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Psychological Training of Miners: How Training Reduces Stress and Increases Attentiveness in the Workplace

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Abstract

Mining is one of the most hazardous industries, where workers are regularly exposed to physical danger, psychological pressure, and cognitively demanding tasks. This article examines the role of psychological training in improving miners' occupational safety, with particular attention to stress reduction and increased attentiveness in the workplace. The paper argues that, alongside conventional safety instruction, psychological preparedness is essential for effective performance in high-risk mining environments. It discusses how psychological training helps miners manage anxiety, maintain concentration, strengthen decision-making, and respond more effectively during emergencies. Special attention is given to new workers, who often face heightened stress when adapting to underground conditions and complex safety procedures. The study also shows that training methods such as stress management, simulation exercises, mindfulness techniques, and guided cognitive preparation can enhance mental resilience and reduce the likelihood of human error. Overall, psychological training is presented as an important component of occupational safety systems in mining, contributing not only to worker well-being but also to higher levels of safety, attentiveness, and productivity.

Keywords

Psychological Training, Occupational Safety, Stress Reduction, Emergency Preparedness, Workplace Safety

1. Introduction

The mining sector, especially underground mining, ranks among the most demanding professions in the working environment worldwide. Miners work under

extreme conditions, such as the constant danger of mine collapse, entrapment in mine fires or explosions caused by flammable gases, frequent exposure to poisonous gases, and physically strenuous tasks. In addition to these physical hazards, miners also face significant mental stress because they often work in confined, dark, and high-pressure underground environments. Mining therefore requires both physical endurance and psychological resilience, as workers must remain alert to multiple hidden risks inherent in the industry.

In this article, psychological training is understood as a structured set of methods aimed at helping miners manage stress, regulate emotional responses, maintain focus, and perform effectively in hazardous conditions. Psychological preparedness refers to a miner's mental and emotional readiness to cope with everyday risks and emergency situations in the mining environment. Attentiveness is defined as the ability to sustain concentration, recognize hazards, monitor the work environment, and respond appropriately to changing conditions.

For these reasons, occupational safety and health have become essential aspects of mining operations. Safety training plays a key role in reducing work-related accidents and incidents and in improving miners' ability to respond effectively to emergency situations. However, an equally important dimension is psychological training, which focuses on reducing stress and improving attentiveness. This paper argues that psychological training can significantly reduce miners' stress levels and improve their attentional performance, thereby enhancing workplace safety and productivity.

2. Importance of Occupational Safety Training in Mining

Training is essential in mining because workers are exposed to daily risks in their working environment (Amponsah-Tawiah & Mensah, 2016). Additional standards relevant to mining are governed by the Mine Safety and Health Act of 1977. These standards are intended to reduce fatal incidents and protect miners' lives through hazard identification, emergency planning, and the use of protective equipment (Rudakov, 2021). Compliance with such standards is critical for minimizing risks to employees and promoting a safe working environment (Labor, 2024).

Occupational safety training is built on knowledge, practical skills, and preventive measures. Hands-on instruction is especially important because it helps miners develop the competencies needed in a dangerous industry (Casey et al., 2021). Training commonly covers hazard recognition, toxic gas management, blasting procedures, machine operation, equipment inspection, signaling systems, evacuation planning, and mock escape drills (Kowalski-Trakofler & Vaught, 2012). These practical skills empower miners to perform their duties with greater safety awareness and significantly reduce the likelihood of accidents.

Research consistently shows that occupational safety training reduces workplace accidents, particularly in high-risk industries such as mining. Studies have identified a direct relationship between comprehensive safety education and lower rates of

work-related injuries and fatalities (Dyreborg et al., 2022). Mining operations that invest more heavily in effective safety programs tend to experience fewer accidents than those that pay less attention to training (Zhang et al., 2020). Therefore, safety training is not only necessary for protecting workers but also beneficial for operational efficiency and productivity across mining subsectors (Wang et al., 2022).

Recent evidence derived from reviews provides a more extensive foundation for these arguments. In a narrative review of mental health interventions in the mining industry, Asare-Doku et al. (2020) concluded that workplace mental health programs in mining remain limited but are increasingly necessary, and that organisational support, supervisor involvement, and work-design changes should be strengthened. Moreover, Derdowski and Mathisen's (2023) systematic review of psychosocial factors and safety in high-risk industries provides preliminary evidence for a link between psychosocial work factors and stress-related states with unsafe behaviour and safety outcomes. The consensus of these reviews is that psychological training should be regarded as an integral component of occupational safety systems, rather than as a standalone initiative focused on well-being.

3. Psychological Preparedness in Emergency Situations

3.1. Psychological Demands of the Mining Environment

Mining activities involve excavation, blasting, and underground movement in high-risk settings, all of which place considerable physical and psychological demands on workers. Underground mining is associated with confinement, poor lighting, limited escape routes, exposure to machinery, and the possibility of explosions or entrapment (Han et al., 2021). These conditions create a uniquely hazardous workplace in which miners must remain constantly vigilant.

The psychological effects of such an environment can be substantial. Miners may experience claustrophobia, anxiety, and chronic stress due to isolation, danger, and the technical demands of the work (Bowers et al., 2018). These stressors can impair mental health and reduce decision-making capacity during emergencies, thereby increasing the probability of incidents (Yu & Li, 2020). As a result, mining requires not only technical competence but also psychological readiness.

3.2. The Role of Psychological Training in Emergency Response

Psychological training has increasingly become an important element of safety preparation for miners working in hazardous conditions (Paul & Maiti, 2007). Its purpose is to improve stress management, concentration, and decision-making during critical events. One key method is the use of realistic simulation exercises that expose workers to controlled emergency scenarios resembling gas leaks, equipment failures, or evacuation situations (Pedram, 2021). These exercises help miners practice their responses under pressure and improve their confidence in dealing with emergencies.

In addition, psychological training often includes coaching and stress management techniques designed to reduce anxiety and strengthen cognitive prepared-

ness. Mindfulness practices, breathing exercises, and cognitive control strategies can help miners recognize stress symptoms and regulate their reactions more effectively. Such techniques may reduce panic and improve performance in hazardous situations (Health, 2023).

3.3. Outcomes of Psychological Preparedness

Psychological preparedness has been shown to improve emergency management in high-risk occupations, including mining. Studies suggest that programs aimed at building mental resilience and stress-coping abilities contribute to faster reaction times and better decision-making during crises (Jonker et al., 2020). Miners who receive psychological training are often better able to assess dangerous situations, identify safe evacuation routes, and make timely decisions that help prevent escalation of accidents (Shimaponda-Nawa, 2024).

By reducing confusion, panic, and stress-related errors, psychological preparedness enhances both safety and organizational resilience. Companies that integrate psychological components into their safety standards are therefore more likely to develop workforces that are capable of responding effectively to emergencies and maintaining performance under pressure (Onifade, 2021).

4. Relevance of Psychological Training for New Workers

4.1. Adjustment Challenges for New Employees

Adapting to work in the mining industry is especially difficult for new employees. Unlike many other occupations, mining requires workers to adjust rapidly to physically dangerous and psychologically demanding conditions, including confined underground spaces, unstable rock formations, toxic fumes, and heavy machinery (Iyanda et al., 2024). For inexperienced workers, these unfamiliar conditions may feel overwhelming and can negatively affect attention, confidence, and compliance with safety rules.

New employees are also less familiar with mining procedures and emergency responses. Combined with pressure to perform effectively, this lack of familiarity can increase stress levels and make mistakes more likely. These realities highlight the importance of targeted psychological support during the early stages of miners' careers.

4.2. Psychological Training as a Support Mechanism for New Workers

Psychological training is particularly valuable for helping new workers adapt to the demands of the mining environment. Such programs focus on the emotional and cognitive stressors associated with mining work and provide employees with tools for stress management, concentration, and resilience (Asare-Doku et al., 2022). Common elements include stress reduction strategies, emotional regulation techniques, and cognitive reframing methods specifically adapted to the mining context.

Mentoring is another important part of psychological support. Experienced miners can guide new workers by sharing practical knowledge, offering emotional encouragement, and helping them manage the stress associated with entering a high-risk occupation (Rogers et al., 2019). In addition, continuous workshops and refresher training allow new miners to strengthen their coping skills over time. This ongoing support not only eases the transition into mining work but also contributes to long-term safety awareness and psychological stability.

New workers should be considered a distinct group within the mining workforce because their needs during the early stages of employment differ from those of more experienced miners. Research indicates that lower levels of job and industry experience are associated with weaker hazard recognition, lower self-escape confidence, and reduced safety compliance, which helps explain why newly employed workers may be more vulnerable in high-risk mining environments (Haas et al., 2019). In addition, recent research on workplace learning in mining shows that formal early-stage training is especially important for providing site orientation, safety procedures, and task-specific foundations, while mentoring plays a central role in developing the knowledge, awareness, confidence, and work practices of novice operators (MacMaho et al., 2024). The same study also warns against informal arrangements in which inexperienced workers are mentored by only slightly more experienced peers, suggesting that onboarding and mentoring for new miners should be structured, deliberate, and supported by experienced personnel rather than left to chance (MacMaho et al., 2024). For this reason, the discussion of new workers should be distinguished from that of the general workforce: in their case, psychological training is most effective when combined with structured onboarding, guided site adaptation, and high-quality mentoring during the early career period.

5. Training as a Means to Reduce Stress and Increase Attentiveness

5.1. The Relationship between Stress and Workplace Safety

Stress plays a central role in workplace safety, especially in hazardous industries such as mining. High stress levels can impair alertness, concentration, and cognitive processing, making it more difficult for workers to assess risks accurately and respond quickly. In mining, where decisions often must be made under time pressure, stress-related impairment can have serious consequences. Yong et al. (2020) note that occupational stress can overload miners' cognitive capacities, weaken concentration, and slow reaction times.

The relationship between stress and unsafe behavior can be explained through its effects on cognitive functioning. When miners experience high levels of stress, a greater share of their mental resources is directed toward managing anxiety, fear, or fatigue rather than toward monitoring the work environment. As a result, attentiveness may decline, warning signals may be missed, and decision-making may become slower or less accurate. In high-risk mining settings, these stress-

related cognitive disruptions can increase the likelihood of unsafe behavior, procedural violations, and human error.

Lower vigilance can result in overlooked warning signs, delayed responses, and critical operational mistakes. For example, Li et al. (2014) found that stress-induced fatigue contributed to failures in recognizing early indicators of equipment malfunction and other dangerous conditions. These findings show that effective stress management is essential for maintaining high attentiveness and safe performance in mining operations.

5.2. Psychological Training Methods for Stress Reduction

To reduce workplace stress, different training approaches have been developed for miners. Many of these programs aim to help workers identify stress symptoms early and respond to them before performance declines. One common strategy is mindfulness-based training, which encourages workers to become more aware of their thoughts, emotions, and bodily reactions under pressure. Breathing exercises and progressive muscle relaxation are also used to reduce tension and restore calmness.

Another important approach involves cognitive-behavioral techniques, which help miners challenge negative thought patterns and develop more adaptive responses to difficult situations. These interventions may be delivered through workshops, scenario-based exercises, and follow-up support sessions. When implemented regularly, such stress management programs can reduce emotional overload and decrease the risk of mistakes and accidents caused by stress.

Different psychological training methods serve different purposes and should not be treated as interchangeable. Mindfulness practices and breathing techniques are especially useful for managing everyday anxiety, emotional tension, and routine work-related stress, as they help miners remain calm and maintain attentiveness during regular operations. Simulation exercises are particularly effective for preparing workers to respond to emergency situations, since they strengthen rapid decision-making, situational awareness, and behavioral control under pressure. Cognitive-behavioral approaches are valuable in both contexts because they help miners identify unhelpful thought patterns, regulate fear, and develop more adaptive responses to risk. At the early stages of a mining career, training should place greater emphasis on stress reduction, emotional regulation, and guided adaptation to the work environment, whereas more experienced miners may benefit more from advanced simulation-based training and refresher programs focused on emergency judgment and sustained performance under pressure.

5.3. Attentiveness as a Safety Outcome of Training

A major benefit of psychological training is improved attentiveness. When miners are better able to regulate stress, they are more likely to maintain concentration, detect hazards, and act appropriately in complex environments. Increased attentiveness supports better monitoring of equipment, stronger compliance with

safety procedures, and more accurate responses to changes in working conditions.

In this sense, attentiveness is not merely an individual cognitive skill but an operational safety outcome shaped by training and preparedness. By improving mental focus and reducing stress-related distraction, psychological training contributes directly to safer behavior and more efficient work performance in the mining sector.

5.4. Sustainability of Training Effects

The effectiveness of psychological training should be assessed not only in terms of its immediate outcomes but also in relation to the durability of those outcomes over time. Although interventions such as mindfulness practice, breathing regulation, and simulation-based training may produce short-term improvements in stress management and attentiveness, these effects may decline if they are not reinforced through regular application and follow-up training. This issue is particularly relevant in mining, where employees operate under continuous psychological pressure and in environments characterized by changing risks and high cognitive demands.

Accordingly, psychological training should be understood as an ongoing rather than a one-time intervention. Booster sessions, refresher training, and repeated practical exercises are likely to play an important role in preserving attentional control, strengthening stress-coping capacity, and maintaining psychological preparedness. Embedding these follow-up components within occupational safety systems can enhance the long-term effectiveness of training and help ensure that improvements in worker performance are sustained over time.

Empirical evidence also supports the effectiveness of psychological and training-based interventions in mining. In a controlled intervention study involving 96 mine employees, a 16-hour soft-skills training program focused on communication, teamwork, self-management, and conflict resolution produced a significant reduction in work-related stress and general health problems. In the intervention group, the modified Occupational Stress Indicator decreased from 94.43 to 68.75, while GHQ-28 scores improved from 17.52 to 12.89, and these positive effects were still evident three months later (Molek-Winiarska & Kawka, 2024). In another randomized study of 66 mine employees, a 40-hour mindfulness-based stress reduction program significantly increased decision latitude and perceived supervisor and coworker support, while also reducing anxiety and depression symptoms (Molek-Winiarska & Żołnierczyk-Zreda, 2018). Although these studies did not assess attentiveness directly, the observed improvements in stress-related symptoms, perceived control, and psychosocial support provide empirical support for the claim that psychological training can strengthen miners' capacity to function more safely and effectively in high-risk work environments.

6. Conclusion

Psychological training plays a significant role in reducing stress and increasing

attentiveness among miners, thereby improving both safety and efficiency in one of the world's most demanding industries. Alongside conventional occupational safety instruction, psychological preparedness equips miners with the mental tools needed to manage anxiety, maintain concentration, and make better decisions in high-risk situations.

This is particularly important in emergency contexts and during the early adjustment period of new workers, who are especially vulnerable to stress and uncertainty. Techniques such as stress management training, simulation exercises, mindfulness, cognitive preparation, and mentoring can strengthen mental resilience and lower the likelihood of human error.

As mining continues to evolve, there is a growing need to integrate psychological training more fully into occupational safety systems. A stronger emphasis on both physical and psychological preparedness can help ensure that miners are better protected, more attentive, and more productive in their workplaces.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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