



Burnout in Chinese coal mine safety supervision



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HIGHLIGHTS

- We discuss commonly-suffered job burnout in Chinese coal enterprises.
- We analyze the special attributes of coal mine safety output.
- We explore two main causes of commonly-suffered job burnout.
- We construct a game model to validate how the two causes act on safety output.
- We put forward related policy suggestions.

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ABSTRACT

This study examines commonly-suffered job burnout as it relates to the practice of safety supervision in Chinese coal mine enterprises. Commonly-suffered job burnout is a form of job burnout caused by external factors. It is closely related to task characteristics rather than individual idiosyncrasies. To explore the causes of commonly-suffered job burnout, the special attributes (the integrated output attributes, conditional output attributes, and public goods attributes) of coal mine safety output and the inevitability of the invalidation of the bounded authority in safety supervision were analyzed in this study, which reveals the formation mechanism of commonly-suffered job burnout. Moreover, a confirmatory game model was constructed to analyze how the attributes of the safety output and bounded authority of safety supervision act on the safety output. The theoretical connotation of commonly-suffered job burnout was explained based on the job demands-resources theory. A comparative analysis of commonly-suffered job burnout and the job burnout that occurs in the traditional research object was also undertaken from the viewpoint of the job demands, which are determined by the characteristics of the work task and their corresponding coping resources. Policy suggestions were given based on interventions in commonly-suffered job burnout.

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1. Introduction

The concept of job burnout was first proposed by the clinical psychologist [Freudenberger \(1974\)](#) and the sociologist [Maslach \(1976\)](#) in the 1970s. They attributed this phenomenon to excessive workloads and the excessive consumption of individual resources available to those engaged in public social service jobs. In this environment, a set of negative changes in attitude and behavior is formed centering on the exhaustion of the employee. The excessive consumption, which is caused by various factors, including production output stress and high work demands, can cause

severe damage to the individuals and the organization ([Ampon-sah-Tawiah et al., 2013](#); [Yu and Chen, 2013](#)). The high rate of job burnout in special occupational areas is the reason that it can cause extensive concern. Researchers have demonstrated that there is a high rate of job burnout among nurses, teachers, police, and others. These occupations demand an excessive level of emotional involvement and energy of many of those engaged in this work. However, this is not a characteristic shared by all group members. Even in these high-occurrence occupational areas, the burnout rate of 25% was considered to be high. [Friedman and Farber \(1992\)](#) found a burnout rate of 5–20% for teachers; [Mateen and Dorji \(2009\)](#) found the rate was about 25% for doctors and other nursing staff; and [Li \(2005\)](#) found the rate was 7.3% for the police.

For a long time the personnel in charge of safety supervision in Chinese coal mine enterprises have generally had the following

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psychological problems: (1) high anxiety and exhaustion due to the uncertainty of their safety supervision performance; (2) a passive work style, a tendency to complain, and a feeling of indignation about their work; (3) a feeling of powerlessness when dealing with work behaviors that are prejudicial to safety; (4) a negative evaluation of their own performance in safety supervision. These negative attitudes are similar to the connotations of job burnout in organizational behavior studies but the job characteristics and the burnout detection rates are quite different to those seen in the existing research. According to a survey of 432 safety supervision personnel in typical coal mine enterprises, the detected rate of job burnout symptoms, including exhaustion, work alienation, and low group efficacy, reached 77%. However, more than 77.8% of safety supervision personnel held a positive evaluation on self-cognition, which implied that the condition of endogenous disease acting on individual psychology and physiological mechanisms did not occur. This is obviously different from the job burnout that occurs in the traditional research objects and it is difficult to explain it with the summation that “individual characteristic fails to match job demands”. Chen et al. (2012) reformulated three antecedents of job burnout, which comprised the characteristics of the organization, the work, and the individuals, and these provided a clearer explanation of the root cause of job burnout.

What kind of job burnout is this? What is the root cause of this kind of job burnout? These issues are discussed in this paper. For the convenience of discussion, we call it commonly-suffered job burnout. Commonly-suffered job burnout reflects the sustained low efficiency of coal mine safety management and safety supervision personnel's inability to work in Chinese coal mine safety supervision. It hinders the performance of coal mine safety management and has a significant negative impact on the work development and mental health of safety supervision personnel. However, job burnout has not been explored in previous research. Thus, the study of this issue can supplement the theories related to burnout and has important practical significance by substantially enhancing the level of Chinese coal mine safety supervision as well as achieving long-term safety production.

2. Methodology

2.1. Mechanism analysis

2.1.1. The special attributes of coal mine safety output

(1) The integrated output attribute of coal mine safety
Coal mine production is usually carried out underground. It has special operating conditions, complex and enclosed operating systems, and distributed and interconnected operating areas. There are various factors that would cause coal mine accidents; for example, gas and coal dust. Any violation of safety procedures by operating staff may cause an accident resulting in a large number of casualties and a system crash, therefore the safety output of a coal mine depends on safe behavior choices made by all the subjects in the production system. The safety output relationship of each system subject has the characteristic of a chain – if one link is invalid it will result in a sharp drop in the safety level and it may even drop to zero. Therefore, in contrast to traditional economic output, coal mine safety is an indivisible output task shared by multiple subjects. It is also an integrated output that depends on the result of safe behavior choices made by all the subjects. This means that coal mine safety is the result of consistent and stable choices of safe behavior that are made by all the behavioral subjects in the system. Safety output has the

characteristic of a simultaneous contribution from all the subjects, and coal mine safety is presented in a form of system state. An underground gas explosion in a coal mine is an example of this: due to the disorder of the ventilation management system,¹ which leads to insufficient air volume in the underground production area, the consequent gas accumulation cannot be detected by the alarm system in a timely manner² so the gas reaches its explosion concentration limit and meets open fire,³ thereby finally precipitating a gas explosion. Any unsafe behavior of a subject in the entire system may lead to accidents and affect the safe state of the system.

(2) The conditional output attribute of coal mine safety
Under the current social economic development structure, coal mine enterprises have the dual goals of economic efficiency and security. These two goals correspond with the raw coal output and the safety output. Raw coal output is the fundamental target output of these enterprises and safety output is an essential condition to achieve the fundamental target. We call the safety output a conditional output. On the one hand, the target output (raw coal output) and conditional output (safety output) are interdependent. On the other hand, there is a competitive relationship in the allocation of resources. First of all, the safety output and raw coal output are interdependent. Accidents can happen easily because of the natural hazards of coal production. Once an accident occurs, it will cause casualties, equipment damage, and wastage of resources. It will inevitably bring huge economic losses to the enterprise, which is against the goal of pursuing optimal economic benefit for the enterprise. Therefore, the coal mine enterprise will invest resources to obtain a basic safety output. The safety output at this level is the condition that the raw coal output of the enterprise must satisfy and it is characterized by a significant economic issue; that is, in order to achieve the goal of optimal economic benefit, income should exceed the cost of investment otherwise the enterprise will automatically adjust the safety input. Secondly, there is a competitive relationship between the safety output and raw coal output in the allocation of resources. In fact, the more resources (including economic resources, human resources, and time resources) that are invested in safety initiatives the less resources that are able to be invested in raw coal output, which leads to a contradictory relationship between the two types of output under the given production technical level. In conclusion, the safety output is a conditional output of coal mine enterprises. This determines that if there is no external pressure, safety will always be in a subordinate position when coal mine enterprises weigh production and safety goals under this condition.

(3) The public goods attribute of coal mine safety

Samuelson (1954) was the first to study the theory of public goods in the modern economy. He considered public goods as

¹ Probably because of management failures by decision-makers, such as permitting production beyond the capacity of the ventilation system; ventilation system chaos; management failures in the ventilation management department, such as operating local ventilation fans arbitrarily or neglecting to repair air duct leakages; working contrary to regulations in the ventilation department, such as failing to execute an anemometric program or falsifying data.

² Probably because of operational violations by operating personnel, such as not moving a gas probe in time or violation of operational procedures by gas inspectors, such as being absent when checking is due or failing to evacuate people in time when the gas exceeds the permitted level.

³ Probably because of electromechanical management failures, such as the electrical equipment lacking an explosion-resistant capability or exposed cable joints; procedural violations by operating personnel, such as illegal blasting, smoking, or removing miners' lamps.

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