Impact of Conflict Management Strategies on the Generation Mechanism of Miners' Unsafe Behavior Tendency

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ABSTRACT

In this paper, we examine the relationship between the generation mechanism of miners' unsafe behavior tendency and conflict management strategies, including cooperative conflict management strategy, competitive conflict management strategy and avoidant conflict management strategy. Miners from 3 collieries in Shanxi province completed a questionnaire, from which a valid sample of 148 responses was selected. Structural equation modeling analysis using the AMOS 7.0 was employed to test the hypothesized model relating the above-mentioned variables. The conclusion shows that the model was supported, and conflict management strategies have a significant impact on the generation mechanism of miners' unsafe behavior tendency. Insecurity psychology acts as an intermediary role between the three conflict management strategies and coal miners' unsafe behavior tendency. Interpersonal intimacy acts partly as a regulating role between the three conflict management strategies and insecurity psychology. Practical implications of these results for the control of miners' unsafe behavior tendency are discussed.

Keywords: conflict management strategies, unsafe behavior tendency, generation mechanism, model building, engineering education and training

INTRODUCTION

According to the statistics of State Administration of Coal Mine Safety, from January 2015 to December 2016, the number of China's overall major coal mine accidents was 49, killing 359...
people. It indicates that the safety production in coal industry in China remains grave. Li and Ji (2011) noted that miners' unsafe behavior is an important cause of coal mine accidents, based on 71 major coal mine accidents, from 2005 to 2010. Chen, Qi, and Tan (2005) found that 55.37% of human accidents are directly caused by miners' deliberate violation behavior. Therefore, it is very necessary to investigate miners' unsafe behavior and unsafe behavior tendency to achieve more effective accident control measures.

A group of international and domestic academics study the mechanism of miners' unsafe behavior tendency based on the Theory of Planned Behavior (TPB). For example, Shahrina M. N., Sivapalan S., Bhattacharyya E., H. H., Fatimah W. Ahmad W., & Azrai Abdullah (2014) study the organizational communication climate and conflict management in an oil and gas company. Liu and Liang (2012) found a significant correlation between miners' unsafe acts and unsafe behavior tendency. But now there is lacking in the research of the generation mechanism of miners' unsafe behavior tendency. In the mechanism, the conflict management strategies play an important role. Le, Bai, Wang, and Huang (2014) suggested that different conflict management strategies can lead to workers' different job morale, and ultimately affect workers' behavioral tendencies. However, no studies have yet been completed on the relationship between conflict management strategies selection and workers' unsafe behavior tendency (Wang, N. N., Jiang, D. D., & Leon Pretorius, 2016; Tomás C. Prieto-Romón, Jose Ramón Cobo-Benita, Isabel Ortiz-Marcos, & Angel Uruburu, 2015; Yan Jin, Bey-Ling Sha, Hongmei Shen, & Hua Jiang, 2014; Ronald A. Dye, & Sri S. Sridharan, 2014).

This study attempts to investigate the generation mechanism of miner's unsafe behavior tendency from the perspective of the selection of conflict management strategies starting from the situation mentioned above, proposes some countermeasures to control miners' unsafe behavior tendency and ensure the safety production of coal mine. AMOS7.0 is used to establish the theoretical model of the relationship between conflict management
strategies and miners' unsafe behavior tendency. Through empirical research, this study will provide some theoretical support for the generation mechanism of miners' unsafe behavior tendency.

THEORIES AND HYPOTHESES

Tjosvold, Hun, and Yu (2003) pointed out that conflict management strategies can be divided into three categories, including cooperative conflict management strategy, competitive conflict management strategy, and avoidant conflict management strategy. Among them, the cooperative conflict management strategy means the team members take the form of mutual cooperation to achieve win-win situation by meeting the interests of all parties. The competitive conflict management strategy refers to the team members who in the face of conflict with others, seek only to satisfy self-interest without regarding the impact of conflict on others. And the avoidant conflict management strategy indicates the team members have realized the existence of a conflict, but chose to avoid or suppress the practice. This classification of conflict management strategies is more suitable for the study of conflict among colleagues than the taxonomy pointed out by Le, Bai, Wang, and Huang (2014). Therefore, this study expands research findings based on the results achieved by Tjosvold, Hun and Yu (2003), which has been repeatedly verified in the country (Chen & Zhao, 2010).

Conflict has multiple dimensions, such as the conflict can be divided into cognitive conflict and emotional conflict (Amason, 1996). In these dimensions, cognitive conflict and emotional conflict were strongly positive correlated with each other, which means cognitive conflict can be transformed into emotional conflict (Lang, Xi, & Guo, 2007). Thus, some scholars pointed out that the conflict is essentially an emotional response (Yang & Mossholder, 2004). And there was a significant correlation between negative emotions and insecurity psychology (Zhang, Wei, & Li, 2015). So there is some correlation between conflict and insecurity psychology. Because the intensity of interpersonal conflict mainly reflected in people's attitudes towards the conflict and the selections of conflict management strategies, so there is some correlation between interpersonal conflict management modes and insecurity psychology. Based on empirical evidence, the following hypotheses can be asserted:

- **H1a.** Cooperative conflict management strategy is negative-interrelated with insecurity psychology.
- **H1b.** Competitive conflict management strategy is negative-interrelated with insecurity psychology.
- **H1c.** Avoidant conflict management strategy is positive-interrelated with insecurity psychology.

Since coal miners are not well educated, it is difficult for them to recognize and eliminate insecurity psychology in time when it comes over. Consequently, unsafe behavior tendency can easily appear. According to the research achievements made by Hooke (2005), there are some major insecurity psychology misunderstandings among mine basic level employees, namely luck, blind obedience psychology, psychological paralysis, mental
shortcuts, conceited psychology and reverse psychology, etc. According to the verification by Ye, Li, and Wang (2014), psychological capital was significantly positive-interrelated with safe acts. Psychological capital refers to the forward positive psychology, including confidence, optimistic, hope, and tough. On the other hand, insecurity psychology is reverse negative psychology, opposing to psychological capital. Accordingly, there is some correlation between the insecurity psychology and unsafe behavior tendency. Thus, the following hypothesis can be asserted:

- **H2.** Insecurity psychology is positive-interrelated with unsafe behavior tendency.

Ye, Li, and Wang (2014) proved the mediating effect of psychological capital in the study of the mechanism of a safe atmosphere acts on workers' safe behavior. Thus, it can be inferred that insecurity psychology plays an intermediary role in the mechanism of conflict management strategies upon unsafe behavior tendency. Therefore, the following hypotheses can be asserted:

- **H3a.** Insecurity psychology acts as an intermediary role between cooperative management strategy and unsafe behavior tendency.
- **H3b.** Insecurity psychology acts as an intermediary role between competitive management strategy and unsafe behavior tendency.
- **H3c.** Insecurity psychology acts as an intermediary role between avoidant management strategy and unsafe behavior tendency.

Due to the regulating role of interpersonal trust between the coal miners anxiety and insecurity psychology, and interpersonal trust is positive-interrelated with interpersonal intimacy (Zhang, Wei, & Li, 2015), the higher interpersonal intimacy among colleagues, the higher trust among them. When a conflict occurs, it is easier for them to resolve, and the possibility of insecurity psychology will be lower. Thus, the following hypotheses can be asserted:

- **H4a.** Interpersonal intimacy acts as a regulating role between cooperative management strategy and insecurity psychology.
- **H4b.** Interpersonal intimacy acts as a regulating role between competitive management strategy and insecurity psychology.
- **H4c.** Interpersonal intimacy acts as a regulating role between avoidant management strategy and insecurity psychology.

This study comes up with 10 hypotheses, including 3 hypotheses about mediating variable and 3 hypotheses about regulating variable. All of these hypotheses are pioneering assumptions. The mediating variable of the theoretical model is insecurity psychology, and the regulating variable is interpersonal intimacy. Control variables include miners' age, length of service, education, physical fitness, psychological quality, values and corporate culture. **Figure 1** shows the specific theoretical model.
Based on the achievements made by Tjosvold, Hun, and Yu (2003), the questionnaire set up 35 questions at first, including 5 questions about cooperative management strategy, 4 questions about competitive management strategy and 3 questions about avoidant management strategy, and 5 insecurity psychology questions, 9 unsafe behavior tendency questions, 7 demographic characteristics questions and 2 interpersonal intimacy questions.

A former small sample test was conducted in which 50 male miners in Shanxi Province served as the target population. A questionnaire was sent to each participant. Later, 50 responses were received. After subtracting 2 invalid responses, the result was 48 viable responses serving as the data pool for subsequent analyses. SPSS22.0 software was used to test the liability and validity of the scales. The results showed that the coefficient of internal consistency of cooperative conflict scale was 0.72, competitive conflict scale was 0.76, and avoidant conflict scale was 0.73. The coefficient of internal consistency of insecurity psychology scale was 0.71, unsafe behavior tendency scale was 0.79. These coefficients were all less than 0.80, indicating that the questionnaire was of little liability. Then, SPSS 22.0 was used to improve the liability of the questionnaire. After subtracting all unreasonable questions, the coefficient of internal consistency of cooperative conflict scale turned into 0.81, competitive conflict scale changed to 0.85, and avoidant conflict scale turned to 0.85. The coefficient of internal consistency of insecurity psychology scale became 0.87, unsafe behavior tendency scale became 0.94. All these coefficients had reached the requirement of scale liability. Thus, the final questionnaire presented 25 reasonable questions, and the first 16 questions of conflict scales adopted Likert 5-point scoring method scoring the way forward. The 7 demographic characteristics questions were designed based on the control variables. And the 2 interpersonal intimacy questions were designed to verify the regulating variables. Adopting Likert 3-point scoring method scoring the way back, the mean of score of the 2 questions represented the degree of interpersonal intimacy.

Figure 1. Theoretical model

MEASUREMENT OF VARIABLES

Figure 1. Theoretical model
SAMPLE SPACE SELECTION AND DATA COLLECTION

The study focused on the generation mechanism of miners' unsafe behavior tendency; it selected the male coal miners who can go into a well for work as the target population, ensured the research subject's age, length of service, education, physical fitness and psychological quality at the same level, and excluded the individuals whose values have extreme deviations. In order to reduce the impact of corporate culture on research results, the survey was conducted in 3 different coal enterprises in Shanxi. A total of 150 questionnaires were given out, and all were taken back. After subtracting 2 responses which were not meet the requirements of the control variables, the result was 148 viable responses. The effective response rate was 98.7%; 72 responses were of high interpersonal intimacy and 76 responses were of low interpersonal intimacy.

EMPIRICAL RESULTS

Table 1 shows the results of variables' means and standard deviations. The maximum absolute value of skewness of the questions is 1.947 (<3); the maximum absolute value of kurtosis is 7.234 (<8). It can be seen that the sample is substantially obey the normal distribution.

Coefficients of internal consistency (Cronbach's α) of every scale in Table 1 are all greater than 0.80, indicating that the questionnaire has good liability. Table 2 shows factor loads of every question of the questionnaire and variance explained rates. It can be seen that all the standardized factor loads are greater than 0.60, and there is no cross load. All the
variance explained rates have met the standard of 60%. So the questionnaire has good construct validity.

Structural equation modeling (SEM) analysis was used to test the fit of the hypothetical model. Goodness of fit index (GFI) was used to assess the model fit. It found that GFI = 0.779 (<0.9), indicating poor model fit. According to Modification Indices (MI) of Amos7.0 output, the residual error of X6, one of observed variables of competitive management strategy, had co-variation with the residual error of X2, one of observed variables of cooperative management strategy; the number of the MI was 16.748. Thus, it can add the co-variation between the two residual errors (X6 & X2) to modify the hypothetical model. The final results of the main amended variable fitting indexes can be seen in Table 3. GFI represents goodness of fit index, IFI represents incremental fit index, CFI represents comparative fit index, AGFI represents adjusted goodness-of-fit index, RMSEA represents root mean square error of approximation. According to the criteria of indexes, the amended hypothetical model can fit into the observed data.

Amos7.0 was used to make hypothesis testing of the modified model, and the results are shown in Figure 2.

Figure 2 shows the entire framework of the hypothetical model and the path coefficients among the variables. Based on the instructions of the arrow in Figure 2, X1-X8 respectively represents the observed variable of each conflict management strategy; Y1-Y8 respectively represents the observed variable of insecurity psychology and unsafe behavior tendency; and e1-e16 respectively represents the residual error of each observed variable. Since the valid sample data of the survey are 148, belongs to a small sample size, the testing method selects the Generalized Least Squares (GLS) estimation.

Figure 2 shows the results of hypothesis testing, as follows:

1) The parameters corresponding latent variables and observed variables are greater than 0.5, indicating that the survey data measured for each latent variable are preferable. According to the path coefficients among the latent variables, cooperative conflict management strategy is negative-interrelated with insecurity psychology (correlation coefficient $\beta = -0.07$); competitive conflict management strategy is negative-interrelated with insecurity psychology (correlation coefficient

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component number</th>
<th>GFI</th>
<th>IFI</th>
<th>CFI</th>
<th>AGFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judgement standard</td>
<td>—</td>
<td>&gt; 0.9</td>
<td>&gt; 0.9</td>
<td>&gt; 0.9</td>
<td>&gt; 0.8</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Conflict management</td>
<td>3</td>
<td>0.967</td>
<td>0.983</td>
<td>0.982</td>
<td>0.929</td>
<td>0.032</td>
</tr>
<tr>
<td>strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecurity psychology</td>
<td>1</td>
<td>0.942</td>
<td>0.954</td>
<td>0.950</td>
<td>0.898</td>
<td>0.041</td>
</tr>
<tr>
<td>Unsafe behavior tendency</td>
<td>1</td>
<td>0.929</td>
<td>1.025</td>
<td>1.000</td>
<td>0.893</td>
<td>0.000</td>
</tr>
</tbody>
</table>
β = -0.14); and avoidant conflict management strategy is significantly positive interrelated with insecurity psychology (correlation coefficient β = 0.62). That means H1a, H1b, and H1c are verified.

2) The correlation coefficient (β) between insecurity psychology and unsafe behavior tendency is 0.56, showing a significant positive correlation, indicates that insecurity psychology may significantly result in miners’ unsafe behavior tendency. Thus, H2 is verified.

3) In the intermediary role of insecurity psychology, the correlation coefficient (β) between the cooperative conflict management strategy and unsafe behavior tendency is 0.03; the correlation coefficient (β) between the competitive conflict management strategy and unsafe behavior tendency is -0.04; the correlation coefficient (β) between the avoidant conflict management strategy and unsafe behavior tendency is 0.04. According to computational formula of intermediary role: c = c'+ ab (c is total effect, c’ is direct effect, ab is indirect effect) (Le, Bai, Wang, & Huang, 2014), the total effect of cooperative conflict management strategy impact on unsafe behavior tendency is -0.01, competitive conflict management strategy impact on unsafe behavior tendency is -0.12, avoidant conflict management strategy impact on unsafe behavior tendency is 0.39, indicating that miners' unsafe behavior tendency will decrease when miners adopting cooperative and competitive management strategies, and unsafe behavior tendency will be prompted when miners adopting avoidant management strategy. Thus, H3a, H3b, and H3c are verified, which means insecurity psychology plays an intermediary role between the three conflict management strategies and coal miners' unsafe behavior tendency.
Table 4 shows the regulating effect of interpersonal intimacy. According to the standard path coefficients in Table 4, it can be concluded that avoidant management strategy has a greater impact on insecurity psychology and higher level of significance when interpersonal intimacy is high. That is to say, when interpersonal intimacy among colleagues is high, avoidant management strategy is more easily lead to the generation of insecurity psychology. When using competitive management strategy, high interpersonal intimacy will weaken the generation of insecurity psychology. On the contrary, low interpersonal intimacy will lead to the generation of insecurity psychology. When interpersonal intimacy is low, the correlation coefficient (β) between cooperative conflict management strategy and insecurity psychology is -4.98, the absolute value greater than 1, which means the path is somewhere unreasonable. Thus, H4b and H4c are verified, and H4a is not verified.

ADVICES

According to empirical results, there are some scientific educational advices for coal mine management personnel to control miners’ unsafe behavior tendency.

1) Taking effective measures to promote the cohesion among coal miners. For example, arrange some collective interactive activities to promote the workers’ communication after work. At the same time, in order to diminish the possibility of the generation of insecurity psychology, the managers should guide and encourage miners to avoid taking avoidant conflict management strategy in dealing with interpersonal conflicts depending on the mechanism of the regulating effect of interpersonal intimacy.

2) Encouraging the conflicting parties to take competitive conflict management strategy when they are close while refrain from taking competitive conflict management strategy when they are not closely related.
3) Strengthening miners’ psychological education, focusing on monitoring and guiding the miners with low level of mental quality and resolving the conflict among miners in time to help them remove negative emotions, eliminate insecurity psychology, and reduce the generation of unsafe behavior tendency.

CONCLUSIONS

1) Conflict management strategy is one aspect of the generation mechanism of miners' unsafe behavior tendency. The conflict management strategies include cooperative, competitive, and avoidant types. Cooperative and competitive conflict management strategies can weaken the generation of unsafe behavior tendency, and avoidant conflict management strategy can lead to unsafe behavior tendency.

2) It is necessary to hire experts train the miners in psychological education such as conflict management education, security psychology education and safety behavior education.

3) Except the selection of conflict management strategies, there are many other factors in the generation mechanism of unsafe behavior tendency which need us to do further study. In addition, the survey, focusing on the subjects in three different coal mining enterprises in Shanxi province, has certain limitations. Thus, the hypothetical model in the study needs further empirical test in other coal mining enterprises in different cities and provinces.

REAL DISCUSSION

The data of the paper are based on a one-to-one questionnaire survey of 148 miners from three coal mining enterprises in Shanxi Province, China. The data are true and reliable. The hypothetical model of the paper is calculated strictly according to AMOS7.0 software. Therefore, it is credible of the hypothetical model that the impact of different conflict management strategies on the generation mechanism of miners' unsafe behavior tendency. Thus, the results of the paper are authentic.

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