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# The effect of hindrance stressors on the emotional exhaustion among front-line healthcare workers in the recuperation period during the COVID-19 epidemic in China: a prospective cross-sectional study

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## ABSTRACT

**Objectives** This study aimed to examine the influence and conditioning process of hindrance stressors on the emotional exhaustion of the front-line healthcare workers during recuperation, examine the potential mediating process of rumination, and explore the moderating role of organisational and family factors.

**Setting** This cross-sectional study was conducted during 12–20 July 2020. Total 418 questionnaires were collected from front-line healthcare workers by random cluster sampling. Hierarchical regression was performed to analyse the mediating effect of affective rumination using SPSS25.0, while PROCESS was used to further investigate the moderating role of servant leadership and family support.

**Participants** 418 healthcare workers were investigated randomly from front-line medical teams. Inclusion criteria included worked as front-line health workers and participated in the fight against COVID-19 in Hubei; age ≥18 years; normal cognitive and comprehension abilities under physical and mental health; volunteer to participate in this study. Exclusion criteria included recently affected by major events other than COVID-19 or those with a history of neurasthenia and trauma.

**Results** Using descriptive analysis of average value and SD measured by a five-item scale (MBI-GS), we found that front-line healthcare workers' emotional exhaustion score (2.45±0.88) was at the medium level. Hindrance stressors, mediated by affective rumination, had a significant positive predictive effect on emotional exhaustion. Servant leadership negatively moderated the direct effect of hindrance stressors on emotional exhaustion (β=−0.106, p<0.01). Family support positively moderated the impact of hindrance stressors on emotional exhaustion (β=0.082, p<0.05).

**Conclusions** During the recuperation period, after successfully controlling COVID-19 at the front line, the first-line healthcare workers should be screened through affective rumination evaluation to gain insight for targeted interventions. We find that servant leadership is beneficial in alleviating emotional exhaustion while family support worsens emotional exhaustion. We suggest that servant leadership should be further promoted in medical organisations, and family support should be applied correctly and cautiously.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Cross-sectional analysis of the occupational and mental health of front-line healthcare workers in the recuperation period during the COVID-19 epidemic.

⇒ Cluster random sampling methods were used to choose 418 healthcare workers randomly from front-line medical teams in Chongqing, China.

⇒ Multilevel regression analysis and conditional process analysis demonstrated the mediating effect of affective rumination and moderating effects of servant leadership and family support, respectively.

⇒ Descriptive analysis revealed that front-line healthcare workers' emotional exhaustion score (2.45±0.88) was at the medium level in the recuperation period during the COVID-19 epidemic.

⇒ Future research should collect multilevel data to achieve more accurate outcomes, and use the longitude method to capture dynamic fluctuation among variables such as affective rumination and emotional exhaustion.

## INTRODUCTION

As of 6 August 2021, the COVID-19 epidemic has caused 200 840 180 infections and 4 265 903 deaths worldwide.[1] However, in China, the epidemic has been well controlled.[2] Since the COVID-19 outbreak in March 2020, more than 40 000 healthcare workers of emergency rescue teams from different cities have rushed to Hubei to fight against the epidemic. About 30% of them were between the age of 20 and 30 years, and most of them were new to a public health emergency and

lacked relevant work experience.[3] In addition to strong virus transmission, high infection risk, lack of personal protective equipment and technical difficulties in the early stage of the outbreak,[4 5] they were vulnerable to mental health problems. At the same time, some of them suffered from anxiety and depression,[6–8] and researchers called for more attention to the psychological burden and overall wellness of healthcare workers.[9] Current studies have explored healthcare workers' mental conditions and burnout in the workplace; nevertheless, few have tracked their physical and mental recovery conditions outside the work. In fact, it has been reported that healthcare workers are at risk of developing post-traumatic stress disorder (PTSD) after a public health emergency support mission.[10] Recent findings revealed the increased risk of PTSD in healthcare workers,[11] especially with the heavy workload and working in unsafe settings.[12]

Furthermore, they are prone to long-term serious mental distress.[13 14] Therefore, it is reasonable to speculate that front-line healthcare workers of emergency rescue teams (hereinafter called healthcare workers) may face emotional and mental threats during recuperation after the anti-COVID-19 mission.

Emotional exhaustion, which healthcare workers are likely to confront in the recuperation period following the COVID-19 epidemic, is a chronic state of physical and emotional depletion resulting from excessive work engagement and personal demands and/or continuous stress. It is manifested by physical fatigue and a sense of feeling psychologically and emotionally 'drained'.[15] Healthcare workers are more likely to experience emotional exhaustion. In the UK, the proportion of doctors experiencing high emotional exhaustion has been reported to range from 31% to 54.3%.[16] Since the COVID-19 outbreak, healthcare workers in Hubei struggled with exhaustion related to long working hours and a crushing emotional and mental toll from overwork, infection risk and medical product shortage. Failing to adjust the mental state and reduce the emotional exhaustion levels during the recuperation period following the stressful event may have a negative effect on future work, life and even health.

Emotional exhaustion may be influenced by the individual state or circumstantial situation the health workers experienced. Rumination is crucial for first-line healthcare workers in the process of returning to normal work.[17] It refers to the tendency to think about work-related issues and events outside of work.[18] Rumination, involving the current emotional state and the causes, consequences and meaning of the event that led to this state, is believed to be an important factor in the development of depression,[19] impaired physical and mental health[20] and an increase in work-related burn-out.[21] Numerous studies have also emphasised the mediating role of rumination linking work stressors with individual physical and mental health.[22 23] Rumination itself may not be associated with impaired health, but rumination's emotional components may cause negative effects from stressors.[24] Nonetheless, job stress and rumination are

not entirely detrimental to the individual. Different stress components may have diametrically opposite effects. It remains to be discussed which components specifically affect emotional exhaustion among front-line healthcare workers. Besides, perceived concerns or support from a social network may relieve the negative effects of stressors.

Few studies have focused on the mediating effect of stressors on the conditioned process of emotional exhaustion, especially some non-work-related factors. In fact, most front-line healthcare workers have successfully recuperated after completing the anti-COVID-19 mission. Also, family factors may impact their subsequent cognitive and emotional states before going back to normal work and life. To address these concerns, we examined these connections, analysed the potential mediating process of rumination and explored the moderating role of organisational and family factors in the present study, thereby enriching the theory of rumination and emotional exhaustion that could be used to better guide the management practice of personnel under the major public health emergency.

## RESEARCH HYPOTHESES
### Hindrance stressors and emotional exhaustion

Hindrance stressors are work-related demands or circumstances that tend to constrain or interfere with individual work achievement and are not necessarily associated with potential individual gain.[25] Some examples of work hindrance stressors are role conflict, role ambiguity and role overload. According to Crawford *et al*, hindrance stressors are negatively related to enthusiasm and calmness and can trigger negative emotions and perceptions, leading to negative, mood-centred responses.[26] The COVID-19 is the fastest spreading, most extensive and most challenging public health emergency China has ever encountered. Over 40 000 healthcare workers from different cities have rushed to Hubei to fight against the epidemic. During this period, various factors such as the unknown infection risk and the lack of standardised controlling work process and tacit cooperation have put a tremendous strain on healthcare workers.[27] In such situations, healthcare workers may experience negative emotions such as anxiety, anger, fatigue, increased emotional exhaustion and even maladaptive coping strategies such as avoiding work. Based on the above mentioned, we proposed the following hypothesis:

> H1: Hindrance stressors have a positive predictive effect on emotional exhaustion.

### Mediating role of affective rumination

Affective rumination, a form of work rumination, refers to intrusive and recurrent negative thoughts in affective terms and has been associated with the sympathetic nervous system's activation. Hindrance stressors are presented at the psychological level through affective rumination that continually consumes the individual's
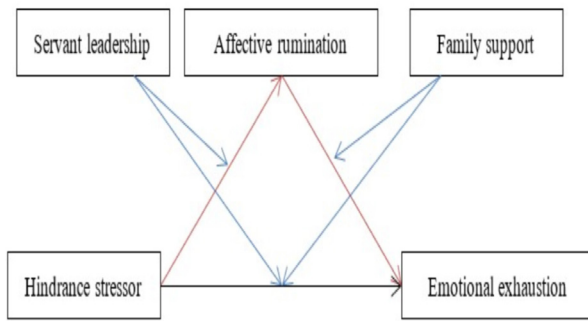
**Figure 1** Theoretical model.

cognitive and emotional resources. Conservation of resources theory offers a framework for understanding responses to stress, suggesting that stress results from circumstances involving threatened or actual loss of valued resources.[28] Furthermore, it asserts that individuals use various resources to complete work tasks such as time, cognitive attention and physical energy. Still, they have to replenish those resources during breaks so as to avoid stress. When individuals ruminate effectively, they often feel upset and anxious because of work. This cognitive manifestation of workplace stressors does not generate any additional resources, but it consumes resources, thus hindering individual recovery and elevating the levels of emotional exhaustion. The mediating role of rumination has been confirmed by many studies. Baranik[29] has shown that rumination negatively mediates individuals' sense of happiness. Fu (2019) pointed out that rumination has a mediating role between job stressors and creativity.[30] Based on these studies, the following hypothesis was proposed.

H2: Hindrance stressors, mediated by affective rumination, have a positive predictive effect on emotional exhaustion.

### Moderating role of servant leadership

Servant leadership is a leadership philosophy in which the main goal of the leader is to serve. This is different from traditional leadership, where the leader's main focus is the thriving of the company or organisations. A servant leader shares power, puts the needs of the employees first and helps people develop and perform as highly as possible. Person-environment fit theory focuses on the interaction between the individual's characteristics and that of the environment, whereby the individual not only influences his or her environment but the environment also affects the individual.[31] Healthcare workers from different cities in China rushed to Hubei to fight against COVID-19 as part of temporarily established teams. They were unfamiliar with the work environment and interpersonal relationships, so their initiatives were affected, and their stress increased. They also experienced depression and rumination, while their emotional exhaustion increased due to the lack of care and support from leaders when facing insurmountable problems at work.

Therefore, servant leadership is conducive to promoting proactive behaviours and reducing stress. Based on the above mentioned, the following hypotheses were proposed.

H3a: Servant leadership negatively moderates affective rumination on hindrance stressors and emotional exhaustion.

H3b: Servant leadership negatively moderates hindrance stressors on emotional exhaustion.

### Moderating role of family support

Family support, a kind of support provided by family members, has an important influence on individuals' development and adaptation.[32] According to previous studies, positive family relationships help individuals overcome negative mental states, such as anxiety and depression.[33] In dealing with COVID-19, many healthcare workers have reported a sense of regret and guilt about leaving their families to support the front line. Restricted by the work environment, they were unable to communicate with their families at any time or place. The more family support resources they acquired, the more confident they were in work and life. As their mental toughness increased, they had more force to face setbacks and difficulties, which in turn reduced the sense of helplessness and depression brought on by hindrance stressors. If they felt that family support resources were insufficient, work stress was more likely to become overwhelming, which may have a negative effect on their emotional state, and eventually result in high levels of burn-out. To sum up, our hypotheses are as follows:

H4a: Family support negatively moderates affective rumination on hindrance stressor and emotional exhaustion.

H4b: Family support negatively moderates hindrance stressors on emotional exhaustion.

A theoretical model (figure 1) was established based on the hypotheses mentioned above.

## METHOD
### Participants

To facilitate the implementation of the investigation, cluster random sampling methods were used to choose the participants. Four front-line medical teams (the third medical team of Chongqing province, the ninth medical team of Chongqing province, the first medical team of the Army Military Medical University, the second medical team of the Army Military Medical University) were selected out of total 18 teams which had been to Hubei from Chongqing to provide support during the COVID-19. We investigated 418 healthcare workers randomly from front-line medical teams in Chongqing, China. Inclusion criteria were the following: (1) those who worked as front-line health workers and participated in the fight against COVID-19 in Hubei; (2) age ≥18 years;

(3) normal cognitive and comprehension abilities under physical and mental health; (4) volunteer to participate in this study. Exclusion criteria included people who were recently affected by major events other than COVID-19 or those with a history of neurasthenia and trauma.

No patient was involved in this study. Participation was voluntary, and each healthcare worker could decide whether to fill in the questionnaire after reading the informed consent on the first page of the survey. This study was approved by the Ethics Committee of Maternal and Child Health Care Hospital in Chongqing, China.

To ensure the effectiveness of the data, managers working in the hospital were asked to communicate with the subjects before the survey to ensure that participants could understand the purpose of the research and the importance of carefully answering the questions. The characteristics of the participants are shown in table 1.

## Research procedure

This cross-sectional study was conducted in Chongqing between 12 July 2020 and 20 July 2020. We conducted the survey by online questionnaires, collecting data on healthcare workers who once worked in front line fighting COVID-19. Taking the epidemic risk into account, we sent out questionnaires online so as to avoid unnecessary human contact. Questionnaires were filled in anonymously to ensure the objectivity and validity of data. The survey in the current study was selected from mature scales. A small-scale presurvey was conducted to confirm the accuracy of the expression of the content in the questionnaire.

## Research instruments

The scales used are widely accepted in academic research. The 'Translation-back translation-proofreading' approach was adopted to ensure the accuracy and consistency of language. All the variables were scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Variables and their measurement tools were as follows:

Hindrance stress was measured by a four-item scale developed by Rodell et al.[34] We added the situation of fighting COVID-19 in the survey to recall the relevant memory of participants. The scale included such items as 'I do not understand my work standard' and 'I had to go through a very tedious process to finish the work'. In this study, the scale's coefficient (α) of internal consistency was 0.731.

Affective rumination was measured using a five-item scale developed by Cropley et al (2007).[35] We also added the situation of fighting COVID-19 in the survey to recall relevant memory of participants. The scale included items such as 'I was nervous thinking about work last night' and 'Last night, I was bored thinking about work'. In this study, the scale's coefficient (α) of internal consistency was 0.872.

Emotional exhaustion was measured by a five-item scale (MBI-GS) developed by Maslach et al.[36] The scale

**Table 1** Demographic characteristics (N=418)

| Variables | n | % |
|---|---|---|
| Gender | | |
|   Male | 125 | 29.90 |
|   Female | 293 | 70.10 |
| Age (years) | | |
|   < 20 | 0 | 0.00 |
|   20–29 | 93 | 22.25 |
|   30–39 | 252 | 60.29 |
|   40–49 | 68 | 16.27 |
|   > 50 | 5 | 1.20 |
| Education | | |
|   College or under | 37 | 8.85 |
|   Undergraduate | 311 | 74.40 |
|   Master | 41 | 9.81 |
|   Doctor | 29 | 6.94 |
| Marital status | | |
|   Married | 327 | 78.23 |
|   Unmarried | 76 | 18.18 |
|   Divorced | 15 | 3.59 |
| Major | | |
|   Clinical medicine | 112 | 26.79 |
|   Medical technology | 1 | 0.24 |
|   Nursing | 285 | 68.18 |
|   Medical management and others | 9 | 2.15 |
|   Others | 11 | 2.63 |
| Rescue experience (n) | | |
|   1 | 349 | 83.49 |
|   2 | 51 | 12.20 |
|   3 | 5 | 1.20 |
|   ≥4 | 13 | 3.11 |
| Front-line institution | | |
|   Vulcan mountain and other infectious diseases specialist hospital | 116 | 27.75 |
|   Mobile cabin hospital | 69 | 16.51 |
|   Wuhan union hospital and other general hospitals | 99 | 23.68 |
|   Others | 134 | 32.06 |

included such items as 'I feel exhausted from work.' and 'I'm close to having a burn-out because of work.' In this study, the scale's coefficient (α) of internal consistency was 0.919.

Servant leadership was measured by a six-item scale developed by Sendjaya.[37] The scale included items such as 'Leader enhances my ability to do good deeds' and 'Leader gives me a sense of meaning in my daily work'. In this study, the scale's coefficient (α) of internal consistency was 0.875.

Family support was measured by a four-item scale developed by Procidano.[38] The scale included such items as 'My family can provide me help' and 'I can talk to my family about my problems'. In this study, the scale's coefficient (α) of internal consistency was 0.911.

## Data processing

As the current study was a self-assessment questionnaire collected at a one-time point, it may be affected by homology bias. In this paper, Harman's single factor test was used to detect the homologous deviation. SPSS results showed that when the data were not rotated, a total of five factors were generated, explaining 68.605% variation. The first principal component obtained was 30.323%, revealing 30.323% explanatory power of variance for all questions, which did not exceed 50% judgement criteria. Therefore, there was no serious homology bias in this study. The adverse effects on the research results could be eliminated, and the research results had certain reliability.

The current study depended on AMOS24.0 (developed by IBM) for confirmatory factor analysis, SPSS25.0 (developed by IBM) for multilevel regression analysis and PROCESS (developed by Haye ) for a further test like conditional process analysis.[39] We standardised the independent variables, mediating variables and moderating variables so as to avoid the multicollinearity caused by the addition of interactions. In this study, hindrance stressor was regarded as a predictive variable, affective rumination as a mediating variable, servant leadership and family support as moderating variable and emotional exhaustion as an outcome variable.

## Patient and public involvement

No patient involved.

## RESULTS
## Reliability and validity

According to SPSS, the internal consistency of hindrance stressor, affective rumination, emotional exhaustion, family support and servant leadership, respectively, estimated by Cronbach's coefficient alpha, was over 0.7, thus showing satisfactory accuracy and reliability.

AMOS24.0 was used in the current study to evaluate the discriminant validity between variables to test potential errors from a single data source. Five-factor model is illustrated in table 2 ($\chi^2$/df = 2.107, root-mean-square error of approximation (RMSEA)=0.052, incremental fit index (IFI)=0.955, comparative fit index (CFI)=0.955, standardized root mean square residual (SRMR)=0. 043), showing better indexes than other models, which identified the independence between five variables. Thus, we can conclude that our variables have reasonable validity, and the data were not influenced by homologous bias.

## Descriptive statistics and correlations

Table 3 presented the average value, SD and correlations among the variables. On the whole, emotional exhaustion was positively related to affective rumination and hindrance stressor, while negatively related to servant leadership and family support. These results supported our preliminary hypotheses.

Given the stress tolerance and emotional state might differ between males and females, we conducted an independent samples t-test to determine whether the gender differences existed regarding the impact of hindrance stressors on emotional status. The result showed that the difference was not significant ($p>0.5$). One possible explanation could be the influence of traditional Chinese culture called *I am ready to give up the self to serve the people,* which reflected the consensus of responsibility and collectivism among the Chinese. That meant, during the COVID-19 fight, no matter what their gender was, healthcare workers considered the anti-COVID-19 mission prior to everything. Their pressure perceived and emotional status were influenced by the epidemic situation rather than gender factors. Therefore, the gender difference of emotional exhaustion was not significant.

## Indirect effect of affective rumination

Hierarchical linear regression was used to test our hypothesised model. As presented in the following table 4, the hindrance stressor was positively related to emotional

| Table 2 | Validity (n=418) | | | | | | | |
|---------|------------------|-----------|-----|--------------|-------|-------|-------|-------|
| **Model** | **Factor** | **$\chi^2$** | **df** | **$\chi^2$/df** | **IFI** | **CFI** | **RMSEA** | **SRMR** |
| 1 | Five-factor | 509.833 | 242 | 2.107 | 0.955 | 0.955 | 0.052 | 0.043 |
| 2 | Four-factor | 1583.605 | 246 | 6.437 | 0.775 | 0.774 | 0.114 | 0.112 |
| 3 | Three-factor | 2927.523 | 249 | 11.757 | 0.55 | 0.548 | 0.161 | 0.162 |
| 4 | Two-factor | 3627.262 | 251 | 14.451 | 0.432 | 0.43 | 0.180 | 0.158 |
| 5 | One-factor | 3797.651 | 252 | 15.07 | 0.404 | 0.401 | 0.184 | 0.158 |

Five-factor model: hindrance stressor, affective rumination, emotional exhaustion, family support, servant leadership; Four-factor model: hindrance stressor, affective rumination, emotional exhaustion, family support+servant leadership; three-factor model: hindrance stressor, affective rumination, emotional exhaustion+family support+servant leadership; two-factor model: hindrance stressor, affective rumination+emotional exhaustion+family support+servant leadership; one-factor model: hindrance stressor+affective rumination+emotional exhaustion+family support+servant leadership.

**Table 3** Descriptive statistics and correlations (n=418)

| Variables | Mean | SD | Hindrance stressor | Affective rumination | Emotional exhaustion | Servant leadership | Family support |
|---|---|---|---|---|---|---|---|
| Hindrance stressor | 2.25 | 0.71 | 1 | 0.368** | 0.438** | −0.288** | −0.279** |
| Affective rumination | 1.68 | 0.65 | 0.368** | 1 | 0.392** | −0.198** | −0.158** |
| Emotional exhaustion | 2.45 | 0.88 | 0.438** | 0.392** | 1 | −0.274** | −0.303** |
| Servant leadership | 3.67 | 0.76 | −0.288** | −0.198** | −0.274** | 1 | 0.260** |
| Family support | 4.03 | 0.81 | −0.279** | −0.158** | −0.303** | 0.260** | 1 |

*P<0.05, ** P <0.01.

exhaustion (see step 2 of table 4, β=0.444, p<0.001), which supported our hypothesis 1. Furthermore, when adding mediators as affective rumination, the influence of hindrance stressor on emotional exhaustion decreased (see step 3 of table 4, from β=0.444 to β=0.341). In contrast, affective rumination was positively associated with emotional exhaustion (see model 3 of table 4, β=0.281, p<0.001).

Thus, the obtained results supported our hypothesis 2 that affective rumination had a partial mediating effect in the relationship between hindrance stressor and emotional exhaustion.

Furthermore, PROCESS was used to carry out 5000 bootstraps for deviation correction. As shown in table 5, the indirect effect of affective rumination was 0.103, and its CI was 0.065 to 0.149, which did not include the value of 0. Hence, these results demonstrated the significant mediating role of affective rumination in the relationship between hindrance stressor and emotional exhaustion. The direct effect was also significant because of the CI 0.242 to 0.438, which indicated that affective rumination had a partially mediating role.

**Moderating influence of servant leadership and family support**
Based on the hierarchical linear regression, we found although the moderate role of both servant leadership and family support was not significant in the indirect

path (β=−0.024, p>0.05; β=0.022, p>0.05), their moderating effect was significant in the direct path between hindrance stressor and emotional exhaustion.

As presented in table 6, servant leadership negatively moderated the relationship between hindrance stressor and emotional exhaustion, while family support positively moderated the relationship between hindrance stressors and emotional exhaustion.

As shown in figure 2, servant leadership interacted with hindrance stressors such that the positive relationship between hindrance stressors and emotional exhaustion was stronger when servant leadership was lower.

In contrast, figure 2 showed that family support interacted with hindrance stressors so that the positive relationship between hindrance stressors and emotional exhaustion became stronger when servant leadership was lower.

## DISCUSSION
This study focused on the emotional and mental threats that the first-line healthcare workers fighting against COVID-19 may encounter during the recuperation period following their anti-COVID-19 mission so as to further elucidate the effect of hindrance stressors on emotional exhaustion and reveal the potential influence

**Table 4** Indirect effect of affective rumination (n=418)

| Variables | Emotional exhaustion | | | Affective rumination | |
|---|---|---|---|---|---|
| | Step1(β) | Step2(β) | Step3(β) | Step4(β) | Step5(β) |
| Gender | 0.128 | 0.22* | 0.247** | −0.112 | −0.063 |
| Age | −0.121 | −0.099 | −0.14* | 0.082 | 0.094 |
| Education | 0.162* | 0.148* | 0.146* | 0.011 | 0.004 |
| Hindrance stressor | | 0.444*** | 0.341*** | | 0.237*** |
| Affective rumination | | | 0.281*** | | |
| $R^2$ | 0.14 | 0.209 | 0.276 | 0.017 | 0.149 |
| F | 1.959 | 27.278*** | 31.478*** | 2.395 | 18.03*** |
| $\Delta R^2$ | 0.014 | 0.195 | 0.067 | 0.017 | 0.132 |

*p<0.05, **p<0.01, ***p<0.001 (two-tailed); gender, age and education served as control variables; hindrance stressor and affective rumination served as predictive variables.

**Table 5** Bootstrap test for mediating effect (n=418)

| Mechanism | | Effect | BootSE | BootLLCI | BootULCI |
|---|---|---|---|---|---|
| HS→AR→EE | Indirect effect | 0.103 | 0.022 | 0.065 | 0.149 |
| | Direct effect | 0.341 | 0.05 | 0.242 | 0.438 |
| | Total effect | 0.444 | 0.041 | 0.311 | 0.468 |

Bootstrap is set by a 95% CI for 5000 repeated samples.
AR, affective rumination; EE, emotional exhaustion; HS, hindrance stressor; LLCI, lower limit CI; ULCI, upper limit CI.

of affective rumination on the relationship between stressors and emotional issues. The study provided a view on the recuperation period based on 418 healthcare workers who experienced the COVID-19 epidemic, which can significantly benefit hospital staff management as well as emotional issues processing. The main findings were as follows.

First, Zheng *et al* (2020) reported that the front-line healthcare workers' emotional exhaustion level was lower than that of front-line nurses.[40] Nonetheless, it was similar to that of those healthcare workers in the non-epidemic period,[40 41] which may be due to the fact that after experiencing high-intensity work at the COVID-19 front line, most health workers recovered emotionally and psychologically during recuperation and their emotional exhaustion was relieved. According to the existing research, hindrance stressors among front-line healthcare workers have been shown to be at the medium level, which suggests that they have encountered some insurmountable difficulties in containing COVID-19. As shown in Zhang's research, the healthcare workers in isolation wards experienced negative emotions due to their worries about infection, unfamiliar work environment, cumbersome work procedures and lack of experience in treating public health emergencies.[42] A high level of acute stress, sleep disorders and depression were found to exist among healthcare workers.[43–45] Our results

suggest that it is necessary to strengthen the awareness of public health emergencies, establish professional emergency response teams during peacetime and enhance the ability to respond to major public health emergencies. The reported scores of servant leadership and family support were high, thus reflecting the favourable effect of support for front-line healthcare workers in fighting the epidemic, which may also explain the different levels of emotional exhaustion.

Second, hindrance stressors, mediated by affective rumination, have a positive predictive effect on emotional exhaustion. Rumination is an important mechanism that links stressors with individuals' problem-solving ability and health-related outcomes. It has been shown that rumination mediates between job stressors and other job variables.[46] Borawski indicated that rumination, as a mediating factor, negatively affects individuals' well-being and happiness.[47] Vandevala *et al* pointed out that increased stressors conferred greater burn-out through increased affective rumination among intensive care unit medical staff.[48] Our study further validated the mediating role of affective rumination in the relationship between affective rumination and emotional exhaustion.

Third, servant leadership's negative moderating effect on the relationship between hindrance stressors and affective exhaustion has been verified. Servant leadership helps healthcare workers have an active role in

**Table 6** Moderating influence of servant leadership and family support (n=418)

| Variables | Emotional exhaustion | | |
|---|---|---|---|
| | Step1(β) | Step2(β) | Step3(β) |
| Gender | 0.113 | 0.194* | 0.197* |
| Age | −0.106 | −0.098 | −0.093 |
| Education | 0.142* | 0.146* | 0.157 |
| Hindrance stressor | | 0.314*** | 0.314*** |
| Servant leadership | | −0.117** | −0.121** |
| Family support | | −0.152*** | −0.148*** |
| Hindrance stressor×servant leadership | | | −0.106** |
| Hindrance stressor×family support | | | 0.082* |
| $R^2$ | 0.014 | 0.261 | 0.278 |
| F | 1.959 | 24.17*** | 19.696*** |
| $\Delta R^2$ | 0.014 | 0.247 | 0.264 |

*p<0.05, **p<0.01, ***p<0.001 (two-tailed).
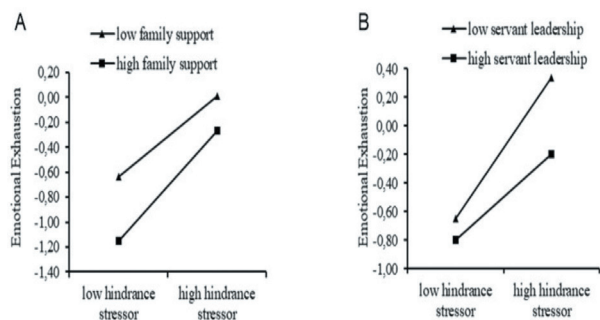
**Figure 2** Moderating effects of (A) family support and (B) servant leadership.

work and interpersonal communication and improve their emotional state. Even when individuals face insurmountable problems at work, trust and gratitude for leadership can reduce their affective rumination and emotional exhaustion. However, servant leadership does not moderate the effect of affective rumination on hindrance stressors and emotional exhaustion. As stress is an external and objective barrier, often stemming from work, the negative effects of hindrance stressors may be reduced to some extent if individuals are cared for by leaders when they are under stress. Rumination, a kind of internal subjective thinking and active introspective behaviour, comes from individuals' subjective cognition and emotion, so external care cannot be influenced. In addition, under the impact of COVID-19, the strong responsibility and high levels of stress may lead healthcare workers to engage in more rumination and introspection, thus making the effective rumination caused by hindrance stressors more difficult to overcome.

Finally, family support can moderate the effect of hindrance stressors on emotional exhaustion, which is contrary to the original hypothesis. Based on previous researches, family support and servant leadership are equally beneficial in encouraging and helping individuals cope with stress. Because individuals are more intimate and unrestrained with family members, they are more inclined to communicate with family members than with leaders when facing overbearing stress. Our research has found that a small conflict can escalate into a big problem when people vent, communicate and interact deeply with those they are close to.[49] Ferrús *et al* demonstrated that permitting healthcare workers involved in an adverse event to speak out their experience could positively respond to their emotional needs.[50] Our study extends scholars' findings by pointing out the negative influence of immersing in negative events. According to the conservation of resources theory, in the process of individual and family interaction, venting and releasing stress, the negative information brought on by stress receives more attention, which leads to the constant consumption of an individual's emotional resources, and pronounced emotional exhaustion. Our results are consistent with Baranik's research.[29] In fact, our study extends Baranik's findings on family support and focuses on the negative

impact of positive responses on individuals. Family support cannot moderate the effect of rumination on hindrance stressors and emotional exhaustion because hindrance stressors during COVID-19 may decrease the efficiency of treatment for patients, thus resulting in a negative mental state among healthcare workers that are difficult to be relieved or eliminated, eventually leading to emotional exhaustion that is challenging to alleviate.

Furthermore, hospital management can directly benefit from our study that also has indirect clinical significance. Understanding the modality of emotional issues experienced by healthcare workers can be extremely useful in helping to regulate their emotional state, thus resulting in improved clinical work. Besides, our findings have a positive implication for the doctor-patient relationship. Previous studies suggested that medical professionals' work burden could undermine the doctor-patient relationship.[51 52] In response to that, our study instructs how to relieve the burden on healthcare workers and regulate their emotions, thus improving the doctor-patient relationship.

The limitations are twofold. First, this study is a cross-sectional design, and all data are self-reported, which can lead to common method biases. The results were proved to be reliable by monofactor analysis. However, in future research, data with multiple time points and sources should be collected to ensure the validity and reliability of surveys and to further explain the relationship among variables. Second, this study only included Chinese healthcare workers as subjects, thus imposing some limitations on conclusions' generalizability. Chinese are influenced by Confucian cultures, which may relieve the negative influence of rumination because Chinese may regard rumination as behaviour that promotes self-growth through introspection, summing up the experience. For other countries, according to reported suicides overseas during the COVID-19 outbreak,[53] people may be more severely affected by the negative influence of rumination and perceive a higher level of emotional exhaustion than in China. Future research could expand its application scope by collecting samples from different countries and populations.

## CONCLUSION

According to our study results, screening first-line healthcare workers for targeted interventions during recuperation after the anti-COVID-19 mission has potential value. Affective rumination can be used to predict burn-out and mental problems such as emotional exhaustion, depression and anxiety. Screening, identifying and assisting healthcare workers with high levels of affective rumination can protect them from burn-out. This study showed that servant leadership had a beneficial role in alleviating emotional exhaustion and was conducive to healthcare workers' work efficiency and physical and mental health. This study's greatest significance lies in the discovery that family support has a 'catalyst' role in the formation

of emotional exhaustion, indicating some complaints and catharses that cannot reduce work stress and are likely to aggravate emotional exhaustion. In this process, family support may deepen healthcare workers' negative emotions, thus consuming their emotional resources to an even greater extent.

Our research provides practical implications for healthcare management. First, regarding the important effect of servant leadership on encouraging healthcare workers to have an active role in work and relieve their emotional exhaustion, healthcare organisations should enhance the service consciousness of organisational supervisors and improve the interaction of healthcare managers and their followers, which can relieve front-line healthcare workers' emotional exhaustion and help them return to normal work and life. Second, family members of healthcare workers should pay attention to the type of their support information cautiously. That means, when they want to provide support to healthcare workers, they are supposed to guide healthcare workers in rethinking negative events and try to find a solution rather than indulge them in dwelling on the negative event because a small conflict is likely to escalate into a big problem. Third, it is reported that individual-directed interventions, such as cognitive–behavioural therapy and relaxation exercises, significantly reduce job burn-out by relieving affective rumination compared with organization-directed interventions.[54] Thus, healthcare workers should develop their mindfulness potential and improve the ability to prevent stress perception and emotional exhaustion. Finally, from the perspective of human resource practices, healthcare sectors should conduct training activities and self-assessment for healthcare workers to reinforce their emergency rescue skills, and further reduce the negative influence of the hindrance stressors.

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