The Effect of Organizational Safety Behavior on Builders Autonomous Safety Behavior - the Mediation of Builders Safety Psychological Capital

Jian Shen and Hongxia Li
College of Management, Xi'an University of Science and Technology, Xi'an Shaanxi, China
Email: 765826364@qq.com, 3349354061@qq.com

***Abstract*—It is great significant for preventing builders safety accidents to investigate the relationship between organizational safety behavior and builders autonomous safety behavior. This paper divides the organizational safety behavior into three dimensions, i.e., safety training, safety inspection and safety incentive. Builders' safety psychological capital is introduced as an intermediary variable. Structural equation model is used to analyze and verify the relationship of the organizational safety behavior, builders ' safety psychological capital and builders' autonomous safety behavior, which is expected to reveal the influence mechanism of organizational safety behavior on builders' autonomous safety behavior. The results show that the three dimensions of organizational safety behavior have significant positive effects on builders' safety psychological capital and builders' autonomous safety behavior, and the builders' safety psychological capital plays a part of intermediary role in the relationship between organizational safety behavior and builders' autonomous safety behavior.**

***Index Terms*—builders autonomous safety behavior; builders safety psychological capital; organizational safety behavior**

I. Introduction

The complex working environment of construction enterprises lead to the frequent safety production accidents. A large number of accident cases show that the problems of illegal operation of construction enterprises and emphasizing interests over safety are the main reasons leading to the occurrence of safety accidents. Therefore, in order to effectively improve the level of safety production management in construction enterprises, it is extremely necessary to study the safety production behavior of builders. By reviewing the literatures, the existing research on buildes' production behavior mainly focuses on the causes of unsafe builders' behavior and intervention measures. In view of the causal factors, scholars have carried out a lot of research on the internal factors [1] such as personality, physiological function, emotion and external factors[2] such as working environment, production technology, working atmosphere, interpersonal relationship, etc. The existing research is relatively rich and in-depth, but it still needs to be further improved. On the one hand, the current research on builders' safety production behavior is mainly from the perspective of prevention and control of unsafe behavior, but is rarely from a positive perspective, such as the formation of builders' independent safety behavior. On the other hand, from the content point of view, the existing researches have mainly studied the influencing factors of individual behavior from both internal and external aspects. The formation of individual behavior is not achieved overnight, but is a process of gradual formation under the influence of various factors. However, the existing research has not systematically combined various influencing factors with the production process of behavior, which can not explain the real mechanism of safety behavior of personnel, especially construction-workers.

Previous studies have shown that employee behavior is shaped by the organizational behavior. Organizational management decision-making is the key factor of employee's safe or unsafe behavior, which directly affects employee's safe behavior and safety state of materials [3]. Social cognitive theory holds that the individual behavior is not only influenced by organizational environment, but also by psychological perception, which plays a mediating role in the formation of behavior. Therefore, starting from the formation of builders' autonomous safety behavior, this study attempts to introduce the intermediary variable of builders' safety psychological capital to explore the relationship between organizational factors, individual psychological factors and builders' autonomous safety behavior, in order to provide a basis for construction enterprises to prevent production accidents and improve safety management level.

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Corresponding author:Jian Shen,765826364@qq.com

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II. Theoretical Framework and Research Hypothesis

A. Organizational Safety Behaviour and Autonomous Safety Behavior

Organizational safety production behavior is the basis of forming safety conditions, which plays a restrictive and guiding role for employees' safety behavior [9]. Liu [10] concluded that the safety production behavior of enterprise organization is a significant factor affecting the safety production behavior of employees through the research on the safety production behavior of small and medium-sized enterprises. Organizational safety behaviors are manifested in various ways. A series of activities taken by to achieve their safety objectives in the actual production process, such as command, supervision, communication and prevention, including safety inspection, safety monitoring and monitoring, safety education and training, safety input and so on, which enterprises make in order to prevent accidents, all belong to the main content of the organizational safety behavior. On this basis, this study divides organizational safety behavior into three dimensions: safety training, safety inspection and safety incentive.

Safety training has positive significance for improving workers' safety behavior [4]. Bena confirmed that the accident rate of workers would decrease by 16% after basic training and 25% after professional training. In addition, Choudhry et al. [5] believed that the level of safety training and education affect employees' safety awareness, safety awareness level, work intensity, self-protection desire and other factors, and these factors further affect employees' safety behavior.

Safety inspection is an effective way to avoid violations and accidents. Through safety inspection, employees' unsafe behavior can be effectively controlled, the accidents can be reduced [6], and the safety performance of enterprises can be improved[7]. At the same time, safety inspection can strengthen employees' sense of responsibility of safety subject, enhance employees' sense of safety, and make employees develop good safety behavior habits[8].

Safety incentive is the process of guiding, changing or strengthening human safety behavior. In order to make employees behave as expected, it is necessary for enterprises to establish a necessary link between employees' behavior and satisfaction of employees' needs. Skinner [9] believed that people can take certain actions to act on the environment in order to achieve a certain goal. When the consequences of such actions are in his favor, such actions will recur in the future; when it is not, such actions will weaken or disappear. It can be concluded that the incentives have an important impact on employees' behavior. Shi [10] thought that the incentives can improve individual behavior, and in the process of safety management, positive incentives are better than negative incentives.

Based on the above analysis, this study considers that the organizational safety behavior has a significant positive impact on builders' autonomous safety behavior, and proposed the hypothesis:

H1: Safety training is positively correlated with builders' autonomous safety behavior.

H2: safety inspection is a significant positive correlated builders' autonomous safety behavior.

H3: Safety incentive is positively correlated with builders' autonomous safety behavior

B. Mediation Role of Builders' Psychological Capital

The organizational safety behavior not only has a direct impact on the builders' autonomous safety behavior, but also has different indirect effects on the builders' autonomous safety behavior through psychological capital. For organizations, there is a significant positive correlation between psychological capital and organizational behavior[11]. The social cognitive theory shows that the individual cognition, environment and behavior are mutually determined and interacted. The cognitive environmental factors can provide relevant information and clues to help cognitive people understand cognitive objects and guide their behavior. Employees' perception and understanding of safety knowledge will be influenced by organizational environmental factors, such as safety training, safety inspection, managerial attitude, etc., which will have a positive impact on employees' learning and perception, and thus will have a positive impact on their willingness and ability to participate in and abide by safety behavior, which improves their mental state at work, and become more confident, optimistic, hopeful and persistent in the face of work difficulties.

Therefore, based on the above analysis, this study proposes:

H4: Safety training is positively correlated with builders' safety psychological capital.

H5: safety inspection is positively correlated with builders'safety psychological capital.

H6: Safety incentive is positively correlated with builders' safety psychological capital

At the same time, for individual builders, the psychological capital is a positive psychological state composed of a series of psychological abilities such as self-efficacy, optimism, hope and resilience[12]. In terms of its effect, the work behavior of employees with high psychological capital is obviously more positive than that of employees with low psychological capital [13]. Therefore, this study proposes that:

H7: Builders' psychological capital is positively correlated with builders' autonomous safety behavior

Through the above analysis, it can be seen that the organizational safety behavior has a certain impact on the builders' safety psychological capital. The builders' safety psychological capital is significantly related to the builders' self-safety behavior. Therefore, this study preliminarily concludes that there is a mediating role between the organizational safety behavior and the builders' self-safety behavior.

H8: Builders' psychological capital plays an intermediary role in the relationship between

organizational safety behavior and builders' autonomous safety behavior.

Based on the above theoretical analysis, a conceptual model of the relationship among organizational safety behavior, builders'psychological capital and builders' autonomous safety behavior is proposed as shown in Fig1.

Figure 1. The relationship model of organizational safety behavior, builders safety psychological capital and autonomous safety

III. Research Design and Reliability & Validity

A. Data Collection and Sample

A survey questionnaire was distributed to the front-line builders of five construction enterprises in Shaanxi Province,China by random sampling. A total of 400 questionnaires were distributed, and 350 valid questionnaires were recovered, with an effective rate of 87.5%. The proportion of senior high school and below education is 58.3%, college and above education is 41.7%, the number of working years under three years is 4.6%, the number of working years over three years is 95.4%, the proportion of unmarried is 24.6%, and the proportion of married is 75.4%. The demographic information of the questionnaire is basically consistent with the actual situation of the construction enterprises and has statistical significance.

B. Variable Design and Measurement

On the basis of relevant literature review, the measurement questionnaire is determined by referring to the existing measurement scales and combining with expert discussions and interviews with builders, and all options are based on the Lickett five-point scoring system.

1) Organizational safety behavior

The measurement items of organizational safety behavior are designed based on relevant literature. Among them, the measurement of safety training mainly refers to the scale of Muniz [14], Ye [15], etc. The measurement of safety inspection refers to the research of Yao [16], Wang [17], etc. The measurement of organizational safety incentive refers to the scale of organizational incentive developed by Chen [18], Jia [19]. According to safety management, the characteristics are adjusted, and an organizational safety behavior scale with 18 items was designed.

2) Builders' safety psychological capital

Based on the statistical analysis of the existing literature, it is found that the psychological capital includes the measurement indicators as hope, self-efficacy, optimism, resilience, honesty and self-esteem. On this basis, the high-frequency indicators are selected, and the psychological capital scales developed by Luthans [20], Wang [21] are used for reference. Some of indicators are selected according to the actual situation of the construction enterprises surveyed. Finally, 15 items of psychological capital scale including five dimensions of safety self-efficacy, hope, resilience, calmness and optimism are determined.

3) Builders'independent safety behavior

Current research on the measurement of autonomous security behavior includes two aspects: safety compliance behavior and safety participation behavior. For the measurement of safety compliance behavior and safety participation behavior, referring to the research of Neal and Griffin[22], we revise and adjust them adaptively. Finally, a measurement scale which includes seven items of safety compliance behavior and five items of safety participation behavior is determined.

C. Reliability and Validity TEST

The reliability coefficients of Cronbach's Alpha, a commonly used index to test the reliability of the scale data, are calculated by SPSS22.0 software. The reliability coefficient of Cronbach's Alpha of the scale is 0.898; the Cronbach's Alpha of builders' safety psychological capital is 0.642; the Cronbach's Alpha of builders' autonomous safety behavior 0.850, which indicated that the scale had good reliability.

At the same time, the KMO values of the organizational safety behavior, builders' safety psychological capital and self-safety behavior calculated by SPSS22.0 software are 0.843, 0.848 and 0.876, respectively. The Sig. values of Bartlett's spherical test are less than 0.01, which indicated that they are suitable for factor analysis. Principal Component Analysis (PCA) and Total Variance Explanation Table are used to analyze the variables of the questionnaire by exploratory factor analysis, and the irrelevant factors are eliminated. Factor analysis results showed that three factors are extracted from the Organizational Safety Behavior Measurement Scale, and the cumulative contribution rate is 63.182%. The factor load of each item is greater than 0.6, which has a high degree of explanation. Five factors are extracted from builders' safety psychological capital, the cumulative contribution rate is 76.19%. The factor load of each item is more than 0.6, which has a high degree of explanation. Two factors are extracted from the scale, and the cumulative contribution rate of the equation is 65.62%. The factor load of each item is more than 0.6, which has a high degree of explanation.

On this basis, the structural equation model AMOS21.0 is used to validate the measurement models of the scale. The results are shown in Table 1.

In conclusion, the reliability and validity of the scale are good, and the fitting of the measurement model is good, which meets the requirements of the follow-up analysis.

IV. Hypothesis Testing and Result Analysis of Model

Using the AMOS21.0 structural equation model, the relationship model of organizational safety behavior,

builders' safety psychological capital and builders' autonomous safety behavior is established. The hypothesis is verified. The model is revised according to the fitting situation of the model. The final model is determined to reveal the organizational safety behavior, builders' safety psychological capital and builders' autonomy.

A. Model Verification

(1)The structural model is identified and tested. The index of DF freedom degree calculated by AMOS21.0 is greater than 0, which belongs to the over-recognition model. The absolute values of the standardized regression coefficients of the influencing factors of each variable are less than 0.95, which indicates that the model does not violate the estimates and is stable, so it can be further analyzed.

TABLE I FITTING RESULTS OF MODEL

Indicator Name	Absolute fitting index			Relative fitting index		
	χ2/df	RMSEA	GFI	NFI	RFI	IFI
Organizational Safety Behavior	1.714	0.065	0.902	0.927	0.916	0.955
Builders' Safety Psychological Capital	1.445	0.032	0.985	0.976	0.962	0.980
Builders' Autonomus Safety Behavior	1.748	0.049	0.955	0.927	0.901	0.968
Fitting criteria	(1,3)	（0,0.08）	（0,1）	NFI>0.9	RFI>0.9	IFI>0.0
Verification results	agree	good	acceptable	good	good	good

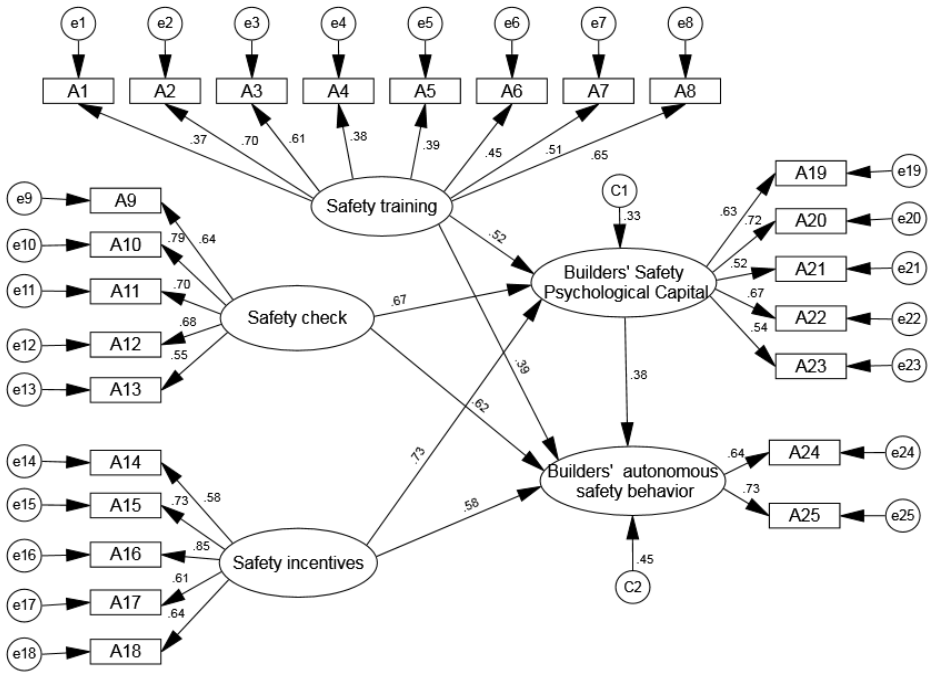

Figure 2. Path coefficients of structural equation model

TABLE II. FITTING RESULTS OF MODEL

Indicator name	Absolute fitting index			Relative fitting index		
	χ^2/df	RMSEA	GFI	NFI	RFI	IFI
Calculated result	1.713	0.042	0.975	0.963	0.951	0.979
Fitting criteria	(1,3)	（0,0.08）	（0,1）	NFI>0.9	RFI>0.9	IFI>0.9
Verification results	agree	good	acceptable	good	good	good

TABLE III. THE INTERACTION OF PARAMETERS OF MODEL

	Effect	safety training	Safety inspection	safety incentive	Safety psychological capital
Safety Psychological Capital	Direct effect	0.52	0.67	0.73	
	Indirect effect	0	0	0	
	Total effect	0.52	0.67	0.73	
Autonomous Security Behavior	Direct effect	0.39	0.62	0.58	0.38
	Indirect effect	0.20	0.25	0.27	0
	Total effect	0.59	0.87	0.85	0.38

(2)The structural model is calculated and tested.After several modifications of the model, the standardized solution of the ultimate model of organizational safety behavior-builders' safety psychological capital-builders' autonomous safety behavior is obtained, as shown in Fig2. 2. The path coefficients of potential variables reach the significant level of $P<0.05$.. There is no negative error variance in nonstandard parameter estimation, and the standard error of variation is very small. At the same time, the overall adaptation of the model is good, and the model has passed the test. The specific results are shown in Table 2.

(3)In order to further analyze the relationship of variables and to clarify the intermediary role of safe psychological capital, the direct, indirect and total effects of variables in the model are summarized and analyzed. The results are shown in Table III.

B. Results and Discussions

1) The main effect of organizational safety behavior on builders' autonomous safety behavior

Suppose H1, H2 and H3 test the relationship between the three dimensions of organizational safety behavior and builders' autonomous safety behavior. The results show that the safety training, safety inspection and safety incentive have a significant positive impact on builders' autonomous safety behavior. From the results of the impact, it can be seen that the safety inspection has the greatest impact on builders' autonomous safety behavior, followed by safety incentive and safety training.

Safety inspection is one of the important tools of safety management. Through the safety inspection, the problems and deficiencies in builders' ideology, post skills and working attitude can be found in time, which can prompt enterprises to take effective measures to cultivate the builders' safety awareness in time and standardize the builders' unsafe behavior. It will play a restrictive role, enhance builders' safety consciousness and urge them to work in safety according to the regulations. Based on the above analysis, it can be concluded that the safety inspection can promote builders to comply with the safety production regulations of the unit, and help to promote the formation of builders' autonomous safety behavior.

Safety incentive is the most effective way to cultivate the self-safety behavior. Reinforcement theory holds that if a person has positive reinforcement after engaging in a certain behavior, the frequency of similar behavior will be greatly increased in the future. If the practice of builders' safe production is strengthened positively, it will play a good role in promoting the formation of their active safety behavior.

Safety training is an important measure to enhance builders' safety awareness. Through the safety training, builders can objectively and rationally understand the importance of safety production, master the necessary safety knowledge and skills, and enhance the ability of risk identification and disposal, so as to provide a basis for the formation of the builders' autonomous safety behavior. All help to continuously improve the content of the safety system, enhance the execution of the system, and standardize the safety production behavior of builders.

2) The intermediary effect of builders' safety psychological capital

①Suppose that H4, H5 and H6 test the relationship between organizational safety behavior and builders' safety psychological capital. The results show that organizational safety behavior has a significant positive impact on builders' safety psychological capital, indicating that positive organizational behavior is conducive to promoting the formation of builders' positive psychological state. In organizing safety behavior, the safety training is helpful to make builders realize the importance of safety and make individuals truly recognize the significance of safety psychologically, which can form a firm safety belief and show a positive attitude. Safety inspection is helpful to make builders clear their responsibilities and change builders' safety attitude. Safety incentives are helpful to make builders perceive the organization's attitude towards safety. When builders feel the importance and support of the organization for safety work, they will be more firm, optimistic and perseverant in their work

② Hypothesis H7 tests the relationship between builders' safety psychological capital and builders' autonomous safety behavior. The test results show that builders' safety psychological capital has a significant positive impact on builders' autonomous safety behavior. Previous studies have also shown that builders with high safety psychological capital have high self-confidence, strong self-regulation ability and high level of safety behavior in their work, while builders with low safety psychological capital have the opposite effect [37,38].

③ On the basis of the assumptions of H4, H5, H6 and H7, hypothesis H8 further tests the mediation effect of builders' safety psychological capital between organizational safety behavior and builders' autonomous safety behavior. Through the summary analysis of direct

effect, indirect effect and total effect of each variable in Table 3, it can be seen that the total effect value of safety training, safety inspection and safety incentive on builders' autonomous safety behavior has increased to a certain extent compared with the direct effect value under the influence of builders' safety psychological capital. It is concluded that the builders' safety psychological capital plays a part of intermediary role between the three dimensions of organizational safety behavior and builders' autonomous safety behavior. From this we can see that the safety behavior of the organization not only directly affects the builders' autonomous safety behavior, but also makes the builders clear the importance of safe production and form a higher psychological capital, so as to promote them to develop independent safety behavior habits in production.

V. Conclusions and Suggestions

The three dimensions of organizational safety behavior (safety training, safety inspection and safety incentive) have significant positive effects on builders' safety psychology. It shows that organizational safety behavior can stimulate builders to show a positive attitude towards work, increase builders' safety psychological capital level, and enhance builders' safety production efficiency. The three dimensions not only have a direct impact on builders' autonomous safety behavior but also indirectly promote the formation of builders' autonomous safety behavior through builders' safety psychological capital.

According to the above analysis results, construction enterprises should effectively take measures, including the safety inspection, safety training and safety incentives, in the daily production process. According to the actual situation of enterprises, the corresponding measures should be formulated and implemented to effectively enhance the level of builders' safety psychological capital to continuously strengthen the safety of builders. All measures can help enterprises to achieve safe production and operation

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Jian shen conducted the research and wrote the paper; Hongxia Li analyzed the data; all authors had approved the final version.

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Jian Shen, born in Gansu Province,China in1977, has the following educational background: Ph.D, Safety Technology and Engineering, Xi'an University of Science and Technology, Xi'an, 2019; Current research focuses on miners' unsafe behavior management and strategies to prevent, job hazard analysis.

She is engaged in scientific research and teaching at Xi'an University of Science and Technology, She has published more than 10 academic papers in the core journals of China and the international reviews, and as one of the designers, she has taken on abou t 10 science research projects.

Hongxia Li , professor,born in China in1965, has the following educational background: Ph.D, Management Science and Engineering, Xi'an Jiaotong University, 2002; Current research focuses on safety management and strategies to prevent.

She is engaged in scientific research and teaching at Xi'an University of Science and Technology, She has published more than 100 academic papers in the core journals of China and the international reviews, and as one of the designers, she has taken on abou t 20 science research projects.