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# The interaction of occupational stress and job burnout on depressive symptoms in railway workers in Fuzhou city

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## Abstract

**Background** To explore the relationship between occupational stress, burnout and depressive symptoms among railroad workers in Fuzhou, and to analyze the interaction of burnout and occupational stress on depressive symptoms.

**Methods** In this study, 861 railway employees of Fuzhou railway bureau were randomly selected from January to April, 2022. Occupational stress inventory revised edition (OSI-R), China job burnout inventory (CMBI) and Symptom Checklist-90 (SCL-90) were used to investigate the occupational stress, job burnout and depressive symptoms of railway workers. Interactions associated with depressive symptoms were assessed by linear hierarchical regression analysis and SPSS macros (PROCESS).

**Results** Occupational stress, job burnout and depressive symptoms accounted for 50.58%, 93.47%, and 11.19% of the study population, respectively. There were intergroup differences between age, marriage status, and length of service ( $P < 0.05$ ). Occupational stress and job burnout are the main risk factors for depressive symptoms ( $OR: 2.01, 95\% CI: 1.17-3.45; 1.94, 1.69-2.23$ , respectively). More importantly, further analysis of the interaction between occupational stress and job burnout showed that those with high levels of job burnout had a high-risk effect on depressive symptoms at high levels of occupational stress.

**Conclusion** Occupational stress and job burnout are risk factors for depressive symptoms among railroad workers in Fuzhou City. The interaction of job burnout and occupational stress increases the risk of depressive symptoms.

**Keywords** Rail workers, Job burnout, Occupational stress, Depressive symptoms, Interaction effect

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## Background

Along with economic development, workers' lifestyles and work environments have constantly changed with the advent of new occupational hazards. Psychosocial factors' influences on physical and mental health have brought extensive attention internationally [1]. Occupational stress and burnout are hot issues in occupational health at home and abroad [2].

Occupational stress refers to the physical and psychological stress caused when the individual's abilities, coping resources, and needs are not balanced with the demands of the job. It has been recognized as a significant issue affecting occupational health globally [3, 4]. Occupational stress is associated with sub-health manifestations, including coronary diseases, digestive system diseases, sleep disorders, depressive symptoms, anxiety, etc [5–7]. Studies have shown that people with high occupational stress are more likely to suffer from depressive symptoms than the general population [8]. Job burnout is delineated as a state of physical, emotional, and mental exhaustion resulting from prolonged engagement in emotionally demanding work [9]. It concerns somatic diseases and psychological disorders and can lead to depressive symptoms and even suicidal thoughts [10, 11]. It was shown that a higher level of job burnout led to severer depressive symptoms [12].

Depressive symptoms is a common mental health problem caused by occupational stress and burnout. It is also a primary mental disease endangering human health [13–15]. WHO reported that the annual prevalence rate of depressive symptoms in females and males is 9.5% and 5.8%, respectively. Patients mainly manifest prolonged low mood and helplessness [16]. Research indicated that depressive symptoms cases rose by 49.86% from 1990 to 2017 globally, and depressive symptoms patients have exceeded 300 million worldwide [17]. According to WHO's projections, depressive symptoms will probably become the most burdensome disease worldwide in 2030 [16]. The occupational population exhibits a higher depressive symptoms tendency with rising occupational stress and burnout [18, 19]. The results of a study on the Effect of occupational stress on the mental health of railroad workers showed that The detection rates of occupational stress, mental health problems and depression among workers in the railroad engineering system were 40.5% (248/613), 9.0% (55/613) and 40.78% (250/613), respectively [20]. In a previous study, the authors found that a total of 532 out of 1,270 railroad workers were identified as having mental health problems, and those experiencing high levels of occupational stress had a higher risk of poor mental health ( $OR=1.80, 95\% CI: 1.31-2.47$ ) [21]. In another study, the authors also found that occupational stress was one of the most important factors contributing to psychological problems among

railroad drivers [22]. Moreover, it was reported that job burnout might mediate the effects of occupational stress on depression [23].

Interactions can more accurately describe and explain how different factors work together to influence an outcome, helping to reveal nonlinear and conditional relationships between variables [24]. It was demonstrated that job burnout might play a moderating role between occupational stress and depression among doctors, nurses, and teachers [25–27]. Therefore, we further explored the relationship between occupational stress, burnout, and depression to focus on the impact of the interaction of burnout and occupational stress on depressive symptoms. This is important for preventing mental health problems among railroad workers and extending the life cycle of employees.

## Methods

### Participants and procedure

The estimated expected prevalence was referred to the prevalence of adult depression in mainland China [28],  $P=23.4\%$ ,  $\alpha=0.05$ ,  $\delta=0.03$ ,  $N=741$  cases, considering the bias to increase the sample size by 10%, the sample size to be investigated was 815 cases. Therefore, in this study, 861 workers (700 men and 158 women) who have been on duty for more than one year in Fuzhou Railway Bureau were randomly selected in January-April 2022 by using cluster sampling as the research subjects for cross-sectional study. The inclusion criteria included employees who were working for more than one year with an excellent mental state and no a history of mental illness or disorder. If participants using any medication for mental health problems in the three months prior to the study will be excluded. Participants ranged from 18 to 60 years ( $39.80 \pm 9.16$  years).

$$N = [(Z_1 - \alpha/2) / \delta]^2 \times p \times (1 - p)$$

An online self-reported questionnaire was employed to collect information on demographic characteristics and lifestyle questions, accompanied by measures of occupational stress, job burnout and depressive symptoms. 861 questionnaires were distributed, and 858 valid questionnaires were returned (99.65%). Approval was granted by the Ethics Committee of Ningxia Medical University (No.2022-N079). All participants provided written informed consent.

### Occupational stress

To investigate occupational stress, stress response, and resilience among subjects, a Chinese version of the instrument called the revised edition of the occupational stress inventory (OSI-R) proposed by Oispow was used [29]. This questionnaire comprises the Occupational

Roles Questionnaire (ORQ), Personal Stress Questionnaire (PSQ), and Personal Resources Questionnaire (PRQ). The ORQ consists of 60 questions from 6 dimensions, including occupational overload, role insufficiency, role ambiguity, role boundaries, role responsibility, and physical environment. The PSQ comprises 40 entries from 4 aspects, including vocational stress, psychological stress, interpersonal stress, and physical stress. The PRQ consists of 40 items from 4 dimensions: recreation, self-care, social support and radiation/cognitive coping. Each item is scored using the Likert 5-level scoring method, ranging from “negative” to “often” (1–5). In PSQ and ORQ, higher scores represent higher occupational stress. In PRQ, higher scores represent better capability to cope with occupational stress with less tension. The Cronbach’s  $\alpha$  coefficient of this questionnaire was 0.966, and the Cronbach’s  $\alpha$  coefficients of the three parts were 0.923, 0.869, and 0.957, respectively.

### Job burnout

The burnout level was measured by the Chinese version of the Maslach Burnout Inventory-General Survey (MBI-GS) [30]. The questionnaire consists of 15 items, including 3 subscales: emotional exhaustion (EE), depersonalization (DP), and reduced sense of personal accomplishment (PA). The 22 items are scored between 0 and 6; the composite score of each scale represents a participant’s total score for each dimension. Participants with scores of 0–18, 19–26, and  $>27$  in the EE scale exhibit low, moderate and high levels of EE, respectively. Those scoring 0–5, 6–9, and  $>9$  in the DP dimension have low, moderate and high levels of DP, respectively. Items in the dimension measuring PA are reverse coded; participants with scores of 0–33, 34–39, and  $>40$  exhibits a low, moderate, and high degree of PA, respectively. Job burnout score =  $[0.4 \times EE + 0.3 \times DP + 0.3 \times (6 - PA)]$ . A score  $<1.5$  indicates that the subject does not have job burnout, 1.5–3.5 indicates that the subject has mild to moderate burnout, and  $\geq 3.5$  indicates that the subject has severe burnout [31]. The Cronbach’s  $\alpha$  coefficient of this questionnaire was 0.910, and the Cronbach’s  $\alpha$  coefficients of the three parts were 0.889, 0.868, and 0.863, respectively.

### Depressive symptoms

The mental health status was investigated with the Symptom Checklist 90 (SCL-90), which included 90 items and 10 factors, somatization, obsessive-compulsive symptoms, interpersonal sensitivity, depressive symptoms, anxiety, hostility, phobia, paranoid ideation, psychoticism, and additional item. Each item is scored on a 5-point scale, from “none” to “severe”. A total score of over 160 in SCL-90 denotes the presence of mental health problems [32]. The Cronbach’s  $\alpha$  coefficient of this questionnaire was 0.983.

### Confounding factors

Sociodemographic covariates: gender, age, marital status, education, length of service and income were assessed and included in the regression model because of their known relationship to depressive symptoms and each facet of social relationships examined [33]. Information on current confounding factors was obtained by questionnaires.

### Statistical analysis

Questionnaire data were entered into Epidata 3.1 and analyzed using SPSS26.0. Categorical data were expressed as ratios, and intergroup comparisons were analyzed using the  $\chi^2$  test. Unqualified data were analyzed using the Fisher exact probability method. In addition, linear hierarchical regression analysis was conducted to analyze the interaction between job stress and job burnout on the depressive symptoms scores. Bonferroni correction was applied as a multiple testing correction. Furthermore, PROCESS version 3.4.1 in SPSS was used to examine the moderating effects of occupational stress and job burnout, and the significant interactive effects were analyzed using simple slope analysis, after adjusting for gender, age, marital status, education, length of service and income [34]. All reported  $P$  values were two-tailed, and those less than 0.05 were considered statistically significant.

## Results

### Comparisons between demographic characteristics

We divide individuals into groups based on whether they have encountered occupational stress, the presence and degree of job burnout, and the development of depressive symptoms, using the differential characteristics of scale assessment scores. This classification enables us to analyze and compare the frequency distributions among these various groups. The results showed that the incidence rates of occupational stress, job burnout, and depressive symptoms were 50.58%, 93.47%, and 11.19%, respectively. The results revealed that age, marital status, educational level, length of service, and income all have varying degrees of influence on occupational stress, job burnout, and depressive symptoms ( $P < 0.05$ ). Among these factors, age, length of service and income had a more pronounced impact. Gender did not exhibit a statistically significant difference in its impact on these three factors (Table 1).

### Regression analysis of the effects of occupational stress and job burnout on depressive symptoms

After adjusting for confounding factors, depressive symptoms was regarded as the dependent variable, and subscales of occupational stress and job burnout were considered independent variables. The logistic regression

**Table 1** Demographic characteristics and score grades of occupational stress, job burnout and depressive symptoms [N(%)]

Variables	Total	Occupational stress		Job burnout			Depressive symptoms	
		No	Yes	No	Low	High	No	Yes
<b>Gender</b>								
Male	700 (81.59)	337 (39.28)	363 (42.31)	49 (5.71)	139 (16.20)	512 (59.67)	625 (72.84)	75 (8.74)
Female	158 (18.41)	87 (10.14)	71 (8.28)	7 (0.82)	29 (3.38)	122 (14.22)	137 (15.97)	21 (2.45)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		2.47		1.74			0.861	
<i>P</i>		0.116		0.419			0.353	
<b>Age(years)</b>								
≤ 25	326 (38.00)	129 (15.03)	197 (22.96)	43 (5.01)	98 (11.42)	185 (21.56)	312 (36.36)	14 (1.63)
25–35	173 (20.16)	78 (9.09)	95 (11.07)	6 (0.70)	24 (2.80)	143 (16.67)	157 (18.30)	16 (1.86)
35–45	217 (25.29)	125 (14.57)	92 (10.72)	2 (0.23)	30 (3.50)	185 (21.56)	180 (20.98)	37 (4.31)
> 45	142 (16.55)	92 (10.72)	50 (5.83)	5 (0.58)	16 (1.86)	121 (14.10)	113 (13.17)	29 (3.38)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		33.18		87.94			35.94	
<i>P</i>		<b>&lt;0.001</b>		<b>&lt;0.001</b>			<b>&lt;0.001</b>	
<b>Marital status</b>								
Married	471 (54.90)	273 (31.82)	198 (23.08)	13 (1.52)	70 (8.16)	388 (45.22)	399 (46.50)	72 (8.39)
Unmarried/Divorced/Widowed	387 (45.10)	151 (17.60)	236 (27.51)	43 (5.01)	98 (11.42)	246 (28.67)	363 (42.31)	24 (2.80)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		30.50		44.75			17.65	
<i>P</i>		<b>&lt;0.001</b>		<b>&lt;0.001</b>			<b>&lt;0.001</b>	
<b>Education</b>								
Senior high school and below	256 (29.84)	152 (17.72)	104 (12.12)	8 (0.93)	49 (5.71)	199 (23.19)	228 (26.57)	28 (3.26)
Junior school, technical secondary school	471 (54.9)	223 (25.99)	248 (28.9)	42 (4.9)	100 (11.66)	329 (38.34)	416 (48.48)	55 (6.41)
Undergraduate	114 (13.29)	39 (4.55)	75 (8.74)	6 (0.70)	14 (1.63)	94 (10.96)	103 (12.00)	11 (1.28)
Master and above	17 (1.98)	10 (1.17)	7 (0.82)	0 (0)	5 (0.58)	12 (1.40)	15 (1.75)	2 (0.23)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		22.11		17.38			0.41	
<i>P</i>		<b>&lt;0.001</b>		<b>0.008</b>			0.939	
<b>Length of service (years)</b>								
≤ 5	441 (51.40)	188 (21.91)	253 (29.49)	44 (5.13)	113 (13.17)	284 (33.10)	417 (48.6)	24 (2.80)
5–10	67 (7.81)	339 (3.85)	34 (3.96)	2 (0.23)	19 (2.21)	46 (5.36)	64 (7.46)	3 (0.35)
10–20	143 (16.67)	78 (9.09)	65 (7.58)	3 (0.35)	9 (1.05)	131 (15.27)	120 (13.99)	23 (2.68)
> 20	207 (24.13)	125 (14.57)	82 (9.56)	7 (0.82)	27 (3.15)	173 (20.16)	161 (18.76)	46 (5.36)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		19.60		59.37			46.50	
<i>P</i>		<b>&lt;0.001</b>		<b>&lt;0.001</b>			<b>&lt;0.001</b>	
<b>Income (yuan)</b>								
≤ 1000	87 (10.14)	47 (5.48)	40 (4.66)	6 (0.7)	16 (1.86)	65 (7.58)	75 (8.74)	12 (1.40)
1000–1500	134 (15.62)	69 (8.04)	65 (7.58)	12 (1.4)	21 (2.45)	101 (11.77)	121 (14.10)	13 (1.52)
1500–2000	307 (35.78)	126 (14.69)	181 (21.10)	32 (3.73)	88 (10.26)	187 (21.79)	289 (33.69)	18 (2.10)
2000–2500	189 (22.03)	106 (12.35)	83 (9.67)	4 (0.47)	21 (2.45)	164 (19.11)	161 (18.76)	28 (3.26)
2500–3000	141 (16.43)	76 (8.86)	65 (7.58)	2 (0.23)	22 (2.56)	117 (13.64)	116 (13.52)	25 (2.91)
Total	858 (100)	424 (49.42)	434 (50.58)	56 (6.53)	168 (19.58)	634 (73.89)	762 (88.81)	96 (11.19)
$\chi^2$		14.75		57.90			18.26	
<i>P</i>		<b>0.011</b>		<b>&lt;0.001</b>			<b>0.003</b>	

analysis showed that PRQ and PSQ in the occupational stress questionnaires affected depressive symptoms ( $P < 0.05$ ). PRQ was a protective factor with an OR (95% CI) of 0.96 (0.95, 0.98). PSQ was a risk factor with an OR (95% CI) of 1.11 (1.09, 1.14). The PA in job burnout is a

protective factor against depressive symptoms, with an OR (95% CI) of 0.92 (0.85, 1.00). On the contrary, EE (OR [95% CI], 1.36 (1.26, 1.46)) and DP (OR [95% CI], 1.11 (1.02, 1.21)) were risk factors for depressive symptoms ( $P < 0.05$ ) (Table 2).

**Table 2** Logistic regression analysis of the factors affecting depressive symptoms

Variables	b	χ <sup>2</sup>	OR (95%CI)	P-value
<b>OSI-R</b>				
ORQ	-0.01	0.78	0.99 (0.98, 1.01)	0.38
PSQ	0.11	96.46	1.11 (1.09, 1.14)	<b>&lt; 0.05</b>
PRQ	-0.04	31.75	0.96 (0.95, 0.98)	<b>&lt; 0.05</b>
<b>CMBI</b>				
EE	0.30	68.69	1.36 (1.26, 1.46)	<b>&lt; 0.05</b>
DP	0.10	5.30	1.11 (1.02, 1.21)	<b>&lt; 0.05</b>
PA	-0.09	4.23	0.92 (0.85, 1.00)	<b>&lt; 0.05</b>

Note OR, odds ratio, 95%CI, 95% confidence interval. Adjusted for gender, age, marital status, education, length of service and income. Statistically significant values were denoted in bold

**Table 3** Multiple moderated regression results (N=858)

Variables	Model1	Model2	Model3
D1 (Female)	0.032	0.039	0.039
D2 (Aged 25–35 years)	<b>0.117*</b>	0.059	0.056
D3 (Aged 35–45 years)	0.126	0.078	0.078
D4 (Aged > 45 years)	0.084	0.047	0.047
D5 (Married)	-0.092	-0.055	-0.049
D6 (Senior high school)	<b>0.084*</b>	0.07	0.069
D7 (Undergraduate)	0.026	-0.013	-0.014
D8 (Master and above)	0.002	0.01	0.013
D9 (Length of service 5–10 years)	0.007	0.018	0.017
D10 (Length of service 10–20 years)	<b>0.133**</b>	<b>0.112*</b>	<b>0.112*</b>
D11 (Length of service > 20 years)	<b>0.275**</b>	<b>0.261**</b>	<b>0.258**</b>
D12 (Income 1000–1500 yuan)	0.012	0.008	0.004
D13 (Income 1500–2000 yuan)	0.014	0.013	0.012
D14 (Income 2000–2500 yuan)	0.017	0.004	0.002
D15 (Income 2500–3000 yuan)	-0.013	-0.014	-0.017
ΔR <sup>2</sup>	<b>0.081**</b>		
Low Job burnout		0.085	-0.176
High Job burnout		<b>0.288**</b>	-0.224
Occupational stress		<b>0.212**</b>	-0.229
ΔR <sup>2</sup>		<b>0.066**</b>	
Job burnout × Occupational stress			<b>0.485*</b>
ΔR <sup>2</sup>			<b>0.006*</b>

Note Linear hierarchical regression was used to examine the moderating effects of occupational stress and job burnout. Depressive symptoms were dependent variable. Model1 included demographic covariates (gender, age, marital status, education, length of service and income), and added the main factors and interactions in model 2 and model 3, respectively. D1-15 were dummy variables. Job stress were standardized variables. Statistically significant values were denoted in bold. \*P<0.05; \*\*P<0.01

**The interactive effects of occupational stress and job burnout on depressive symptoms**

The interaction between occupational stress and job burnout was analyzed by linear hierarchical regression analysis (Table 3). As shown in Model 2, the effects of occupational stress and burnout on depressive symptoms ( $\beta=0.288, P<0.01$ , Bonferroni corrected  $P<0.01$ ;  $\beta=0.212, P<0.01$ , Bonferroni corrected  $P<0.01$ , respectively) remained significant after controlling for covariates. In addition, Model 3 showed a significant

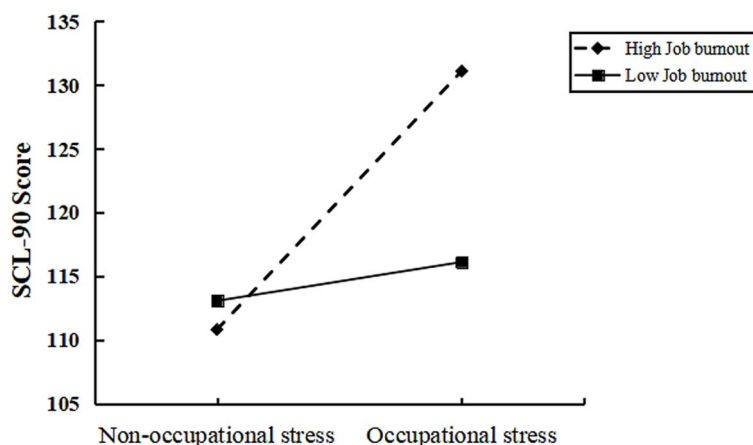
interaction between occupational stress and job burnout on depressive symptoms ( $\beta=0.485, P=0.015$ , Bonferroni corrected  $P<0.01$ ). These results suggest that job burnout may be considered as a moderator when examining the association between occupational stress and depressive symptoms in this study.

To further explain the moderating role of job burnout between occupational stress and depressive symptom, we analyzed simple slopes within groups with different degrees of burnout after controlling for covariates. The results showed that occupational stress was a significant positive predictor of depressive symptoms at different degrees of burnout. As shown in Fig. 1, suggests that when occupational stress is higher, different degrees of burnout have a risk effect on depression. Even more importantly, the higher the level of job burnout, the greater the risk for depression.

**Discussion**

The results of this study found that the incidence of occupational stress among railway workers in Fuzhou City was 50.58%, which was lower than that of employees of medical staff (59.4%) [35] and higher than coal miners (38.1%) [36]. The higher occupational stress scores in the age<25 years and working experience<5 years group are consistent with the findings of Ines et al. [37]. It may since this group of workers are new to their jobs, have heavy workloads, are inexperienced, and encounter more difficulties and challenges [38]. The incidence of job burnout among participants was 93.47%, which was higher than that of caregivers (67.37%) [39] and coal miners (77.74%) [36]. The higher burnout scores in the age group of 35–45 years old and 10–20 years of service are consistent with the results of Xian et al. [40], which may related to the fact that this group of workers has been in the job for a long time, but their career development is different from what was envisioned, and their professional enthusiasm diminishes due to a lower sense of professional identity. Furthermore, 11.19% of the participants were defined as depressed and the tendency to depression increased with age and working age, which is consistent with the results reported by Seo JW et al. [41]. The possible explanation for this is that with increasing age and working age, employees’ physical functioning gradually declines, lack of vigor at work, and quality of life decreases, which tends to lead to low mood, thus increasing the chances of depression [42].

The regression analysis indicated that occupational stress and burnout were both risk factors for depressive symptoms. Consistent with certain studies showed that PSQ of occupational stress was a risk factor for depressive symptoms, and PRQ was a protective factor [43]. With the advent of EE, DP, and RA, the degree of job burnout increased with higher odds of developing



**Fig. 1** Interaction between occupational stress and job burnout on depressive symptoms

depressive symptoms, consistent with Alan et al.'s study [44]. Occupational stress played a significant role in depressive symptoms, and EE induced by job burnout was highly correlated with depressive symptoms [45, 46]. When railway workers face heavy vocational tasks and give more than they get, they will probably be in a state of tension [47]. Stress alters hormone secretion, affecting individuals' mentality and behavior, leading to EE, DP, and even depressive symptoms [48].

Prolonged occupational stress exposure may lead to persistent feelings of fatigue and exhaustion, which may ultimately develop into job burnout. Among the core dimensions of burnout, emotional exhaustion is strongly associated with depressive symptoms. Research findings have shown that as the level of burnout increases, so does the likelihood of depression, a pattern that has been demonstrated in a variety of occupational groups such as doctors and teachers [49]. Maslach et al.'s [31] research particularly emphasizes that the interaction and impact of EE, DP, and reduced personal accomplishment (rPA) on one another are crucial in understanding and identifying potential risks for depression when assessing job burnout.

In addition, the potential role of the interaction between occupational stress and job burnout on depression may be unknown. Therefore, this study aimed to investigate the interaction between occupational stress and job burnout in the depressive symptoms of Chinese railway workers and to test whether different levels of job burnout exacerbate the effect of occupational stress on depressive symptoms. First, the interaction between occupational stress and job burnout had a significant effect on depressive symptoms after controlling for covariates. In addition, our study found that subjects with high levels of job burnout scored higher on depressive symptoms under high job stress. Taken together, these results suggest that occupational stress and job burnout interactions influence depressive symptoms,

which is supported in several related studies [23, 25]. It is generally understood that under the prolonged influence of occupational stress, if an individual fails to obtain sufficient resources and social support to address the issues, it can potentially lead to the emergence of job burnout [27]. This denotes that there may be an interaction between occupational stress and job burnout, affecting depressive symptoms individually or in combination, consistent with Lin et al.'s findings [49]. Furthermore, workers under prolonged occupational stress and emotional exhaustion find it challenging to recover from the situation with insufficient resources, thereby affecting physical and mental health [50].

This study suggests that the railway management layer needs to pay more attention to employees' occupational stress and depressive symptoms. Moreover, heavy occupational tasks, high living stress, occupational identity, and disease status are critical causes of job burnout [15]. Managers in the railway bureau should provide prompt psychological counseling for employees, give them adequate autonomy and control, and raise wages to decrease the occupational stress response and emotional exhaustion. Meanwhile, psychological lectures and vocational training should be provided to foster personal resilience, prevent depressive symptoms, and improve the quality of life of railway workers [51].

Studies may show that people with high occupational stress are more likely to suffer from depression [52]. The strength of this study is that we developed an interaction model to explore the relationship between occupational stress, job burnout, and depressive symptoms. Nonetheless, this study had some limitations: (1) Our sample represents a population of railway workers in Fuzhou. It is unclear whether the interaction between occupational stress and burnout in depressive symptoms extends to other occupational groups. (2) Assessments of occupational stress, job burnout, and depressive symptoms are based exclusively on subjective questionnaires, which are

prone to false-positive results and may affect the accuracy of the results. For example, the SCL-90 can investigate and reflect mental health problems in different occupational groups, but a diagnosis of depression needs to be confirmed on the basis of a clinician's diagnosis. (3) This study was a cross-sectional study could not establish a causal relationship. Therefore, a longitudinal study is necessary to explore the relationship between occupational stress, job burnout and depressive symptoms.

## Conclusion

Our results found that the depressive symptoms of railway workers in Fuzhou city was related to occupational stress and job burnout. The higher ORQ and PSQ of occupational stress, the higher the possibility of depressive symptoms was. The more serious the EE, DP and PA of job burnout are, the more obvious the depressive tendency will be. More importantly, occupational stress and varying degrees of burnout interact to influence depressive symptoms, especially under high job stress and high burnout. These findings laid a foundation for studying the correlation between occupational stress and depressive symptoms and the impact of job burnout on the mental health of workers. For workers, the adjustment of the neglected job burnout may be an effective way to reduce depressive symptoms at work life.

## Abbreviations

OSI-R	Occupational Stress Inventory Revised Edition
CMBI	China Job Burnout Inventory
SCL-90	Symptom Checklist-90
ORQ	Occupational Roles Questionnaire
PSQ	Personal Stress Questionnaire
PRQ	Personal Resources Questionnaire
MBI-GS	Maslach Burnout Inventory-General Survey
EE	Emotional exhaustion
DP	Depersonalization
PA	Personal accomplishment

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## Author contributions

S.Y. and M.Z. did the Investigation, Drafted the manuscript. Y.L. and C.L. Collected the data, did the Methodology. Y.F. did the Data curation. Y.J. did the Study design, Writing - review & editing. S.G. did the Project administration, Writing-review& editing.

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## Data availability

The datasets analyzed in the current study are available from the corresponding author on reasonable request.

## Declarations

## Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Ningxia Medical University (No.2022-N079).

## Consent for publication

Not applicable.

## Competing interests

The authors declare no competing interests.

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