high-frequency group (β = 0.17, p < 0.05).

5. Discussion

5.1 General

Of 336 Chinese nurses investigated in this study in February and March 2022, most nurses (85.2%) reported involvement in COVID-19 work, and 24% took part in pairing assistance to offer healthcare support in other cities and regions affected by COVID-19. Pairing assistance is a national strategy in China for healthcare workers in one region to aid a designated region needing help to fight the COVID-19 outbreak. To our best knowledge, this is the first study examining how the job demands of frontline healthcare workers influenced burnout under the Zero-COVID campaign. In this study, the mean of nurses' burnout was 3.73 ± 1.17 on a 6-point scale, which is higher than the level of burnout reported in the early period of the COVID-19 breakout (see [7]). This result may indicate the accumulated effect of burnout overtime during the COVID-19 pandemic.

5.2 Variance Analysis Results

Though nurses with a high frequency of involvement in COVID-19 work reported significantly higher workloads, no significant difference was observed in the burnout level between the two groups. The result differed from our expectation that nurses with high frequent involvement in COVID-19 work would report higher workloads. The reasons could be the following. First, there might be a spillover of work from the high-frequency group to the low-frequency group. Specifically, when some nurses are assigned COVID-19 work (high-frequency group) like paring assistance in other cities, the other nurses who remain working in the office (low-frequency group) need to take over the routine work left by the colleagues going for COVID-19 work. As a result, the workload of the low-frequency group increase, which results in the same level of burnout as the high-frequency group. The other reason could be that the higher level of relationship with supervisor among the high-frequency group helps them to deal with their higher workload without increasing burnout levels compared with their colleagues less frequently involved in COVID-19 work.

Nurses' burnout was related to demographic characteristics including age, material status, and

education level. Nurses aged from 18 to 29, unmarried, and with bachelor's degrees are more vulnerable to burnout. Much research observed a higher level of burnout among younger and unmarried nurses [50, 51].

5.3 Hypothesis Testing

Nurses' burnout was positively related to workload, emotional demands for COVID-19, and work-family conflict. The impact of work-family conflict on nurses' burnout was higher than that of emotional demands for COVID-19 and workload, and work-family conflict was strongly associated with burnout in both high and low-frequency groups. This increased family demands could explain this result because of the closing of schools and childcare services and the development of remote education during the pandemic [52]. This is particularly relevant to China's Zero-COVID policy because in most cases, healthcare workers were constantly isolated from family members to prevent and control the virus, aiming for zero infection cases.

In addition, nurses' burnout was negatively related to their relationship with supervisor, remuneration, and work independence. This may be explained by the COR theory, as social support like quality relationships with supervisors helps reduce burnout. Interestingly, remuneration was negatively related to burnout which is not widely observed in international literature. However, burnout was not significantly related to relationship with colleagues, which is understandable because colleagues (e.g., at the same level) do not have or provide as many resources as supervisors do.

The most interesting findings of this study are the different associations between job demands, job resources, and burnout due to the frequency of involvement in COVID-19-related work. The positive relationship between workload and burnout is marginally weaker among nurses more frequently involved in COVID-19 work. The possible reason for this result is that nurses in the high-frequency group may have more resources such as supervisor's support evidenced in this study by a higher level of relationship with a supervisor as well as a higher level of emotional intelligence as a personal resource. It is worth noting that nurses of the high-frequency group reported a higher mean on remuneration than that in the low-frequency group, despite no significance found. It is a common practice that those involved in COVID-19 work receive an allowance or bonus for recognizing their efforts. That implies that remuneration as a job resource may mitigate the relationship between workload and burnout.

Unlike the low-frequency group, the high-frequency group revealed a positive relationship between emotional demands for COVID-19 and burnout. Healthcare workers' concerns and worries about infection at work have been widely documented in much research [9, 13]. Our study further proves nurses' emotional demands for COVID-19 harm their well-being.

In addition, remuneration was negatively related to burnout for the high-frequency group, but not in the low-frequency group. Again, the findings may imply that the high-frequency group received higher remuneration which in turn helped to reduce burnout for this group. Independence of work was negatively related to burnout among the low-frequency nurses, but not in the high-frequency group. It is plausible that the nurses involved in COVID-19 need to follow more rigid, strict, and coordinated procedures to avoid infection, thus reducing work autonomy for those nurses in the high-frequency group.

Emotional intelligence mitigates the positive relationship between workload and burnout in both

the overall sample and the low-frequency group, but not in the high-frequency group. In other words, individuals with higher emotional intelligence are less prone to the risk of burnout caused by workload because emotional intelligence as a personal resource may compensate for the resources lost from job demands, according to the COR theory [53]. However, emotional intelligence marginally accentuated the positive relationship between emotional demand for COVID-19 and burnout among the high-frequency group (β = 0.17, p = 0.05), but not for the low-frequency group. This result is rather surprising. A possible reason would be those nurses with higher emotional intelligence are more sensitive to the emotions (most of the time negative emotions like worry and fear) of their working targets (e.g., patients or residents seeking COVID-19 tests) and thus worsen the relationship between emotional demands for COVID-19 and burnout. Future research is needed to examine such a possibility.

5.4 Implications and Contribution

China adopted the Zero COVID policy for three years (ending in December 2022). This study reveals that Chinese nurses' burnout was higher than that reported in the early period of the COVID-19 breakout. Thus, given nurses' increased job demands in implementing the zero COVID-19 policy, healthcare policymakers need to be aware of the burnout problem under such policy caused by workload, work-family conflict, and emotional demands. This study revealed that work-family conflict was a prominent predictor of nurses' burnout. Healthcare authorities and hospital managers must address healthcare workers' family needs like childcare and elderly care.

The significant relationship between emotional demands for COVID-19 and burnout and emotional intelligence's moderation role in this study suggest the importance of "managing emotions" in the fight against the COVID-19 pandemic. Hospital managers may invest in training and improve nurses' emotional knowledge and emotional management skills.

Although it is not well recognized in international literature, remuneration emerges as a useful tool for managers to reduce nurses' burnout. Thus, in addition to developing quality relationships with nurses, hospital managers may increase financial rewards to recognize nurses' endeavors in fighting the COVID-19 virus.

To our best knowledge, this is the first study that investigates how job demands and job resources predict nurses' burnout by considering low and high frequent involvements in COVID-19 preventive and control work. The findings provide insights into the "Zero-COVID" policy and its impact on nursing professionals and enrich literature in JD-R studies with a unique sample from China, a country employing a unique policy to fight the COVID-19 pandemic.

5.5 Limitations

It's important to note that the sample for this research was collected in one specific province in China, so caution should be taken when trying to generalize these results to other populations or contexts. Additionally, since this study was cross-sectional, it's impossible to establish a definitive causal relationship between the studied variables. Furthermore, it's important to consider the limitations of self-reported questionnaires and the relatively small sample size used in group comparison analysis. These limitations should be considered when interpreting the findings of this study.

5.6 Conclusions

This study aimed to investigate the job demands, job resources, and burnout experienced by nursing professionals in China during the implementation of the Zero-COVID policy. Our findings suggest that the associations between job demands, job resources, and burnout varied depending on nurses' frequency level of involvement in COVID-19-related work.

From a theoretical perspective, our study provides valuable insights into the JD-R model and COR theory by examining the experiences of nursing professionals working in an extraordinary environment, during three years of Zero-COVID policy implementation in China. These findings have important implications for developing effective interventions to prevent burnout and promote well-being among nursing professionals working in similar contexts.

Author Contributions

X., Wang developed the theoretical framework, analyzed the data, and wrote the article. S., Ma designed and directed the study, and edited the article. W., Liao conducted the data collection and assisted data analysis.

Competing Interests

The authors have declared that no competing interests exist.

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