

# Study on Mine Safety based on Workers' Personality Characteristics

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## Abstract

In this study, mainly through site survey to analyze the composition of the present structure of coal miners, and a "Symptom Checklist-SCL90" front-line staff to study the psychological status of coal and causes, the use of statistical software SPSS14.0. There's bad for miners psychological problems, take effective measures to improve the safety of coal production.

## Keywords

SCL90, Mine safety, Questionnaires.

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## 1. Introduction

The psychological condition of coal miners plays a crucial role in the safety of coal production. The safety of coal mines is mainly affected by the unsafe behavior of people, the unsafe state of things, the unsafe factors of the environment and the defects of management.[1] The safety behavior mainly lies in the psychological problems of miners, according to statistics, more than 70% of the safety accidents are man-made, and the impact of people's psychological quality is the key to safe construction, so it is a long way to study the psychology of miners.

## 2. Brief Introduction of SCL90 Scale

This research use scale for the self-assessment lists of symptom - SCL90, it is one of the world's most famous mental health test scale, is also the most widely used mental disorders and mental health check-ups scale, it can from the feelings, emotions, thinking, consciousness, behavior, until the life habits, interpersonal relationship, diet, sleep and other point of view, To assess whether a person has certain psychological symptoms and how severe they are. It has a good ability to distinguish between people with psychological symptoms (that is, people who may be at the edge of psychological disorders or psychological disorders), and it is suitable for detecting which people in a crowd may have psychological disorders, what kind of psychological disorders a person may have and how serious they are. There are 90 items in the symptom self-rating Scale, including 9 factors, which are "somatization", "obsessive-compulsive symptoms", "interpersonal sensitivity", "depression", "anxiety", "hostility", "terror", "paranoia", "psychosis" and other factors. As the miners in the tested group mainly come from rural areas with low education level and do not often contact with written materials, their enthusiasm for written answers is insufficient and their attention time is short. [2].

Accordingly, the 90 questions in SCL90 are likely to cause the weariness and exhaustion of respondents, which leads to the lack of reliability of the results. Therefore, the number of questions in this survey scale has been reduced accordingly. According to previous studies, "obsessive-compulsive symptoms", "psychosis" and other factors in the scale did not distinguish miners from the general population, so they were deleted. Of course, the deletion of the questions will damage the

integrity of the scale to a certain extent, but it is desirable in this case. There were 63 items in the reduced scale, including seven factors: "somatization", "interpersonal sensitivity", "depression", "anxiety", "hostility", "terror" and "paranoia".[3][4].

### 3. Distribution of Questionnaires and Analysis of Statistical Results

The objects of this survey are front-line staff from DZ coal mine, ZZ coal mine and DP coal mine. 30 questionnaires are distributed to each of the three coal mines, and then randomly distributed and tested by coal mine management personnel. 27 valid questionnaires are recovered from DZ coal mine and 25 valid questionnaires from ZZ coal mine. The recovery rates of 28 questionnaires in DP Coal mine were 90.0%, 83.3% and 93.3%, respectively.

The statistical software used in this study is SPSS14.0, a special statistical software package for social sciences.

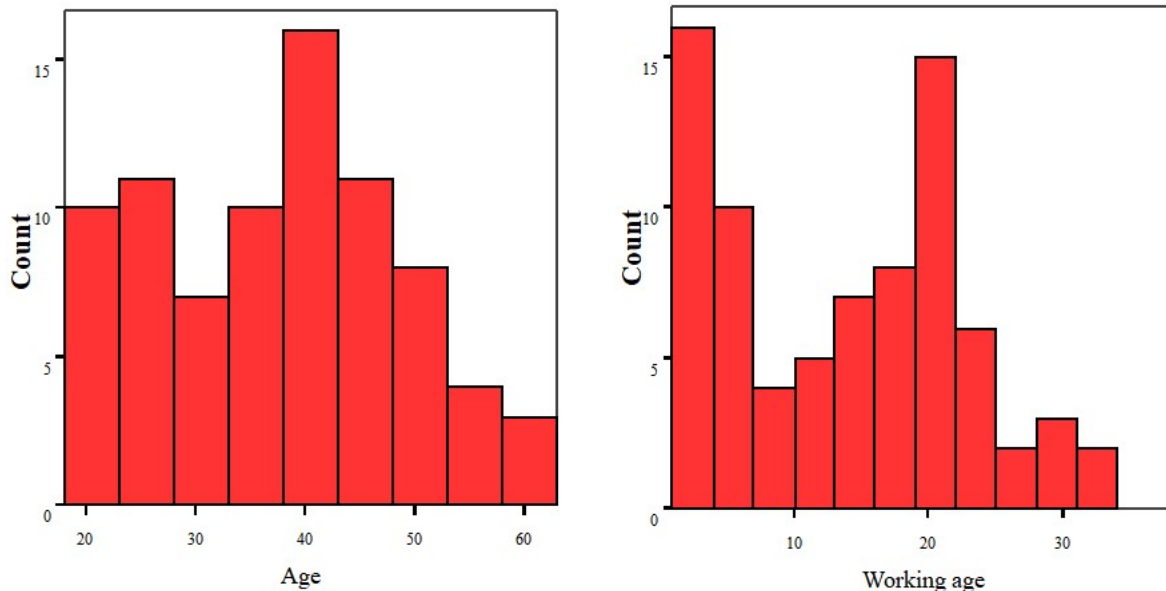
The statistical results were classified according to educational level, household registration type, job type, job type and marital status, and their frequency distribution was shown in Table 1.

**Table 1.** Distribution of variables

Category	Effective variable	Frequency	Percentage	Effective percentage	Cumulative percentage
Level of education	Primary school	12	15.0	15.0	15.0
	Junior high school	50	62.5	62.5	77.5
	High school	10	12.5	12.5	90.0
	University and above	8	10.0	10.0	100
	Total number	80	100	100	
Account type	Rural	70	87.5	87.5	87.5
	Rity	10	12.5	12.5	100
	Total number	80	100	100	
Position type	Ordinary workers	69	86.3	86.3	86.3
	Technical manager	11	13.8	13.8	100
	Total number	80	100	100	
Type of work type	Ground	19	23.8	23.8	23.8
	Downhole	61	76.3	76.3	100
	Total number	80	100	100	
Marital status	Unmarried	22	27.5	27.5	27.5
	Married	58	72.5	72.5	100
	Total number	80	100	100	

As can be seen from Table 1, nearly 80% of front-line employees in coal mining enterprises have a junior high school education level or below, with low education level. The vast majority of coal miners, almost 90 percent, come from rural areas, and a simple conversation tells us that most of them come from poor families, which is predictable; It can also be seen from Table 1 that nearly 70% of

employees are ordinary workers and engaged in underground work, while only 20% are engaged in surface work and technical management. At the same time, it can be seen from Table 1 that 70% of front-line employees are married, so it can be inferred that the psychological status of these miners is greatly affected by the family environment. The frequency distribution histogram of age and working age is shown in the figure below.



**Fig.1** Frequency distribution histogram of age    **Fig.2** Frequency distribution histogram of working age

From Fig.1 and Fig.2, it can be seen that the majority of workers in the front-line coal mine are middle-aged and young people, and the majority of them are in their mid-20s and 40s, which is completely reasonable. Most of the underground work depends on physical labor. The length of service shows two peaks, especially for the new employees with less than 5 years of service and about 20 years of service.

Through statistical analysis of the effective SELF-rating Symptom Scale SCL90, the scores of coal miners in the revised VERSION of SCL90 are compared with the norm in Table 2.

**Table 2.** Comparison table between scores of coal miners and norms on SCL90 revision

Project	Study group	Norm	T value	P value
SCL Somatization	2.14±0.55	1.37±0.48	26.22	***
SCL Interrelationship sensitivity	2.01±0.57	1.65±0.61	23.56	***
SCL Depressed	2.34±0.59	1.50±0.59	30.08	***
SCL Anxious	2.48±0.67	1.39±0.43	35.17	***
SCL Hostile	1.52±0.63	1.46±0.55	1.57	--
SCL Terror	1.63±0.57	1.23±0.41	3.22	**
SCL Bigoted	1.52±0.54	1.43±0.57	2.09	*
Note: ***P<0.001; **P<0.01; *P<0.5; --P>0.5				

As can be seen from the above table, coal miners differed significantly from the norm in the items of "somatization", "interpersonal sensitivity", "depression" and "anxiety" in the revised VERSION of

SCL90, with a significance level less than 0.001. "Terror" item, significant difference at 0.01 level; "Paranoid" items, significant difference at 0.05 level; But there was no significant difference in "hostile" items.

## **4. Psychological Problems of Workers in Mining Enterprises**

### **4.1 Psychology of Fear**

We can often see reports about mine accidents from the media. People who pay attention to this industry all have the recognition that the coal industry is a high-risk industry. As a coal miner, especially those who have been engaged in underground labor for a long time, they are likely to have the experience of losing their fellow workers. Coupled with the publicity of enterprises in this regard, they will know more about mine accidents and have a more specific feeling of danger. In a sense, it is of great benefit for them to attach importance to safety and standardize operation, but on the other hand, it also aggravates their psychological burden. They feel that their lives are always in danger and accidents may occur at any time, resulting in unpredictable panic about life. The longer you work in the coal industry, the greater the psychological pressure. If this psychological situation can not be timely dredged and resolved, a long time may lead to their numbness to life, negative psychology, so it is not conducive to safe production.

### **4.2 Hypochondria**

Coal industry is the existence of more occupational diseases of the industry, coal buried deep underground, coal mining work environment is impossible to compare with the ground type of work. Poor air quality, a high temperature, high humidity, high dust, and all kinds of poisonous and harmful gases constitute the work environment of coal mining, coal mining is a high labor intensity of effort, in such an environment the medium to long engaged in labor, there may be some occupational disease, silicosis and rheumatism is typical of a coal mine workers occupational disease. Taking care of health is also a human instinct. Most miners have little knowledge of life and health, let alone scientific knowledge. Therefore, they are skeptical of their physical condition, the body is slightly unwell to be frightened and frightened, always suspect that he suffered from incurable diseases, with such psychological pressure, the state of mind will be greatly affected, so it is not conducive to physical health.

### **4.3 Inferiority Complex**

This is a common psychological phenomenon among coal miners, mainly from social injustice. In the eyes of the public, coal miners are engaged in a low-level occupation, and most of those engaged in this occupation are simple people who make a living by selling their labor. Such unfair understanding of the society will spread and take root in the hearts of coal miners, which will greatly hurt their self-esteem. They despise and belittle themselves. They never dare to say "I am a coal miner" proudly in their communication with the society, and always feel inferior because of their identity as a coal miner.

### **4.4 Lonely Psychology**

It is well known that coal is always contained in poor transportation and remote places, where it is impossible to build developed living quarters and where there are not enough sports and cultural facilities for the coal miners to relieve their loneliness. In order to engage in production, coal miners are far away from their relatives and friends. Although there are many exchanges between workers and friends and the care of enterprises, such exchanges are limited after all. They need to pour out their hearts to their wives, children, parents and friends, and even to have extensive contact and communication with the whole society. The heavy work and the boredom after work lead to the lonely psychology of coal miners.

## **5. Adjust the Psychology of Workers in Mining Enterprises to Improve Safety Production Capacity**

### **5.1 Improve the Working Environment of Coal Miners**

Coal mining is mainly carried out underground. Among all kinds of harmful factors, adverse climate conditions occupy an important position. The climatic conditions in the mine are characterized by high temperature, high humidity and many harmful gases, as well as great variation of wind speed and temperature in different locations. Because of the particularity of coal mining, it is difficult to completely improve the working climate under the current economic and technological conditions. We can formulate a reasonable work and rest system from the perspective of labor hygiene, shorten the duration of work as much as possible (such as implementing small shift change, increasing the number of breaks, etc.), set up a rest room near the workplace with good climate conditions, supply and allocate nutrients, and various protective supplies.

### **5.2 Change the Wage Payment and Incentive Mechanism**

Many front-line coal miners engaged in coal mining are forced to live, and they expect to get a certain amount of labor remuneration, so the wage payment and reward system has a great influence on the psychology of miners. Now the wage and bonus system of coal mining enterprises are mostly related to coal output, which has a great sense of pressure on coal miners. Therefore, the wage structure of coal miners should be based on the necessary labor quantity of miners, rather than the final coal output as the number of pieces. In a word, a reasonable and correct wage structure and reward system should not only reflect the principle of distribution according to work, mobilize the enthusiasm of coal miners in production, but also prevent coal mine safety from being affected by the pure pursuit of coal output.

### **5.3 Enrich Organizational Life and Create an Atmosphere of Safe Production**

Organization life is the most important life of miners after work, besides family life. Organization life is the most direct factor that makes workers feel the warmth of organization. Therefore, first of all, the life of the organization should be enriched so that workers can truly feel the care and concern of the organization. Secondly, enterprise leaders should enhance the communication and communication with miners, timely understand the difficulties of workers and give support. According to the herd mentality, when most coal mine workers can abide by the production norms and work safely, others will also have this tendency. Therefore, it is very important to create a safe production atmosphere. We should put the publicity of safe production in the primary position of publicity work, and use all means and facilities to increase the dissemination of safety culture.

### **5.4 Strengthen Safety Education for Coal Miners**

Safety education is one of the main ways to prevent accidents, and it plays an important role in various preventive measures. Safety education is very important, first of all, it can improve the sense of responsibility and consciousness of coal miners to do a good job in safety production. Secondly, the popularization and improvement of safety technical knowledge can make the majority of coal miners master the objective law of safe production, improve the level of safety technology, master the technical ability to eliminate work-related accidents and prevent occupational diseases. Finally, safety education can create better working conditions for safe production, protection of one's own safety and health, and improvement of labor productivity.

## **6. Conclusion**

Through the symptom self-rating scale, we found that the scores of "somatization", "interpersonal sensitivity", "depression" and "anxiety" were significantly different from the norm, indicating that there were certain psychological problems in this group. The work of coal mine safety management is closely related to the psychology of miners. Therefore, a key point of mine safety management is to improve the psychology of miners through various systems and regulations.

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