Research on the Influence of Incentive Strategy on Active Safety Behavior of Miners Group Based on ERG Theory

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Abstract. In order to improve the safety behavior level of miners, stimulate the enthusiasm of them to work, so as to improve the level of coal mine safety management. The paper is based on the ERG theory, to find the relationship between the incentive strategy and the active safety behavior of the miners, and the theoretical model of the influence of the active safety behavior is constructed from the three kinds of motivation of the survival class, the relationship class and the growth class, and the mechanism of self-efficacy and safety motive is the intermediary variable. The influence of the incentive strategy on the active safety of miners was studied by the questionnaire survey method (571 questionnaires) and the structural equation model method. The results show that incentive strategies can positively affect the active safety behaviors of miners through self-efficacy and safety motivation. The influence of survival incentive, relationship incentive and growth incentive on active safety behaviors of miners is 0.278, 0.160 and 0.155. Different incentive strategies can influence the active safety behavior of miners and provide new ideas for decision makers.

Keywords: incentive strategy · safety motivation · active safety behavior · structural equation model

1 Introduction

The occurrence of coal mine accidents is closely related to the unsafe behavior of miners [1]. Active behavior research is a hot topic in many fields such as management and organizational behavior. Through research, Sun Yongbo et al. found that goal setting and work outlook have a positive impact on employees' active behavior, and employee training can stimulate employees' job crafting and enhance their active behavior [2]. From the perspective of human management, it is very important to use incentive measures to control and guide human behavior [3].Yao Min demonstrated that the implementation of safety behavior needs incentives [4].Therefore, based on the theory of humanistic needs (Existence, Relatedness, Growth, ERG) [5], this paper divided the dimensions of incentive strategies, and analyzes the influence of incentive strategies on the active safety behavior of miners by determining the relationship between incentive strategies, self-efficacy, safety motivation and active safety behavior of miners.

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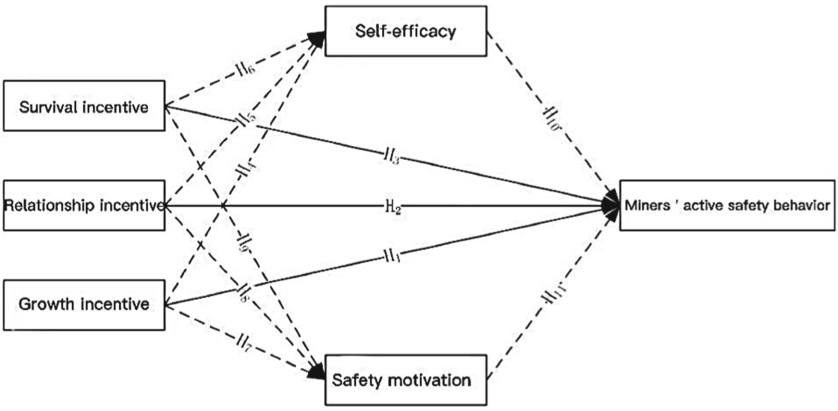

Fig. 1. The theoretical model of the influence of incentive strategies on miners' active safety behavior

2 Theoretical Assumptions and Methods

2.1 Theoretical Hypothesis Research

According to the different dimensions of incentive strategies in academic circles [1, 6], the management purpose is achieved by correctly guiding and strengthening the work behavior of employees. Therefore, the following hypothesis is proposed.

h1: Survival incentive affects miners' active safety behavior; h2: relational incentives affect miners' active safety behavior; h3: Growth incentives affect miners' active safety behavior.h4: Survival motivation affects self-efficacy; h5: Relationship motivation affects self-efficacy; h6: Growth motivation affects self-efficacy; h7: Survival incentives affect safety motivation; h8: relational incentives affect safety motivation; h9: Growth incentives affect safety motivation; h10: Self-efficacy affects miners' active safety behavior; h11: Safety motivation affects miners' active safety behavior.

In summary, a theoretical model is constructed as shown in Fig. 1.

2.2 Scale Design

The scale of incentive strategy mainly draws on the miner safety incentive scale compiled by Zhang Shu and the incentive factor scale compiled by Yuan Heyan; the self-efficacy mainly refers to the miner self-efficacy scale compiled by Liu Yuxin; the safety motivation scale mainly draws on the miners' safety motivation scale compiled by Tan Dongwei; the problem design of the active safety behavior scale mainly adopts the active safety behavior scale compiled by Sun Le. The questionnaire design was measured according to the Likert five-level scale method. The answers were listed from 1 to 5 points to 'completely disagree' to 'completely agree', and some basic information questions were added, such as gender, age, and education.

2.3 Research Samples

The subjects of the questionnaire were selected from the front-line staff of Dahaize Coal Mine, Daliuta Coal Mine and Yubei Coal Industry, and 589 copies were recovered. After screening, 571 valid questionnaires were obtained, with an effective rate of 96.94%. The education level is mostly high school / secondary school / technical school, accounting for 30.6%, and the length of service is mostly 1–5 years, accounting for 53.4%.

3 Data Analysis

3.1 Reliability and Validity

SPSS26.0 was used to analyze the reliability and validity of the data. The Cronbach's Alpha of scales were 0.875, 0.817, 0.760 and 0.825, respectively, which were all greater than 0.7, indicating that the reliability of each variable was good. The CITC values of the items in each dimension of the scale were all greater than 0.4, indicating that the correlation of the items was strong, and the research significance was large.

The confirmatory factor analysis of each variable shows that the AVE values of survival motivation, relationship motivation, growth motivation, self-efficacy, safety motivation and miners' active safety behavior are 0.5098, 0.6963, 0.5762, 0.5341, 0.5023 and 0.5004 respectively, all above 0.5, indicating that the questionnaire has good convergence validity.

3.2 Model Construction

This paper uses Amos to construct the influence relationship model of incentive strategy on miners' active safety behavior, and tests whether the hypothesis path established by the structural equation model is valid, as shown in Fig. 2.

The fitting index of the overall model is calculated. The fitting index is not within the standard value range, indicating that the model fitting effect is not good, the results are shown in Table 1.

3.3 Model Updating

The double arrows represent the covariance correction index between the residual variables, and M.I.represents the chi-square degree of freedom of the model that at least decreases if a correlation path is added between the two residual variables. It can be seen from Table 2 that the correlation between e17 and e19, e10 and e26, e8 and e17, e7 and e24 is high, so the model is modified.

Based on the preliminary test of the modified index table in Table 2, the larger M.I.value and Par Change value are preferred for correction. In order to make the model as simple as possible, the M.I.value is used as the reference value for the selection modification. Therefore, the relationship between error e17 and e19, e10 and e26, e8 and e17, e7 and e24 is established.

The standardized estimation model of the impact of the modified incentive strategy on the active safety behavior of the miners is shown in Fig. 3.

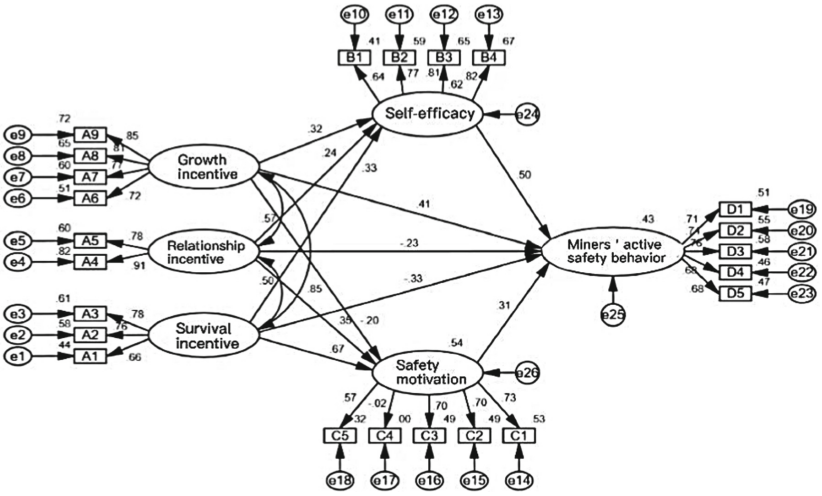

Fig. 2. Structural equation model of the influence of incentive strategy on active safety behavior of miners

Table 1. Preliminary fitting results of the model

Index	c2/df	GFI	RMSEA	RMR	CFI	NFI	TLI	AGFI	IFI
Criterion for judgement	<3	>0.8	<0.10	<0.05	>0.9	>0.9	>0.9	>0.9	>0.9
validation model	3.120	.841	.084	.040	.871	.923	.949	.912	.872
Model fitness	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No

Table 2. Preliminary fitting results of the model (>15)

	M.I.	Par Change
e17 ↔ e19	19.957	.087
e16 ↔ e18	17.623	.078
e10 ↔ e26	25.198	.108
e9 ↔ e20	17.046	−.064
e8 ↔ e17	19.875	.083
e7 ↔ e24	21.852	.055
e1 ↔ e22	15.690	.094

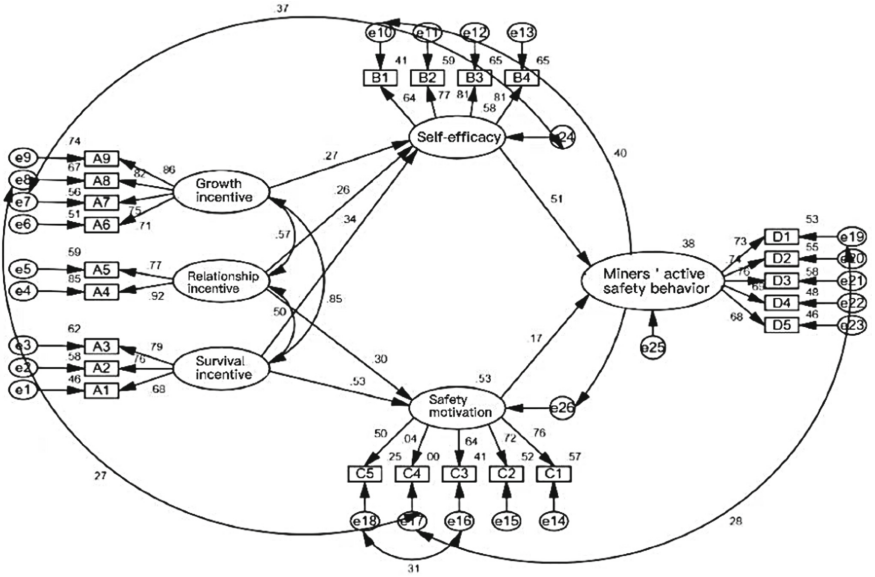

Fig. 3. Structural equation final model of the effect of incentive strategy on active safety behavior

Table 3. Fitting test results of the final model

Index	c2/df	GFI	RMSEA	RMR	CFI	NFI	TLI	AGFI	IFI
criterion for judgement	<3	>0.8	<0.10	<0.05	>0.9	>0.9	>0.9	>0.9	>0.9
validation model	2.649	.862	.074	.038	.902	.950	.982	.923	.901
Model fitness	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3.4 Model Test

By testing the final model, it can be seen that the final model fitting degree meets the matching requirements, and the model fitting test results are shown in Table 3. The final model path coefficient test results are shown in Table 3.

The final model path coefficient test results are shown in Table 4.

3.5 Analysis of Model Results

After modifying the model, four hypotheses were not established at a significant level of 0.05, that is, h1: survival incentives affect miners' active safety behavior; h2: relational incentives affect miners' active safety behavior; h3: Growth incentives affect miners' active safety behavior; h9: Growth incentives affect safety motivation, and the remaining assumptions are valid. The results are shown in Table 5.

Table 4. The test results of the path coefficient of the final model

(* P < 0.05, **P < 0.01, ***P < 0.001)	Estimate	S.E.	C.R.	P
Safety-efficacy ← Survival incentive	.237	.114	2.079	*
Safety-efficacy ← Relationship	.177	.043	4.128	***
Self-efficacy ← Growth incentive	.278	.108	2.588	*
Safety motivation ← Relationship incentive	.314	.078	4.046	***
Safety motivation ← Survival incentive	.682	.116	5.872	***
Active safety behavior ← Safety motivation	.142	.066	2.149	*
Active safety behavior ← Safety-efficacy	.652	.112	5.819	***

Table 5. Results of the research hypothesis

research hypothesis	C.R.	P	results of inspection
h1	——	——	false
h2	——	——	false
h3	——	——	false
h4	2.588	**	organize
h5	4.128	***	organize
h6	2.079	*	organize
h7	5.872	***	organize
h8	4.046	***	organize
h9	——	——	false
h10	5.819	***	organize
h11	2.149	*	organize

By summarizing the standardized path coefficient relationship between each latent variable, the influence degree of different strategies on the active safety behavior of miners can be obtained. The overall effect of survival incentive on the active safety behavior of miners is 0.278, the overall effect of relationship incentive on the active safety behavior of miners is 0.160, and the overall effect of growth incentive on the active safety behavior of miners is 0.155.

4 Conclusion

Incentive strategy is significantly positively correlated with miners' active safety behavior, and further positively affects miners' active safety behavior through mediating variables self-efficacy and safety motivation. Survival incentive has the greatest impact on miners' active safety behavior, which can indirectly affect miners' active safety behavior

through self-efficacy and safety motivation. Growth incentives have the least impact on miners' active safety behavior, which can only indirectly affect miners' active safety behavior through safety motivation.

Based on the findings above, coal mine enterprise managers should be better than to strengthen to meet the survival needs of miners, by improving the welfare benefits, improve the reward and punishment system, improve the level of wages and improve the working environment and other measures to promote the improvement of miners living conditions and working environment level.

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