# ABSTRACT

## Occupational Fatigue, Cognitive Workload, and Safety Management in Coal Mining: A Systematic Literature Review

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Background: Coal mining involves continuous operations, heavy equipment, and demanding environmental conditions, where occupational fatigue and cognitive workload pose critical safety risks.

Objective: To synthesize published evidence on fatigue-related occupational exposures, real-time fatigue monitoring, and occupational health and safety (OHS) intervention strategies in coal mining.

Research Methods/ Implementation Methods: Following PRISMA 2020 guidance, a systematic literature review was conducted using ScienceDirect, identifying 69 eligible studies assessed via a five-criterion quality appraisal protocol.

Results: Among the 69 included studies, 56 investigated fatigue risk factors (RQ1), identifying 12-hour night shifts, circadian disruption, whole-body vibration, heat stress, and cognitive overload as primary triggers. Thirty-six studies evaluated monitoring technologies (RQ2), highlighting electroencephalography, eye-tracking, and in-cabin computer vision, with selected multimodal AI models achieving 88.1%–90.6% classification accuracy. Fifty-nine studies assessed OHS and ergonomic interventions (RQ3), reporting that active seat suspension reduced vertical vibration by ~50% and structured fatigue management recovered 2.6%–5.5% operator productivity in cited applications. These figures reflect individual study findings rather than pooled meta-analytic effects.

Conclusion/Lesson Learned: The evidence highlights the value of integrating real-time monitoring, ergonomic controls, and organizational fatigue risk management in coal mining, though future research should validate cyber-physical approaches across varied field conditions.

Keyword : coal mining; occupational fatigue; cognitive workload; fatigue risk management; whole-body vibration; safety monitoring

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