

Study on Influencing Factors of Psychological Resilience of Miners Based on ISM

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Abstract

“Psychological resilience” is a brand-new concept in the psychology community. In recent years, its research field has also been continuously expanding. In order to study the factors affecting the psychological resilience of coal mine employees, this paper constructs the index system of the influencing factors of the psychological resilience of miners from the three aspects of the coal mine workers themselves, work, and organization, and uses the ISM to analyze the relationship between the various influencing factors. Established a three-tier ladder structural model The results show that the most surface factors affecting the psychological resilience of miners are concentrated on the level of the miners themselves, including emotional emotions, problem-solving abilities, and self-efficacy; the middle-level factors that affect the psychological resilience of miners include working years, adaptability, work intensity, relationship between colleagues, and work pressure. working environment; the deepest factors that affect the psychological resilience of miners focus on the organizational level, including organizational justice, organizational support, and psychological security education.

Keywords

Miners; psychological resilience; influencing factors; ISM.

1. Introduction

The issue of safe production in coal mines has always been the focus of academic attention. Heinrich found through research that 88% of accidents are caused by human insecurity[1]. Therefore, the key to the high incidence of unsafe accidents lies in human unsafe behavior, and human unsafe behavior will be affected. The dominant state of mind[2]. Coal miners work long-term in underground high-risk and confined spaces. Their psychological state is affected by factors such as the working environment. They easily exhibit greater volatility and are prone to unhealthy mentality, leading to frequent unsafe behaviors. Furthermore, coal miners Most of them come from the bottom of the society, have low incomes, heavy family burdens, and great psychological pressure. These have laid down hidden dangers for the safe production of coal mines. In order to reduce the frequency of unsafe accidents in coal mines and better mine miners' positive forces to enhance their “immunity” to reduce the occurrence of unsafe accidents, we can learn from the disciplines that specialize in the active forces of individuals—positive psychology. Research results. The concepts it mainly include: subjective well-being, psychological resilience, positive personality, and active social organization systems. The connotation and denotation of psychological resilience has broadly covered most of the positive forces and qualities included in positive psychological theory.

“Psychological resilience” originated in Rutter's research on maternal love deprivation in the 1970s[3]. At present, there are three kinds of understanding about “psychological resilience”: quality theory[4], process theory[5], and result theory[6]. The quality theory holds that psychological resilience is an individual's ability or characteristic. For example, mental resilience is the ability of an individual to withstand high levels of destructive changes and at the same time demonstrate as little as possible bad behavior; the procedural theory sees mental resilience as a Dynamic development and change process, for example, psychological resilience is a dynamic process in which individuals are well-adapted to a dangerous environment; the resulting definition focuses on the definition of psychological resilience from the results of development. For example, psychological resilience is a phenomenon that is characterized by for serious threats, individual adaptation and development are

still good. The writer tends to the second process theory that mental resilience is a process of adaptation and that it is capable of training.

Therefore, this study will focus on miners as research objects and psychological resilience as the main research content, in order to provide scientific basis for safe production in coal mines.

2. Analysis of Factors Affecting Miners' Mental Resilience

There are many factors that affect the psychological resilience of miners. The author has refined and summarized 12 factors that affect the psychological resilience of miners from the three aspects of the individual factors, work factors and the organization management through literature review and field research. As shown in Table 1.

Table 1. Factors Affecting Miners' Psychological Resilience

classification	Influencing factors
individual factors	Problem solving ability S1 Emotional mood S2 Working years S3 Adaptability S4 Colleague relationship S5 Self-efficacy S6
work factors	Work intensity S7 Working pressure S8 Working environment S9
Organization and management factors	Organization support S10 Organizational fairness S11 Psychological safety education S12

(1) Individual factors

Mowbray[7] proposed seven dimensions for measuring psychological resilience in his psychological resilience assessment questionnaire: personal vision, purpose, interpersonal interaction, social interpersonal relationship, problem solving ability, plan organization ability, and self-confidence. Zhang Jin[8] proposed that adaptability, self-confidence, and problem-solving ability can be used as indicators to measure the psychological resilience of employees in a study on the influencing factors of the psychological resilience of Chinese MNC employees. He believes that there are organizational support for the factors affecting the psychological resilience of employees. Employee relations and more. Zhao Ran et al[9] in the study of the factors affecting the psychological resilience of employees of oil companies believe that employees' age, length of service, monthly income, and social support will affect the psychological resilience of employees. Luthans and other scholars[10] pointed out that self-efficacy is a key factor affecting psychological capital. Based on the above research, the author selects problem solving ability, Emotional mood, working years, adaptability, relationship between colleagues, and self-efficacy as personal factors that affect the psychological resilience of miners.

(2) Work factors

Zhao Ran[9] proposed stress levels in the study of the psychological status of employees in oil companies and affected their psychological resilience. Li Hongxia[11] found that the attention of the miners will be weakened during difficult times. Bi Zuozhi[12] pointed out that the working environment, operating intensity, and working time and other factors will affect the psychological status of miners. Based on the above research, the author selected work intensity, work pressure and working environment as working factors that affect the psychological resilience of miners.

(3) Organization and management factors

Zhang Jin[8]believes that organizational support and motivation will affect the psychological resilience of employees. Li Naiwen[13]found that in the construction study of the coal mine enterprise safety psychological training system, organizational justice, safety management, and organizational support will affect the psychological status of employees. Therefore,the author selected organizational support, organizational fairness, and psychological safety education. As an organizational and management factor that affects the psychological resilience of miners.

3. Miners Psychological Resilience Influencing Factors ISM Establishment

3.1 ISM Overview

ISM technology was a technique developed by Professor Warfield in 1973 to analyze the structural problems of complex socio-economic systems. The steps are: (1) extracting the constituent elements of the problem; (2) establishing a system element relationship table; (3) establishing an adjacency matrix and a reachability matrix; (4) decomposing an achievable matrix and establishing a structural model; (5) according to a structural model Create an explanation structure model.

3.2 Determining Adjacency Matrix

Consultation with industry professionals and experts. The above 12 influencing factors are analyzed and an adjacency matrix A is established to describe the relationship between the two elements in the system. The matrix expression method states that when the element Si has an influence on Sj, the matrix element aij is 1; when the element Si has no influence on Sj, the matrix element aij is 0.

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

3.3 Reachability Matrix Calculation

After the adjacency matrix A is found, according to the Boolean matrix operation rule, the sum of the adjacency matrix A and the identity matrix I is calculated as (A+I), and then (A+I) is raised to (A+I)^{K-1}. (A+I)^K=(A+I)^{K+1}, matrix M=(A+I)^K is a reachability matrix. The computational reachability matrix is as follows

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

3.4 Dividing Hierarchical Relationships

After calculating the reachability matrix, it needs to be hierarchically divided. According to R(Si)∩Q(Si)=R(Si), the following table 2 divides the hierarchy of factors affecting the psychological resilience of miners. In Table 2, for i=1,2 , 6 meet the conditions. Then the elements of 1, 2, and 6 in Table 2 are all removed, and i=3, 4, 5, 7, 8, 9 are satisfied to satisfy R(Si)∩Q(Si)=R(Si). Finally, with regard to 1,2,3,4,5,6,7,8,9, we find that i=10,11,12 satisfy R(Si)∩Q(Si)=R(Si). Therefore, the first node of the influencing factors of the psychological resilience of miners: L1={1,2,6}; the second-level node: L2={3,4,5,7,8,9}; the third-level node: L3= {10,11,12}.

Table 2. reachable set and predecessor set and their intersection

i	R(S _i)	Q(S _i)	R(S _i) ∩ Q(S _i)
1	1	1, 3, 5, 7, 8, 10, 11, 12	1
2	2	2, 4, 5, 7, 8, 9, 10, 11, 12	2
3	1, 3, 6	3, 10, 11	3
4	2, 4, 6	4, 10, 11, 12	4
5	1, 2, 5, 6	5, 11, 12	5
6	6	3, 4, 5, 6, 8, 10, 11, 12	6
7	1, 2, 7	7, 10, 12	7
8	1, 2, 6, 8	8, 10, 12	8
9	2, 9	9, 10, 11	9
10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	10	10
11	1, 2, 3, 4, 5, 6, 9, 11	11	11
12	1, 2, 4, 5, 6, 8, 12	12	12

3.5 Establishing Miners' Psychological Resilience Influence Factors ISM Model

In summary, the ISM model is shown in Figure 3:

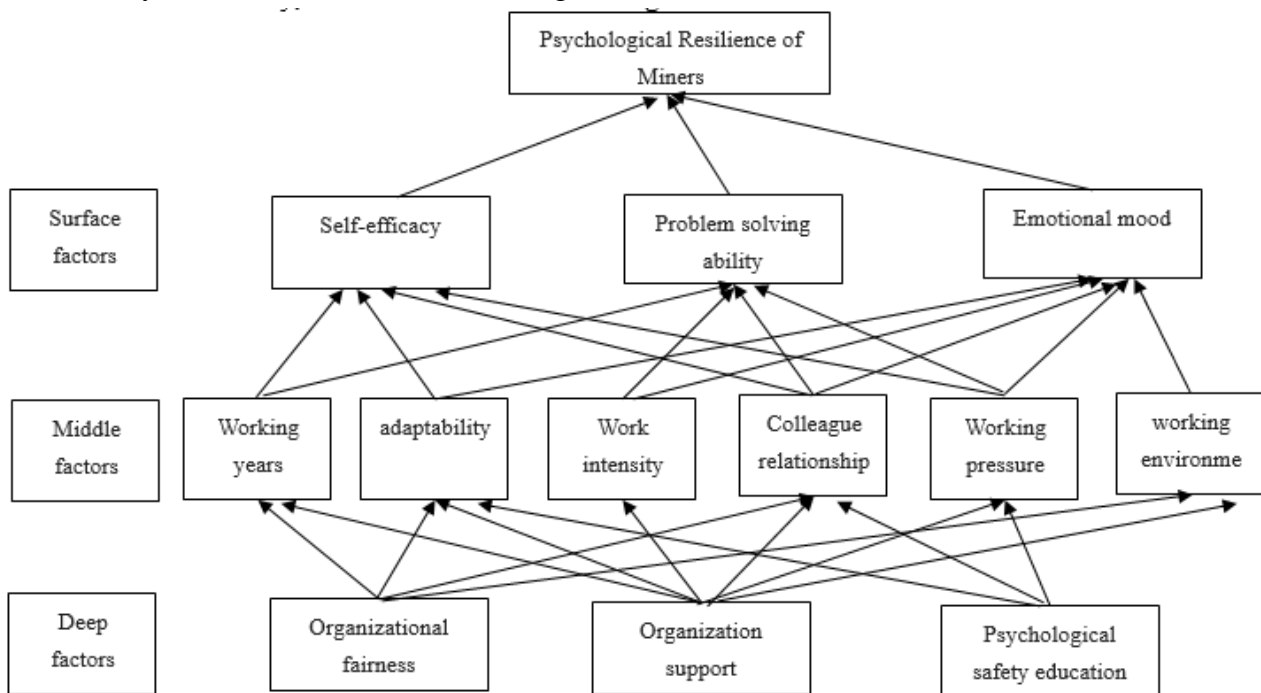


Figure 1. Miner's psychological resilience influencing factors ISM

(1)Surface influencing factors

There are three superficial factors that affect the psychological resilience of miners, namely: self-efficacy, problem-solving ability, and emotional mood. These three factors directly affect the psychological resilience of miners.

The miners are in a high-risk, high-pressure working environment for a long time. Downhole operations are very complex. If the subjective assessment of whether the miners can complete their work is low, it is difficult to obtain motivation and confidence from the work. This low self-efficacy will weaken the miners' Psychological resilience; miners with outstanding problem-solving ability can properly deal with sudden underground incidents, and the confidence of the miners at work will continue to accumulate with each proper handling of unexpected situations, thus making their

psychological resilience gradual. Increased; long-term high-load labor will increase the physical fatigue of miners, family members do not support and the community's prejudice against their own profession is easy to produce psychological discomfort, will make miners appear bored and resist emotions, this kind of mood will affect miners The mental resilience.

(2) Mid-level influencing factors

The mid-level influencing factors include the six factors of working years, adaptability, work intensity, relationship, work pressure, and work environment. The working hours of miners will affect the proficiency of their own technology and their awareness of the work. With the proficiency of the miner's technology and the deeper awareness of the work, it will lead to more active self-efficacy and more flexible issues. Solve the ability, and then enhance their psychological resilience; in the face of underground complex operating environment, the strength of the miners' adaptive ability will have a great impact on self-efficacy and emotional emotions, which indirectly affect its psychological resilience; Due to the high repeatability of underground operations, the physical and psychological burden of miners will increase with the increase of work intensity, which will affect the problem solving ability and emotional mood of miners, ultimately affecting their psychological resilience; leadership and lower-level employees The good relationship between employees will enhance the self-efficacy of employees. The good relationship between peers will create a good working atmosphere. This atmosphere will allow miners to face collectively in the face of unsafe accidents and increase the mentality of miners. Resilience; Miner's high-intensity workload, high-risk work nature, society's prejudice against miners' occupations, and family members' support for the miner's occupation will exert pressure on the miners. This pressure will cause miners to face unexpected accidents. The mental resilience of the time is reduced; downhole noise, dust, and a dark work environment will directly affect the emotions of employees when they work, and also indirectly affect the psychological resilience of miners through emotional emotions.

(3) Deep influence factors

There are three influential factors that affect the psychological resilience of miners, including organizational support, organizational fairness, and psychological security education.

The special nature of miners' occupations makes them more in need of emotional support and spiritual care. The organization's support for its work directly affects the miners' work intensity, work pressure, and work environment, and thus affects mental resilience.

At work, if the leaders are dissatisfied with the miners because of their personal feelings, the contradictions among the workers, the unfair rewards and punishments, etc., can cause the miners to have a bad mentality. This inequality will allow the miners to feel conflicted and evasive in the face of difficulties, thus weakening the psychological resilience of the miners.

Due to the special nature of downhole operations, the miners have some adverse psychological reactions during the work process. Therefore, in terms of mental health, the organization must provide targeted psychological safety education for miners working underground for a long time in order to enhance the miners' ability to resist pressure and adapt to guide the miners to form a positive and optimistic psychological state. At the same time, good psychological conditions will also Make the miners produce a more harmonious relationship between colleagues, thereby enhancing the mental resilience of miners.

To sum up, the organization should create a harmonious, united, open and mutual working atmosphere. A good working atmosphere will give employees a sense of belonging; they should give the miners more support and fair treatment. The leader of the organization should actively listen to the miners' opinions and meet the needs of the miners as much as possible so that the miners can feel the organization to him.

4. Conclusion

(1) According to the psychological resilience of miners, from the three aspects of individual, work, and organization, a structural interpretation model for the influencing factors of the psychological resilience of miners is constructed, and a three-level diagram of different influencing depths is obtained.

(2) The ISM model of the miners' psychological resilience affects the degree of influence of various factors on the psychological resilience of miners. Organizational fairness, organizational support, and psychological safety education are the most influential factors that affect the psychological resilience of miners. This is of guiding significance for the organization how to cultivate the psychological resilience of miners.

(3) According to the analysis of the influencing factors of the psychological resilience of miners, it is found that the psychological resilience of miners is not static and will be affected by many factors, which provides new ideas for safe production of coal mines.

(4) This article also has limitations in research. In the selection of influence factors, this paper only extracts from the three levels of personal, work, and organization management. The extracted elements need to be improved. Therefore, in the future research, we can consider extracting influencing factors from more levels.

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