Research on Impact of Role Overload on Miners' Unsafe Behavior

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Abstract: In order to explore the influence mechanism of role overload on miners' unsafe behavior, cognitive load and emotional exhaustion were introduced as intermediary variables, and a chain intermediary model was constructed. Using the role overload scale, cognitive load scale, emotional exhaustion scale and unsafe behavior scale, this paper makes a quantitative study on 351 miners' samples by questionnaire, and uses SPSS27.0 and AMOS28.0 to carry out correlation analysis and intermediary effect test on the experimental data.;At the same time, through personnel interviews, we have a deep understanding of the miners' views on the role of the role, the load, and emotional exhaustion of the miners. The results show that role overload can not only directly and positively affect miners' unsafe behavior, but also affect unsafe behavior through the independent mediation effect of cognitive load and emotional exhaustion, as well as the chain mediation effect of cognitive load and emotional exhaustion. Identifying and intervening miners' role overload, cognitive load and emotional exhaustion in time can promote the effective accumulation of positive psychological resources, which is of great practical significance for preventing miners' unsafe behavior and improving the safety production level of coal mining enterprises.

Keywords: role overload; miners; unsafe behavior; cognitive load; emotional exhaustion

1 INTRODUCTION

With the development of society and technological progress, the competition among enterprises is becoming more and more severe, and the same situation exists in coal mining enterprises. In particular, the existence of a shift system leads to groups of miners facing greater time pressure from time to time, and in this context it is easy to produce the phenomenon of role overload.

Based on the literature review, this paper focuses on the initial resource changes and psychological feelings of miners after role overload[1] is applied to them, and introduces cognitive load and emotional exhaustion as mediating variables to explore

V. Vasilev et al. (eds.), *Proceedings of the 2024 5th International Conference on Management Science and Engineering Management (ICMSEM 2024)*, Advances in Economics, Business and Management Research 306,
https://doi.org/10.2991/978-94-6463-570-6_19

the intrinsic mechanism of role overload's influence on unsafe behavior[2]. Some empirical studies have shown that miners' cognitive load plays an important mediating role in the process of reducing decision-making performance by role overload[3] . According to the resource limitation theory, attention is a limited resource, and when an individual's attention allocated to one task increases, the attention allocated to other tasks decreases. Whereas role overload can substantially limit attentional resources, when enough selective resources are limited, cognitive load results. Whereas overload may likewise cause emotional exhaustion, role overload as a work stressor may cause employees to become mentally unbalanced, and if employees experience emotional exhaustion, they may reduce their work input to compensate for this disequilibrium. Therefore, the stress disequilibrium compensation theory provides a suitable framework to explain the mediating mechanism between role overload and miners' unsafe behaviors.

In summary, this paper intends to start from the resource limitation theory, introduce cognitive load and emotional exhaustion as mediating variables, construct a structural relationship model of the four components of role overload, cognitive load, emotional exhaustion and miners' unsafe behaviors, and reveal the role pathway from role overload to unsafe behaviors, the mediating effects of cognitive load and emotional exhaustion, with a view to enriching the theoretical background related to role overload, and providing new ideas for the effective prevention of coal mining enterprise employees' and provide new ideas for the effective prevention of unsafe behaviors of coal mine employees.

2 RESEARCH HYPOTHESES

2.1 Role Overload and Unsafe Behavior

Role overload is usually accompanied by multiple influences from family, society, and at work. Research has shown that in addition to situational factors, role overload is also influenced by leader factors and individual psychological factors[4]. That is to say, excessive input in a limited time will bring psychological pressure to individuals, so that they have to force themselves to adapt to the state of high intensity, and in the long run, individuals will have the tendency of psychological imbalance, breeding negative emotions like sensitivity and irritability. Domestic scholars Wang Dan et al believe that miners' unsafe behaviors can be divided into non-participation in safety behaviors and non-compliance with safety behaviors. According to the ABC theory of emotions, the stressful scenario of role overload stimulates individuals to produce negative emotions, which in turn affects miners' insecurity. In summary, the authors concluded that role overload stimulates individuals' unsafe behaviors.

H1: Role overloading overloading positively affects miners' unsafe behavior.

2.2 The Mediating Role of Cognitive Load

Cognitive load refers to the total memory resources required to accomplish a task, which contains internal, external, and related cognitive load. It has been shown that

attentional resources and working memory resources are two important cognitive resources, and when an individual is under role overload[5], the individual is unable to effectively extract relevant memory resources, which results in cognitive load. According to the resource conservation theory, role overload will overconsume an individual's cognitive resources, which in turn will damage his or her working memory resources. In other words, role overload not only impairs the efficiency of utilizing attentional resources, but also restricts working memory in time.BALA et al found that cognitive load negatively affects employees' positive behaviors by influencing communication agility.

H2: Cognitive load mediates the relationship between role overload and miners' unsafe behavior.

2.3 Mediating Role of Emotional Exhaustion

Emotional exhaustion is a chronic sense of physical and emotional depletion. Emotional exhaustion occurs when an individual perceives a lack of resources while performing a task and feels emotionally overprogressed and exhausted. According to the give-and-take imbalance model, when an employee in a role overload state gives enough attentional resources to satisfy the acquisition of positive psychological resources, it triggers the individual's negative emotions[6], which in turn leads to emotional depletion. According to the ego depletion theory, when individuals face conflicts between external pressures and internal demands, they prefer self-regulation, which can deplete limited internal resources and thus breed negative behaviors. Some studies have shown that emotional depletion induces insecure behaviors by affecting employees' self-efficacy.

H3: Emotional exhaustion mediates the relationship between role overload and miners' unsafe behavior.

2.4 Chain Mediation of Cognitive Load and Emotional Exhaustion

Relevant studies have found that role overload causes individuals to exert more effort to accomplish complex tasks, and this pressure causes employees to be in a state of cognitive load all the time. According to the cognitive load theory, massive heterogeneous information will consume a large amount of attentional resources thus causing individuals to generate negative emotions, and the accumulation of negative emotions will result in emotional exhaustion. Emotional exhaustion will limit the rise of psychological capital and restrict the positive behavior of individuals.

H4: The Relationship Between Role Overload and Unsafe Behavior Is Mediated by a Chain of Cognitive Load and Emotional Exhaustion

3 RESEARCH METHODS

3.1 Research Subjects

The samples of this research come from two large-scale coal mining enterprises in Shanxi Province and Liaoning Province, 400 questionnaires were distributed and 351 valid questionnaires were returned, with a recovery rate of 87.75%. In the recovered samples, the gender is male; the age is mainly concentrated in 36-45 years old, accounting for 57.54%; the education is mainly concentrated in junior college and below, accounting for 85.07%; the working experience is concentrated in 1-5 years, accounting for 41.88%. In summary, the sample representation is good.

3.2 Research Tools

The Role Overload Scale developed by Peterson et al was used with five items. Items such as "I feel overburdened at work" were used. The scale was scored on a 5-point LIKERT scale, where the higher the score, the more severe the role overload, and the Cronbach's (reliability) coefficient for the scale was 0.905.The Miners' Unsafe Behavior Scale (MUSBS) developed by Wang Dan et al was used, which consists of two dimensions, non-participation and non-compliance, with a total of eight items. Items such as "I don't communicate with my superiors" were used. The scale was scored on a 5-point LIKERT scale, and the higher the score, the greater the tendency for miners to engage in unsafe behaviors, with a Cronbach's alpha of 0.934.

3.3 Personnel Interviews

In order to gain a more comprehensive understanding of miners' understanding and awareness of unsafe behaviors, this study used personal interviews. Through in-depth conversations with 15 representative miners, the mechanisms by which role overloading affects unsafe behaviors were explored.During the interview process, the following questions were asked to understand the miners' views and perceptions of the relationship between role overload, cognitive load, emotional exhaustion and unsafe behaviors.

(1) In your work, have you engaged in any unsafe behaviors as a result of role overload? Can you describe these behaviors specifically?

(2) Do you believe that cognitive load has an impact on your work behavior? How does this impact manifest itself?

(3) Emotional exhaustion can limit an individual's positive behavior. do you think this behavior is affected by role overload?

(4) Do you believe there is a link between role overload, cognitive load, and emotional exhaustion? If so, please share your insights.

4 DATA RESULTS AND ANALYSIS

4.1 Reliability Test

The Cronbach's α of role overload, cognitive load, emotional exhaustion, and insecure behavior in the model of this study were 0.905, 0.862, 0.897, and 0.934, respectively, which were all greater than 0.8, proving that the scales had good reliability. In addition, this study conducted a validated factor analysis of the four variables of role overload, cognitive load, emotional exhaustion, and insecure behavior using AMOS28.0, as shown in Table 1.The four-factor model fit was significantly better than the others, which demonstrated that there was a good discriminant validity among the core variables.

Table 1. Confirmatory Factor Analysis（n=351）

Mould	Combinatorial	X2/df	GFI	RMSEA	CFI	TLI	IFI
One-factor model	RO+CL+EE+UB	8.827	0.295	0.150	0.525	0.491	0.527
Two-factor model	RO+CL+E, UB	5.349	0.513	0.111	0.737	0.717	0.738
Three Factor Model	RO, CL+EE,UB	3.638	0.709	0.087	0.841	0.828	0.842
Four-factor model	RO, CL, EE, UB	1.879	0.924	0.057	0.945	0.936	0.952

4.2 Common Method Bias Test

Since the samples in this study were all derived from the self-assessment of the miners' samples, there may be homoscedastic variance, therefore, SPSS27.0 was used to test the sample data, and a total of four principal component factors were extracted, and the explained variance of the unrotated first principal component was 28.973%, which was less than the critical value of 40%, indicating that there was no serious homoscedastic error in this study.

4.3 Descriptive Statistics and Correlations Between Variables

Based on the statistical description and correlation analysis of the four variables, the results are shown in Table 2. There is a significant positive correlation between both two of role overload, cognitive load, emotional exhaustion and insecure behavior.

Table 2. Correlation analysis of each variable（n=351）

	M	SD	1	2	3	4
Role overload	3.514	1.063	1			
Cognitive load	3.584	0.912	1	1		
Emotional exhaustion	3.251	0.875	0.527**	0.517**	1	
Unsafe behavior	3.614	1.005	0.485**	0.604**	0.709**	1

4.4 Est of Results for Mediating Effects of Role Overload

This subsection uses the Process macro plug-in of SPSS27.0 to test the indirect effects of cognitive load and emotional exhaustion in the path of role overload affecting miners' unsafe behaviors by using bias-corrected percentile Bootstrap. 5000 Bootstrap samples were taken from the original data N=351 by repeated random sampling, and the results are shown in Table 3: Cognitive load and emotional exhaustion have significant mediating effects. The results are shown in Table 3: the mediation effect of the two variables of cognitive load and emotional exhaustion is significant, including a total of three mediation paths: the first mediation path verifies that H2 is established: role overload → cognitive load → insecure behavior, the confidence interval of this mediation effect is between [0.04, 0.12] without 0, indicating that cognitive load has a significant indirect mediation effect; the second mediation path verifies that H3 is established: role overload → emotional exhaustion → insecure behavior, the mediation effect of this mediation effect is significant. Insecure behavior, the confidence interval of this mediation effect is between [0.07, 0.15] without 0, indicating that the indirect mediation effect of emotional exhaustion is significant; the third mediation path verifies that H4 is established: role overload→cognitive load→emotional exhaustion→insecure behavior, and the confidence interval of this mediation effect is between [0.02, 0.09] without 0, indicating that the indirect mediation effect of cognitive load and emotional exhaustion is significant. indirect effects are significant.

Table 3. Mediating Effect Test

	efficiency value	Boot CI Lower bound	Boot CI upper bound	Relative mediation effect
Total Indirect Effects	0.29	0.12	0.31	48.69%
Indirect effect 1	0.11	0.04	0.12	17.93%
Indirect effect 2	0.13	0.07	0.15	18.72%
Indirect effect 3	0.06	0.02	0.09	12.04%

5 DISCUSSION

This paper explores the mediating role of cognitive load and emotional exhaustion in the way role overload affects miners' unsafe behaviors[7]. It has been verified that role overload can affect unsafe behaviors not only through the independent mediating role of cognitive load and the independent mediating role of emotional exhaustion, but also through the chain mediating role of cognitive load and emotional exhaustion. This study focuses on the mechanism of miners' role overload on unsafe behaviors.Most of the relevant literature on role overload in China focuses within the field of economics.This study introduces role overload into the field of safety management, which is a supplement to the theory of safety management, aiming to provide reasonable and effective suggestions and measures to reduce miners' unsafe behaviors.

5.1 Role Overload and Unsafe Behavior

Role overload positively affects miners' unsafe behaviors[8]. Role overload, as a stressor in daily work, is usually closely related to gender, education level, and nature of work. Usually males, those with lower education, and those with characteristics such as shift work are more likely to experience role overload. Due to the special characteristics of miners, the risk of role overload is much higher than that of other occupations. According to the resource conservation theory, when an individual needs to accomplish too many tasks, his or her restricted mental resources usually manifest negatively and are more likely to induce unsafe behaviors.

5.2 The independent Mediating Role of Cognitive Load

Role overload can influence miners' unsafe behaviors through the independent mediating role of cognitive load. Time pressure and lack of resources and skills can lead to individuals not being able to complete tasks in a timely manner, and the overload caused by this pressure can lead to cognitive load. Some studies have shown that cognitive load can potentially induce numerous negative behaviors and limit positive behaviors.

5.3 Independent Mediating Role of Emotional Exhaustion

Role overload can influence miners' unsafe behaviors through the independent mediating role of emotional exhaustion. Fatigue occurs when individuals deal with too many tasks, and this fatigue can give rise to undesirable emotions such as irritability and sensitivity. Based on the give-and-take imbalance model[9], individuals are highly susceptible to emotional exhaustion under the cumulative effect of long-term cognitive effort and negative emotions. Meanwhile, when emotional exhaustion arises, individuals' positive psychological resources are depleted and they are more likely to engage in unsafe behaviors.

5.4 Chain Mediation of Cognitive Load and Emotional Exhaustion

Role overload will affect insecure behaviors through the chain-mediated effects of cognitive load and emotional exhaustion. According to the cognitive filtering and attenuation theory, information passes through filters and attenuators, where information that exists in an important sense is filtered out, while unimportant information gradually attenuates until it is forgotten. When an individual is in a dynamic and cumbersome stressful environment[10], the filtering function of the filter is constantly used, increasing the burden of the filter. The constant process of comparing and selecting information in the information selection stage also produces an emotional exhaustion, which in turn limits the positive behavior of the employee.

6 CONCLUSIONS

This paper explores the mechanism of role overload as an antecedent variable on miners' unsafe behaviors, reveals the mechanism of influence between the two, and has important theoretical significance and practical value for restricting miners' unsafe behaviors and enhancing the safety production level of coal mining enterprises, with the following conclusions:

Role overload, cognitive load, emotional exhaustion and unsafe behavior are all positively correlated. Role overload can not only directly and positively affect miners' unsafe behaviors, but also indirectly affect unsafe behaviors through cognitive load and emotional exhaustion.

This study mainly investigated the effect of role overload on miners' unsafe behaviors, and in the future, we can focus on the role overload inducing factors; this study used the questionnaire survey method, and the test results may be affected by the subjective thinking of the subjects, which has certain limitations, and in the future, we can use the physiological methods, such as the ERP correlation potential test, to further validate the results of the test.

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