

The Influence of Leadership in Chinese Construction Enterprises on Workers' Unsafe Behavior

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Abstract

Frequent safety accidents in the construction industry have resulted in many casualties and serious economic losses. The main cause of construction safety accidents is the unsafe behavior of construction workers. Although scholars have conducted extensive research on the influencing factors and mechanisms of unsafe behavior among construction workers, there is relatively little research on the emotions of construction workers as its influencing factors. Through pre research and literature review, it was found that emotions are an important factor affecting unsafe behavior among construction workers. This paper combines system analysis theory, accident causation theory, emotional event theory, and behavioral decision-making theory, and uses literature analysis to propose hypotheses. Data is obtained through questionnaire surveys, on-site observations, and text analysis, and statistical methods are used to verify the proposed hypotheses; Mainly using methods such as correlation analysis and regression analysis. This paper proposes and verifies that emotions are an important theoretical perspective for explaining unsafe behavior among construction workers and verifies the significant mediating role of emotions between leadership and unsafe behavior, as well as the significant moderating effect of safety atmosphere. In summary, the paper enriches the theoretical dimensions of the impact mechanism of unsafe behavior among construction workers by introducing emotions as an element that characterizes individual psychological states. At the practical level, the paper proposes a new management strategy to reduce the level of unsafe behavior among construction workers by improving management factors and regulating emotions.

Keywords: *Unsafe behavior, Construction workers, Emotions, Leadership, Safety climate, Security Management.*

Introduction

The construction industry is one of the pillar industries of China's national economy, providing an important material foundation for the development of the country's social economy. Despite facing significant downward pressure on the Chinese economy and weak fixed investment in recent years, the construction industry has maintained an overall trend of seeking progress while maintaining stability (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024). The relevant data released by the National Bureau of Statistics shows that by the end of 2023, the total output value of the construction industry in China (general contracting and professional contracting construction enterprises with qualification levels, excluding labor subcontracting construction enterprises) has reached 296 trillion yuan, a year-on-year increase of 3.2%. The completed output value was

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1.89 trillion yuan, a year-on-year increase of 7.1%. The construction area of the house reached 14.7 billion square meters, and the completed area of the house reached 4.7 billion square meters; The signed contract amount is 4.9 trillion yuan, a year-on-year increase of 5.3%. Achieved a profit of 790 billion yuan, a year-on-year increase of 2.4%. In 2023, the added value of the construction industry in the whole society will reach 780-billion-yuan, accounting for about 7.1% of the gross domestic product, maintaining a significant contribution of the construction industry to the national economy. By the end of 2023, there were 109000 construction enterprises engaged in construction activities nationwide; The number of employees reached 58 million, a year-on-year increase of 7.1%. The construction industry plays a more prominent role as a pillar of China's national economy, showing basic characteristics such as further expansion of scale and continued growth in the number of practitioners. From this, the construction industry plays a significant role as a pillar of China's national economy, presenting basic characteristics such as a large scale and numerous practitioners. According to statistics from the Ministry of Emergency Management of the People's Republic of China, although the number of deaths in China's construction industry has decreased in recent years, the overall situation remains extremely severe. Data disclosed by the Ministry of Emergency Management shows that there were 301 production safety accidents in the national building materials industry (which may include some activities related to the construction industry, but not all) in 2023, resulting in 302 deaths (excluding fires, special equipment, and construction accidents). Another statistic shows that the number of safety accidents in China's construction industry (which is closer to what we usually refer to as the construction industry) will continue to increase in 2023, but no specific death toll has been directly given. However, the statistics mentioned some characteristics of construction safety accidents, such as high incidence periods and types of accidents. In summary, due to differences in data sources and statistical scope, it is difficult to provide an accurate number of deaths in China's construction industry in 2023. However, it can be made clear that the construction industry is a high-risk and accident-prone industry, and its safety situation is still not optimistic. The safety situation of China's construction industry is facing enormous challenges. The frequent occurrence of accidents in the construction industry has had a great impact on the healthy development of the industry and social stability, especially posing a serious threat to the life and property safety of construction workers. At present, the number of employees in China's construction industry is as high as 58 million. Considering that the construction industry is a typical labor-intensive industry, a considerable proportion of construction workers are on the front line of operation. Paying attention to the safety conditions and risks they face is the original intention of the paper research. Due to the extreme importance of safety issues in the construction industry, the goal of exploring construction safety management practices and academic research, whether by relevant government departments, construction companies, or academia, is to prevent and reduce the occurrence of safety accidents, minimize injuries and economic losses (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

Problem statement

People pay early attention to safety accidents in various workplaces. According to the statistical study by the renowned American scholar Heinrich (1950) in his monumental work *Prevention of Industrial Accidents*, approximately 88% of accidents are caused by unsafe human behavior. Salminen (1996) and other scholars analyzed the deaths caused by work in Finland from 1985 to 1990 and the serious accidents in the country from 1988 to 1989 and found that 84% -94% of all work-related accidents were caused by unsafe behavior of operators. The Health and Safety Agency (HSE) in the UK (2002) also found in their statistical analysis in 2002 that 80% -90% of all workplace accidents were attributed to unsafe behavior. In addition, Williamson (1990) confirmed the presence of behavioral factors in 91% of occupational fatalities that occurred in Australia between 1982 and 1984. From the statistical results reflected in the typical studies mentioned above, there is a significant correlation between various safety accidents that occur in the workplace and the unsafe behavior of operators. Specifically, in the construction industry,

unsafe behavior among construction workers is very common (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024). For example, high-altitude falls are one of the more common major accidents in the construction industry, and they often result in fatal injuries. Both the homework standards and the repeated orders of the team leader emphasize the correct wearing of safety belts and other protective devices when working at heights. Unfortunately, it is not uncommon for workers to not wear safety belts during high-altitude operations. For example, when Chi et al. (2009) analyzed cases of electrocution accidents at construction sites, the first three of the four reasons identified were unsafe behaviors of workers: failure or improper use of protective equipment, operating within a dangerous distance, and non-standard operating procedures. For example, at the construction site, welders do not wear protective masks according to regulations, and operators operate construction vehicles in violation of regulations. The total number of construction accidents in China has increased in 2021. 2330 accidents occurred during construction, with 2760 deaths, an increase of 2.8% and 2.1% year-on-year, respectively. There were 78 major collapse and falling accidents, resulting in 344 deaths, accounting for 76.5% and 77.8% of major construction accidents, respectively. In 2021, the official website of the Ministry of Housing and Urban Rural Development announced that high-altitude operation accidents accounted for 49% of construction enterprise accidents. Accidents caused by human factors can eliminate objective environmental factors such as construction environment and mechanical failures. In summary, safety accidents in the construction industry are closely related to the unsafe behavior of construction workers. Therefore, the research topic of the paper focuses on the unsafe behavior of construction workers. Since the unsafe behavior of construction workers ultimately stems from the actions taken by the workers themselves during the construction process, generally speaking, human behavior and actions are closely related to their current state, which includes not only the state of the behavior initiator themselves, but also the state of their environment (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

Research Questions

Based on the above problem statement, this paper mainly analyzes the unsafe behavior of construction workers and the relationship between related influencing factors. Organizational climate is one of the important factors that affect employee behavior, performance, and achievement development, and leadership is one of the key factors in the formation of organizational atmosphere (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

- 1) Does leadership have a positive impact on unsafe behavior among construction workers?
- 2) Does leadership have a positive impact on the emotions of construction workers?
- 3) Do the emotions of construction workers have a positive impact on their unsafe behavior?

Research Objectives

This paper, through pre research and literature review, finds that emotions are an important factor that should be considered in influencing unsafe behavior among construction workers. However, previous studies have not given sufficient attention to emotions.

1. To examine the impact of leadership on unsafe behavior among construction workers.
2. To examine the impact of leadership on the emotions of construction workers.
3. To examine the impact of the emotions of construction workers on their unsafe behavior.

Research Scope

The research object of this paper is construction workers, referring to workers engaged in building construction operations, and does not include workers in railway and highway construction, road and bridge construction, and other municipal construction fields. The workers referred to in this paper refer to frontline operators engaged in specific labor (such as civil engineering and building installation and decoration engineering), and do not include technical

workers such as technicians and budget officers on construction sites who do not directly participate in specific operational labor.

LITERATURE REVIEW

Numerous investigations into construction safety accidents have shown that due to the different research fields, industries, and perspectives of these scholars, their definitions of unsafe behavior by workers are also not the same. However, a general consensus is that unsafe behavior is the behavior of workers who, due to their unwillingness or interference from various other factors, fail to comply with relevant safety regulations and engage in illegal operations during their specific operations. (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024). There is also a view that due to the incorrect command and decision-making of managers on site, workers' erroneous operations were caused, and the misjudgment and incorrect command of the situation by managers should also be considered as a general level of unsafe behavior. The unsafe behavior referred to in the paper does not include managerial command errors, but specifically refers to various operational errors and non-compliance with safety by construction workers without improper command (Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

Firstly, what exactly causes unsafe behavior among construction workers? With this question in mind, I consulted typical studies on the causes of unsafe behavior among construction workers in the Web of Science database in recent years, which were sourced from high-level foreign journals and have been cited frequently. These literatures have been organized and summarized, as shown in Table 2-1. According to Table 2-1, inducing unsafe behavior among construction workers can be classified into the following nine categories: 1) high-intensity labor; 2) Physiological fatigue; 3) Overestimating personal abilities; 4) Underestimating security risks; 5) Insufficient provision of safety conditions on construction sites; 6) Lack of safety awareness and knowledge; 7) Managerial concepts and attitudes; 8) Safety climate, 9) limited attention, etc. The reasons for these categories are classified according to individual worker factors and environmental factors. It is worth noting that among these 9 reasons, the factor of construction workers' emotions learned from the pre survey mentioned above has not been fully considered and has not received sufficient attention from previous scholars.

Table 2-1: Summary of Typical Literature Research on the Causes of Unsafe Behavior of Construction Workers

No.	Year	Scholar	Main research content	Attribution of unsafe behavior
1	2002	Abdelhamid et al	1. By measuring the heart rate and consumption data of construction workers during work, it is demonstrated that individuals have a physiological threshold for coping with high-intensity labor	1. High intensity labor 2. Physiological fatigue 3. Lack of concentration
2	2022	Wang,J.,Zhang,J.,&Li,X.	Beyond physiological limits, workers may experience fatigue, which can lead to non-standard operations	1. Weak safety culture 2. Organizational management deficiencies 3. Personal psychological factors (such as stress and anxiety)
3	2022	Chen,H.,Liu,Y.,&Wang,L.	Explore the impact of safety culture on unsafe behavior among construction workers.	1. Poor safety culture 2. Poor communication on safety culture 3. Lack of safety culture training
4	2023	Zhao,Y.,Yang,K.,&Zhang, M.	Investigate the influencing factors and root causes of unsafe behavior among construction workers.	1. Lack of personal safety awareness 2. High work pressure 3. Lack of effective safety training
5	2023	Liu,X.,Wu,J.,&Huang,T.	Study the impact of psychological factors such as stress and anxiety on the safety behavior of construction workers.	1. Psychological pressure 2. Anxiety and tension 3. Underestimation of security risks
6	2023	Sun,Y.,Li,W.,&Wang.Q.	Assess the long-term impact of safety training on unsafe behavior among construction workers.	1. Insufficient training 2. The training content is disconnected from the actual work 3. Inadequate mastery of safety knowledge

7	2023	Zhang,X.,Chen,Z.,&Liu,Q.	Study the impact of cognitive risk and safety climate on unsafe behavior among construction workers.	<ol style="list-style-type: none"> 1. Low risk perception 2. Adverse safety climate 3. Neglecting safety regulations
8	2023	Yang,J.,Wang, C., & Liu, Y.	Explore how psychological and organizational factors affect unsafe behavior among construction workers. Unreasonable organizational structure, insufficient support from management, and psychological pressure on workers	<ol style="list-style-type: none"> 1. Lack of safety knowledge 2. Lack of safety equipment and conditions
9	2023	Xu, Z., Zhou, H., & Ma, H.	Analyzing the unsafe behavior of construction workers based on the theory of planned behavior.	<ol style="list-style-type: none"> 1. Behavioral intention and attitude 2. Subjective norms 3. Lack of behavioral control
10	2024	Wang, Y., Zhang, C., & Zhao, L.	Analyze the influencing factors of unsafe behavior on construction sites from multiple perspectives.	<ol style="list-style-type: none"> 1. Construction site management issues 2. Personal factors of workers 3. External environmental pressure
11	2024	Huang, X., Wu, X., & Zhang, Y.	Assess the impact of safety management practices on unsafe behavior among construction workers.	<ol style="list-style-type: none"> 1. Insufficient safety management measures 2. Insufficient supervision 3. Poor implementation of safety regulations
12	2024	Li, R., Zhang, J., & Wang, H.	Study the impact of safety culture and training on unsafe behavior among construction workers.	<ol style="list-style-type: none"> 1. Lack of safety culture 2. Poor effectiveness of safety training 3. Employees have weak safety awareness
13	2024	Gao, Q., Liu, X., & Chen, F.	Analyze the impact of work pressure and safety climate on unsafe behavior among construction workers.	<ol style="list-style-type: none"> 1. High work pressure 2. Adverse safety climate 3. Lack of psychological support
14	2024	Jiang, L., Wang, S., & Li, L.	Explore the relationship between job satisfaction and unsafe behavior among construction workers.	<ol style="list-style-type: none"> 1. Low job satisfaction 2. Insufficient safety incentives 3. Insufficient management support

In addition, leadership has a profound impact on the behavior and emotions of workers in construction enterprises, especially in high-risk and high-pressure work environments, where it may directly affect workers' safety behavior and mental health. In Chinese construction enterprises, Abusive Leadership and Paternalistic Leadership are two typical leadership styles, which have different mechanisms of influence on workers' unsafe behavior (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022). Abusive leadership is a negative leadership style characterized by leaders frequently imposing hostility, insults, belittling, and emotional abuse on subordinates. This kind of leadership often leads to strong negative emotions among workers, such as anger, anxiety, and suppression, thereby increasing their likelihood of unsafe behavior at work. Research has shown that workers who encounter Abusive Leadership in construction companies often lose their motivation to work due to psychological pressure and low mood, and even resort to taking risks or not complying with safety regulations to vent their emotions (Zhang Qiang, 2022). From another perspective, the benevolent leaders are those who create visible benefits, actions or outcomes for the common good. The common good in this sense is the benefit of all or most of the members of a community. Benevolent leaders exemplify honest and genuine action at work to the benefit of those around them (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022). Thus, emotion is a complex psychological and physiological state that individuals experience when faced with external stimuli and is a core component of human internal psychological activity. Emotions not only affect an individual's psychological state and behavioral responses, but also have a significant impact on their social interactions and work performance. In recent years, the role of emotions in organizational behavior has received increasing attention from the academic community, especially in high-risk industries such as the construction industry. Emotions, as a mediating variable, can explain how leadership affects workers' unsafe behavior (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

Emotions are usually divided into two categories: positive emotions and negative emotions. Positive emotions include happiness, satisfaction, pride, etc., which are usually associated with positive behaviors such as increased motivation, creativity, and social skills of individuals. Negative emotions include anger, anxiety, frustration, etc., which often lead to individual work fatigue, negative coping, and even impulsive behavior. The role of emotions in the workplace is

particularly complex, as various factors in the work environment, such as leadership, work pressure, and colleague relationships, can affect workers' emotions and subsequently alter their behavioral performance. Research suggests that happy people believe positive outcomes are more likely than negative ones. So cheerful decision-makers often overestimate the likelihood of a positive outcome and underestimate the chance of a negative one (Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024; Fredrickson 2023). Positive emotions expand our awareness and open us up to new ideas, so we can grow and add to our toolkit for survival, Fredrickson (2023) explains. "But people need negative emotions to move through difficult situations and respond to them appropriately in the short term." This further confirmed the U-shaped relationship between positive emotions and unsafe behaviours suggested in the literature.

Anxiety can also affect your behaviour. You may withdraw from friends and family, feel unable to go to work, or avoid certain places. While avoiding situations can give you short-term relief, the anxiety often returns the next time you're in the situation (Li Qiang, 2023). In Chinese construction companies, emotions serve as a mediating variable that connects the relationship between leadership and unsafe worker behavior. Specifically, different leadership styles affect workers' emotional states, which in turn impact their safety behaviors at work. Abusive Leadership, Usually, unsafe behavior at work is caused by increasing workers' negative emotions such as anger, anxiety, and stress. These negative emotions can lower workers' attention and self-control abilities, making them more likely to ignore safety regulations or engage in risky behavior (Li Qiang, 2023). Conversely, Paternalistic Leadership, especially in terms of kindness and morality, the incidence of unsafe behavior is reduced by enhancing workers' positive emotions such as sense of security, trust, and belonging (Wang Li, 2022). Positive emotions can not only increase workers' work engagement, but also enhance their willingness to comply with safety regulations, thereby effectively reducing unsafe behavior (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022).

METHODOLOGY

Research Methods

Based on the research objectives of this study, the following research methods have been used:

1. Literature analysis: By further reviewing classic literature on leadership, emotions, unsafe behavior, emotional intelligence, safety climate, and their interrelationships, especially those applied in the fields of construction and safety management, we aim to draw on academic knowledge and establish a theoretical framework for the research of the paper. This will lay the foundation for clarifying and revising the measurement methods of each variable.
2. Questionnaire survey method: Based on experimental psychology, construct statistical hypotheses related to theoretical models; Determine the measurement methods (scales) for each measured variable (independent variable, dependent variable, mediator variable, moderator variable, control variable) in the survey. Determine the sample population and the number of test workers, and determine the statistical methods used for data processing.
3. On site observation method: mainly used for observing the behavior of workers on construction sites and identifying unsafe behaviors; And record the frequency of their unsafe behavior.
4. Text analysis method: By using text analysis method to study the emotional related texts in construction workers' online social tools and work recordings, it assists in obtaining the emotional state and changes of workers during a working day. Combined with the unsafe behavior records obtained by observation method, it comprehensively analyzes the relationship between workers' emotions and unsafe behavior.
5. Statistical methods: Using statistical methods to validate the proposed hypotheses; Mainly using methods such as correlation analysis and regression analysis.

Implementation of Research

After the selection of the scale was completed, 50 workers were randomly selected for pre survey of the questionnaire. Based on the results of the pre survey, the questionnaire was adjusted and revised. The revision situation will be introduced in the following text. Thus, the formal questionnaire for this study was formed. Subsequently, with the assistance of the Construction Engineering Quality Supervision Station of the Xi'an Municipal Construction Commission, 10 ongoing projects in Xi'an were selected and distributed to construction workers engaged in frontline operations, covering as many types of work as possible on the construction site, to carry out formal research work. The questionnaire was distributed through random sampling, with a total of 300 copies distributed. As of March 2024, a total of 271 questionnaires were collected. Analyze the quality of the collected questionnaires and eliminate invalid questionnaires. The process of eliminating invalid questionnaires mainly includes the following two aspects: 1) According to certain standards, samples with poor questionnaire quality are excluded, such as duplicate questionnaires. If more than 90% of the test items in two or more questionnaires obtained on the same construction site are completely identical, only one of them will be retained as a valid questionnaire (5); Questionnaires with severe missing items will be considered invalid if more than 30% of the test items are not answered accordingly (11 questionnaires); Questionnaires that are not filled out seriously, and questionnaires with consistent results for more than 20 consecutive questionnaire items are considered invalid (7 questionnaires); 2) Due to the focus of this study on the changes in psychological factors such as emotions of construction workers caused by leadership style, and how they affect unsafe behavior of construction workers, physiological factors were excluded from interfering with unsafe behavior. Therefore, the questionnaire was set with "How is your sleep quality in the recent period?" For samples who answered, "very bad" and "not good" to this question, it was considered that physiological factors may have led to unsafe behavior. Therefore, in this study, these types of questionnaires were classified as invalid questionnaires (16 questionnaires). Based on the above aspects, a total of 39 invalid questionnaires were excluded. The remaining valid questionnaires are 232. The effective questionnaire response rate is 77.33%. Meet the requirement of a valid sample ratio of no less than 2/3 in social surveys. Among the valid samples, males accounted for 87.5% (203 people) and females accounted for 12.5% (29 people); The distribution of educational backgrounds is as follows: 16 primary school students, accounting for 6.9%, 64 junior high school students, accounting for 27.6%, 129 high school students, accounting for 55.6%, and 23 college graduates or above, accounting for 9.9%. The youngest participant is 19 years old, the oldest is 54 years old, and the average age is 39.8 years old; The average working years of the participants were 11.15 years; The average length of service is 3.10 years. However, the methodological constraint limits this study quality, quantity, or diversity of the data. The empirical constraint also limits the representativeness, validity, or reliability of the data. Analytical constraint limits the accuracy, completeness, or significance of the findings. and ethical practice limits the access, consent, or confidentiality of the data of this study.

Validity testing

Validity usually refers to the accuracy of the measurement tool towards the measured object. When using scale methods, its meaning is whether the scale used can accurately measure the measured variable or theoretical construct, rather than other variables or theoretical constructs. Validity can be divided into content validity, construct validity, and criterion related validity. In the paper, emphasis is placed on content validity and construct validity, and criterion related validity is not currently considered (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022). Content validity is used to measure whether the selected scale tool and its measurement items can accurately express the meaning of the tested question. Due to the fact that the selected scales in the paper are all referenced from mature scales widely used in authoritative journals, or partially revised based on these scales, and then reviewed by experts in relevant fields. Therefore, it can be considered that the scale tools chosen for measuring each variable in the paper meet the basic requirements of content validity. Structural

validity can be divided into convergent validity and discriminant validity, where convergent validity refers to the degree to which different measures can be used simultaneously to measure the same latent variable. Discriminant validity is the expression of whether there are significant differences between different variables (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022). Because factor analysis has already been used for item purification in 4.2.2, and factor analysis is an important method for testing the structural validity of scale tools, the testing of structural validity will not repeat the content of item purification. The statistical results in Table 3-19 are used to test the structural validity of the selected scales for each variable

Table 3-19: Reliability Coefficient Table of Various Variables

Variable	Code	Number of measurement items after purification	Cronbach's Alpha coefficient	Cronbach's Alpha coefficient judgment criteria
Unsafe behavior of construction workers	UB	6	0.873	
Abusive Leadership	AS	10	0.929	
Kind Leadership	BL	7	0.848	
Moral Leadership	ML	8	0.892	
Authoritarian Leadership	AL	7	0.864	
Positive emotions	PA	10	0.928	
Negative emotions	NA	10	0.933	
Emotional intelligence	EI	7	0.910	$\alpha \geq 0.7$
Safety climate	SC	24	0.942	

FINDINGS

By interpreting the regression coefficients in Table 4-11, it can be seen that the regression coefficient of AL to NA in Model 15 ($\beta=0.298, P<0.001$) indicates a very significant positive correlation between the two. Therefore, hypothesis H4f "There is a positive correlation between authoritarian leadership and negative emotions in Paternalistic Leadership" has passed the test; Furthermore, due to the significant regression coefficient ($\beta=-0.231, P<0.01$) corresponding to the cross product term in Model 36, it can be concluded that EI plays a negative moderating role between AL and NA for construction workers. This validates the hypothesis H9h that "higher levels of emotional intelligence can weaken the positive correlation between authoritarian leadership and negative emotions in Paternalistic Leadership relative to lower levels of emotional intelligence" and has been validated.

Table 4-12: Regression Analysis of Moderation Effect -9 (The Regulating Effect of EI on the Main Effect AS-UB)

Dependent variable	Positive Emotions (PA)					
	Model 2		Model37		Model 38	
	β	t	β	t	β	t
Control variable						
Gender	0.100	1.577	0.107	1.678	0.099	1.561
Age	0.034	0.430	0.026	0.332	0.018	0.230
Educational level	0.170	2.666	0.164	2.571	0.165	2.598
Work experience	0.101	1.255	0.100	1.249	0.094	1.174
Independent variable						
Abusive Leadership (AS)	0.175**	2.733	0.194*	2.950	0.125	1.662
moderator variable						

Emotional Intelligence(EI)	0.082	1.248	0.128	1.803
Cross term				
Abusive Leadership*Emotional Intelligence(AS*EI)			-0.141	-1.678
R ²	0.301	0.097		0.108
ΔR ²	0.028	0.036		0.011
F	4.504	4.022		3.877

Notes: 1) * means significant at the 0.05 confidence level, ** means significant at the 0.01 confidence level, *** means significant at the 0.001 confidence level, N = 232; 2) Independent variables and moderator variables are normalized, and the cross term is the normalized product of the two.

The analysis of the regression coefficients in Table 4-12 shows that the regression coefficient of AS to UB in Model 2 ($\beta=0.175$, $P<0.01$) indicates a significant positive correlation between the two. However, since the regression coefficient corresponding to the cross product term in Model 38 ($\beta=-0.141$, $P>0.05$) is not significant, it can be concluded that EI does not play a moderating role between AS and UB for construction workers. Therefore, the hypothesis H8c that "higher levels of emotional intelligence can weaken the positive correlation between Abusive Leadership style and unsafe behavior of construction workers relative to lower levels of emotional intelligence" was rejected and failed the test.

Table 4-13: Regression analysis of moderation effect -10 (the moderating effect of EI on the main effect ML-UB)

Dependent variable	Positive Emotions (PA)					
	Model15		Model35		Model 36	
	β	t	β	t	β	t
Control variable						
Gender	0.072	1.450	0.117	1.791	0.117	1.568
Age	0.029	0.553	0.028	0.330	0.028	0.238
Educational level	0.171	3.013	0.178+	2.774	0.162+	2.692
Work experience	0.094	1.533	0.110	1.288	0.092	1.183
Independent variable						
moral Leadership (ML)	0.144**	3.333	0.127**	3.151	0.125	1.641
moderator variable						
Emotional Intelligence (EI)			0.091	1.525	0.128	1.855
Cross term						
moral Leadership*Emotional Intelligence(ML*EI)					-0.093	-1.435
R ²	0.352		0.097		0.099	
ΔR ²	0.022		0.035		0.011	
F	6.328		6.328		3.492	

Notes: 1) * significant at the 0.05 confidence level, ** means significant at the 0.01 confidence level, *** means significant at the 0.001 confidence level, N = 232; 2) Independent variables and moderator variables were normalized, and the cross term was the normalized product of the two.

Through the analysis of the regression coefficients in Table 4-13, it can be concluded that the regression coefficient of ML on UB in Model 4 ($\beta=-0.273$, $P<0.001$) indicates a significant negative correlation between the two. Additionally, due to the regression coefficient corresponding to the cross product term in Model 40 ($\beta=0.185$, $P<0.01$), it can be inferred that EI plays a positive regulatory role between ML and UB for construction workers. Therefore, the hypothesis H9f that "higher levels of emotional intelligence can enhance the negative correlation between moral

leadership and unsafe behavior in parental leadership style compared to lower levels of emotional intelligence" has passed the test.

DISCUSSION AND CONCLUSION

The collected data on the emotions and unsafe behaviors of construction workers using two different data collection methods, analyzed the relationship between the two, and verified the hypotheses of "U-shaped relationship between positive emotions and unsafe behaviors of construction workers" and "positive correlation between negative emotions and unsafe behaviors of construction workers". This means that the level of unsafe behavior among construction workers varies depending on their emotional state. As the level of negative emotions decreases, the likelihood of unsafe behavior decreases; As the level of positive emotions increases, the likelihood of unsafe behavior first decreases and then increases; When the emotional level of construction workers is at a high level of negative and positive emotions, the likelihood of unsafe behavior occurring is highest; When positive emotions are within an appropriate range (α , β), the likelihood of unsafe behavior among construction workers is the lowest (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023). It is worth noting that the research conclusion of "a positive correlation between negative emotions and unsafe behavior" is consistent with previous research findings that negative emotions can reduce employee job performance, produce behaviors such as deviation and counterproductive behavior that are harmful to the overall goals of the organization. However, the "U-shaped relationship between positive emotions and unsafe behavior of construction workers" is not completely consistent with previous research findings that positive emotions can improve employee performance and benefit organizational behavior, looking back at the cognitive mechanisms behind unsafe behavior, it can be inferred that excessively high levels of positive emotions can lead to states of excitement, arrogance, and other mental states. These states may result in a decrease in attention levels, making it difficult to effectively conduct "conscious search" or "unconscious search" for risk information, and thus unable to enter the risk perception stage in the CM-CWUB model, rendering the rational cognitive process of risk ineffective and leading to unsafe behavior. Therefore, it can be inferred that worker emotions are one of the potential reasons for the failure in the "information acquisition" stage of CM-CWUB. (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022)

The above conclusion clearly answers from an emotional perspective what kind of emotional state workers are more likely to engage in unsafe behavior, and what kind of workers should be given special attention in construction safety management. If we consider how to reduce unsafe behavior from an emotional perspective, the goal is to lower the positive emotional level of workers, gradually transform it into a positive emotional state, and maintain it within a reasonable range. This can gradually reduce the probability of unsafe behavior among construction workers.

Based on the data analysis in the previous chapter, it is found that there is a close relationship between leadership and unsafe behavior among construction workers, and there are differences in the relationship between different leadership styles and unsafe behavior among construction workers. Among them, Abusive Leadership, as a destructive leadership style that damages the relationship between leaders and employees, is significantly positively correlated with unsafe behavior among construction workers. That is, the higher the level of abusive leadership among grassroots managers in engineering construction projects, the higher the probability of unsafe behavior among construction workers. This conclusion also responds to previous research on how abusive leadership style reduces employee job performance and lowers employee behavior that is beneficial for achieving organizational goals, thereby reducing behaviors that are detrimental to personal or organizational goals (Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022). Based on the above analysis, it can be concluded that abusive leadership and authoritarian leadership have a negative impact on unsafe behavior

among construction workers. The relationship between benevolent leadership and unsafe behavior among construction workers is still unclear, while ethical leadership style can reduce the level of unsafe behavior among construction workers. Furthermore, the regression coefficients (AS: $\beta=0.175$, $p<0.01$; AL: $\beta=0.164$, $p<0.05$; ML: $\beta=-0.273$, $p<0.001$), It was found that moral leadership has a greater impact on unsafe behavior among construction workers compared to the other two types of leadership.

From a global perspective, the construction industry is a sector with a high accident rate and prominent safety risks compared to other industries (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024). It has become a consensus in the industry that unsafe behavior of construction workers is the main cause of frequent accidents in the industry. It is precisely because of the prevalence of such behavior on the front line of construction projects that it is very important to consider how to improve the safety performance of construction enterprises by adopting appropriate measures to reduce or even gradually eliminate the level of unsafe behavior of construction workers. However, existing research on the mechanisms and influencing factors of unsafe behavior among construction workers lacks analysis from the perspective of workers' emotions. Therefore, the paper attempts to use emotions as a starting point to explore the influencing factors and paths that lead to unsafe behavior among construction workers, design improvement plans to reduce unsafe behavior among workers, and track and test the effectiveness of the plans (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

Actionable recommendations are possible by contemplating the success of any organization relies on the leadership styles practiced by the leaders. This review has found that leadership styles such as Transformational Leadership, Transactional Leadership, Full Range Leadership, Servant Leadership, Contextual Leadership, Safety Specific Transformational Leadership and Charismatic Leadership are being practiced in construction (Chen et al. 2021; Chen et al. 2023; Deng et al. 2023; Fatima 2023; Gao et al. 2024; Hochwarter et al. 2024; Hoffmeister et al. 2022; Lin et al. 2024).

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