Literatur Review

EFFECTS OF SLEEP ON WORKER HEALTH: RECENT DEVELOPMENTS AND OCCUPATIONAL HEALTH IMPLICATIONS

PENGARUH TIDUR TERHADAP KESEHATAN PEKERJA: PERKEMBANGAN TERKINI DAN IMPLIKASI KESEHATAN KERJA

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ABSTRAK

Latar Belakang: Tidur merupakan kebutuhan fundamental yang berdampak pada produktivitas dan kesehatan pekerja secara keseluruhan. Penelitian terbaru menunjukkan bahwa kuantitas dan kualitas tidur memiliki dampak signifikan terhadap berbagai aspek kesehatan pekerja, termasuk fungsi kognitif, kesehatan kardiovaskular, dan metabolisme. Artikel ini mengintegrasikan temuan terbaru mengenai mekanisme biologis, faktor risiko okupasional, dan strategi intervensi untuk meningkatkan kesehatan tidur pekerja. Sebagai kesimpulan, manajemen tidur yang optimal merupakan komponen kritis dari program kesehatan kerja yang terintegrasi.
Metode: Pendekatan tinjauan sistematis pada basis data akademik utama, termasuk PubMed, Scopus, Web of Science, dan Google Scholar. Pencarian dilakukan dengan menggunakan kombinasi kata kunci berikut: "sleep health workers", "sleep deprivation occupational", "sleep quality workers", "shift work sleep", "sleep duration cardiovascular disease workers", "sleep fatigue workplace", dan "sleep productivity workers".
Hasil: Gangguan tidur memengaruhi 30–37% pekerja, yang sebagian besar disebabkan oleh jam kerja panjang, kelelahan akibat pekerjaan (burnout), dan bahaya fisik di tempat kerja. Gangguan ini menyebabkan defisit kognitif yang parah dan secara signifikan meningkatkan risiko kardiovaskular serta metabolik melalui jalur biologis dan psikologis yang kompleks. Penerapan intervensi individual dan organisasi yang terarah, seperti terapi kognitif perilaku untuk insomnia berbasis digital (digital CBT-I) dan adaptasi shift kerja, secara kritis memulihkan keselamatan, kesehatan, dan produktivitas pekerja sekaligus menghasilkan keuntungan ekonomi yang substansial.
Kesimpulan: Kualitas dan durasi tidur merupakan penentu kritis bagi kesehatan, keselamatan, dan produktivitas kerja. Mengingat tingginya prevalensi global gangguan tidur (30–56%) yang mendorong risiko kardiovaskular, metabolik, kesehatan mental, dan keselamatan melalui jalur biologis dan psikologis, intervensi di tempat kerja yang terarah sangat diperlukan untuk mengurangi dampak tersebut.

Kata kunci: tidur, pekerja, kesehatan kerja, produktivitas, gangguan tidur, durasi tidur, kualitas tidur

ABSTRACT

Background: Sleep is a fundamental need that impacts workers' productivity and overall health. Recent research shows that sleep quantity and quality have a significant impact on various aspects of workers' health, including cognitive function, cardiovascular health, and metabolism. This article integrates recent findings on biological mechanisms, occupational risk factors, and intervention strategies to improve workers' sleep health. In conclusion, optimal sleep management is a critical component of an integrated occupational health program.

Methods: Systematic review approach in major academic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search was conducted using a combination of the following keywords: "sleep health workers," "sleep deprivation occupational," "sleep quality workers," "shift work sleep," "sleep duration cardiovascular disease workers," "sleep fatigue workplace," and "sleep productivity workers.

Result: Sleep disorders affect 30–37% of workers, heavily driven by long hours, occupational burnout, and physical workplace hazards. These disturbances cause severe cognitive deficits and significantly elevate cardiovascular and metabolic risks through complex biological and psychological pathways. Implementing targeted individual and organizational interventions, such as digital CBT-I and shift adaptations, critically restores worker safety, health, and productivity while yielding substantial economic returns.

Conclusion: Sleep quality and duration are critical determinants of occupational health, safety, and productivity. Given the high global prevalence of sleep disorders (30–56%), which drive cardiovascular, metabolic, mental health, and safety risks through biological and psychological pathways, targeted workplace interventions are urgently required to mitigate these outcomes.

Keywords: *sleep, workers, occupational health, productivity, sleep disorders, sleep duration, sleep quality*

INTRODUCTION

Sleep is an essential biological process that occupies approximately one-third of human life and plays a crucial role in maintaining physical and mental health (Das, 2024). In the modern context, increasing work demands, irregular work shifts, and excessive use of technology have led to a significant decline in sleep quantity and quality among workers (Shimura, 2026). Global epidemiological research indicates that sleep disorders affect over 100 million workers worldwide, with substantial health and economic impacts (Amiri, 2021). Sleep deprivation is defined as a reduction in total sleep duration below a person's normal biological needs, which typically range from 7–9 hours per day for adults (Hardian, 2025). Modern workers often face challenges in achieving this sleep duration target due to various work-related factors, including long working hours, shift rotation, and high work intensity (Ikeda, 2025). A recent meta-analysis identified that approximately 38% of male workers and 32% of female workers experience work-related sleep disorders (Amiri, 2021). The health implications of sleep deprivation are broad and include decreased cognitive function, increased risk of cardiovascular disease, metabolic disorders, and an increased likelihood of work-related injuries [4]. Research shows that every one-hour reduction in optimal sleep duration is associated with a 20% increase in the risk of cardiovascular disease and a 25% increase in the risk of metabolic disorders (Chen, 2024). Considering the burden of disease posed by workplace sleep disturbances, a thorough understanding of the mechanisms, risk factors, and intervention strategies is crucial for public health and occupational health.

The purpose of this review article is to integrate recent developments in sleep research in working populations, identify the biological mechanisms underlying sleep's effects on health, and outline evidence-based intervention strategies that can be implemented in the workplace. The review will also explore individual variability and sociodemographic factors that influence the relationship between sleep and worker health.

METHODS

SEARCH STRATEGY AND STUDY SELECTION

This literature review used a systematic review approach in major academic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search was conducted using a combination of the following keywords: "sleep health workers," "sleep deprivation occupational," "sleep quality workers," "shift work sleep," "sleep duration cardiovascular disease workers," "sleep fatigue workplace," and "sleep productivity workers." No language restrictions were applied in the initial search phase, but articles were selected for review if they were available in English or could be accurately translated.

INCLUSION AND EXCLUSION CRITERIA

Studies were included in the review if they met the following criteria: (1) they involved a working population aged 18 years or older; (2) they evaluated sleep duration, sleep quality, or sleep disturbances using validated instruments such as the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), or polysomnography; (3) they assessed at least one health outcome, including cognitive function, cardiovascular disease, metabolic disorders, work productivity, or occupational safety; (4) used an observational (cross-sectional, case-control, cohort) or experimental (randomized controlled trial) study design; and (5) was published between 2015 and 2026 to ensure relevance to recent developments.

Studies were excluded if: (1) they involved non-working or retired populations; (2) they focused exclusively on sleep disorders such as sleep apnea without reference to general workers; (3) they used cross-sectional methodology with a sample size of fewer than 50 participants; and (4) they did not provide quantitative data on the association between sleep and health outcomes.

DATA ANALYSIS STRATEGY

Data from included studies were systematically extracted, including population characteristics, sleep measurement methods, measured health outcomes, and key findings. High methodological heterogeneity among studies prevented formal meta-analysis; instead, descriptive and narrative analyses were used to synthesize the findings. Biological mechanisms, intermediary pathways (mediators), and moderating elements were identified and grouped based on construct similarities.

RESULTS

Prevalence of Sleep Disorders in Workers

Global Epidemiology of Sleep Disorders

A meta-analysis involving 48 research articles from various global industries showed that the prevalence of sleep disorders in industrial workers reached 30% with a 95% confidence interval [3]. Further breakdown revealed the prevalence of poor sleep quality at 36%, insomnia at 22%,

sleep duration less than 7 hours at 37%, snoring at 29%, and excessive daytime sleepiness at 10% [3]. Stratified analysis by gender showed a higher prevalence in male workers (38%) compared to female workers (32%), although this difference varied by industry type and geographic region. A prospective cohort study of 6,855 workers in Japan showed that the transition to telework during the COVID-19 pandemic resulted in paradoxical changes in sleep patterns: despite increased overall sleep duration, sleep disturbances remained high due to a sleep schedule delay of an average of 72 minutes [2]. This phenomenon illustrates that increased sleep duration does not always translate into improved sleep quality or reduced sleep disturbances.

Factors Associated with Workplace Sleep Disturbances

A cross-sectional study of 29,213 Korean workers showed that all physical workplace risk factors including vibration, noise, and extreme temperatures were associated with sleep disturbances in a significant dose-response relationship (Park, 2022). Exposure to severe noise was associated with an odds ratio of 2.52 for male workers and 3.52 for female workers (Park, 2022). A study of 1,617 oil workers in China identified occupational burnout as a significant predictor of poor sleep quality, with an odds ratio of 1.611 (95% CI: 1.291-2.010) (Gui, 2026). Furthermore, anxiety was identified as a significant mediator explaining 33.08% of the total association between burnout and sleep quality. A longitudinal study of 98 workers in Japan revealed that long working hours (>12 hours per day) were significantly associated with increased fatigue, decreased total sleep time (TST), and increased systolic blood pressure (Ikeda, 2025). Categorical analysis showed that working more than 13 hours significantly reduced TST compared to working 9 hours or less.2. The Impact of Sleep on Cognitive Function and Work Productivity.

Effects of Sleep Deprivation on Cognitive Performance

Sleep deprivation has a measurable impact on various domains of cognitive function. An experimental study of 54 participants undergoing 35 hours of continuous wakefulness showed that impairments in sustained attention (measured by the Psychomotor Vigilance Task) reached 33-52%, while impairments in executive function ranged from 45-49% (Yan, 2025). The phenomenon of "circadian rescue" suggests that cognitive performance partially improves in the afternoon or evening despite prolonged wakefulness, but this improvement does not fully compensate for the cognitive deficits induced by sleep deprivation (Yan, 2025). A meta-analysis of 39 studies involving 4,578 participants showed that sleep deprivation (either acute <6 hours or chronic <5-7 hours/night) results in moderate-to-large impairments in executive functioning, with an effect size of Hedges' g = -0.62 (95% CI) (Rajeev, 2025). Subdomain analysis revealed the greatest impairment in working memory (g = -0.71), followed by inhibitory control (g = -0.59) and cognitive flexibility (g = -0.49). These impairments have significant practical implications for jobs requiring complex decision-making or rapid problem-solving. A study of 22 distributed team members undergoing 62 hours of wakefulness in a laboratory setting showed a significant decline in cooperation and team dynamics after 21 hours of wakefulness, as well as a deterioration in team performance and team cohesion after 36 hours (Greer, 2025). These findings indicate that sleep deprivation affects not only individual performance but also collaborative work effectiveness, with important implications for organizations that rely on teamwork**.**

Sleep and Presenteeism

Presenteeism is a condition where employees are physically present at work but not functioning optimally has been shown to be strongly associated with sleep disturbances. An

ecological momentary assessment study of 2,899 office workers showed through path analysis that job stressors directly influence presenteeism, but this impact is partially mediated by sleep disturbance and psychological/physical stress responses (Furuichi. The developed model explained 32.2% of the variance in presenteeism, with sleep disturbance being a key pathway in the relationship between job stressors and presenteeism. Research on 212 correctional and transportation workers identified that precarious work schedules (characterized by long shifts, non-daytime hours, and high intensity) have indirect effects on fatigue and depressive symptoms through reduced sleep quantity (Dugan, 2022). Notably, schedule flexibility and sleep quality each served as significant moderators, with workers with greater schedule flexibility reporting more sleep hours, and workers with better sleep quality reporting lower fatigue and depressive symptoms. A randomized controlled trial showed that digital cognitive behavioral therapy for insomnia (dCBT-I) resulted in significant reductions in total work impairment of 16.5 percentage points compared to a sleep education control (Russell, 2026). Importantly, interventions targeting sleep improvement resulted in estimated annual productivity savings of $12,376 per employee, underscoring the economic value of sleep optimization in the workplace.

The Impact of Sleep on Cardiovascular and Metabolic Health Sleep Duration and Cardiovascular Disease

A meta-analysis involving nine cohort studies with a total of 564,287 participants from Africa, Europe, and Asia showed that short sleep duration was associated with a 1.20-fold increased risk of cardiovascular disease compared with adequate sleep duration (aHR = 1.20; 95% CI = 1.14 to 1.25) (Hidayat, 2025). Dose-response analysis revealed a nonlinear relationship between sleep duration and CVD risk, with a J-shaped curve indicating an increased risk at both extremes (short and long sleep). A prospective study of 7,905 participants aged ≥45 years from China showed that changes (transitions) in nighttime sleep duration and sleep quality have long-term health implications (Zhang, 2025). Compared with participants with consistently optimal nighttime sleep duration, those with consistently non-optimal duration had an incidence rate ratio (IRR) for CVD of 1.36 (95% CI: 1.15–1.61). The transition pattern from optimal to non-optimal or from non-optimal to optimal showed IRRs of 1.20 and 1.23, respectively, indicating that persistent exposure to poor sleep behavior is more harmful than transient disruptions. Data from the 2005-2020 National Health and Nutrition Examination Survey (NHANES) involving 13,002 participants showed gender-stratified associations between short sleep duration and CVD outcomes (6). In male workers, short sleep duration (<7 hours/day) was associated with increased odds of congestive heart failure (OR = 1.67), angina (OR = 1.66), stroke (OR = 1.55), and diabetes (OR = 1.15). In female workers, associations observed included angina (OR = 1.83), heart attack (OR = 1.63), and diabetes (OR = 1.32) with short sleep duration.

Sleep and Metabolic Syndrome

A cross-sectional study of 88,343 Spanish workers using multiple obesity indices—including Body Mass Index (BMI), waist-to-height ratio (WHtR), Clínica Universidad de Navarra Body Adiposity Estimator (CUN-BAE), and Metabolic Score for Visceral Fat (METS-VF)—identified that poor sleep quality was independently associated with higher odds of obesity across all indices (Valasco, 2026). The strongest association was observed for central obesity, with a WHtR OR of 1.58 (95% CI 1.48–1.69), with stronger associations in women. Restricted cubic spline models revealed a progressive dose-response relationship between increasing PSQI score and central obesity. A Mendelian randomization analysis in 33,270 Han Chinese individuals

showed that both short and long sleep durations are potential causal risk factors for metabolic syndrome (Lin, 2025). In observational analyses, the ORs for MetS with sleep durations <5 hours, 8–9 hours, and >9 hours (compared to 7 hours) were 1.23, 1.15, and 1.84, respectively. In MR analyses after multivariable adjustment, weighted genetic risk scores showed ORs of 1.55 for long sleep and 1.66 for short sleep, providing evidence for a causal relationship rather than a simple correlation. A longitudinal study of 6,462 Chinese participants aged ≥45 years revealed that baseline short sleep duration was independently associated with increased Cardiometabolic-Kidney-Metabolic (CKM) syndrome risk, with an adjusted OR = 1.148 (95% CI: 1.014–1.299) (Pan, 2025). Persistently abnormal sleep trajectories over a 2-year period further elevated the risk, with an OR = 1.259 (95% CI: 1.077–1.471). Causal mediation analysis showed that depressive symptoms partially mediated this association (attributable causal mediation effect = -0.002; P < 0.001), indicating a complex pathway between sleep, mental health, and cardiometabolic outcomes.

Biological Mechanisms Linking Sleep and Cardiometabolic Disease

A study of 98 Japanese workers showed that acute reductions in total sleep time (TST) were significantly associated with higher systolic blood pressure both before bedtime (β=0.76) and upon waking (β=0.76), as well as with greater fatigue (Ikeda, 2025). Categorical analysis revealed threshold effects, with working >13 hours significantly reducing TST, and sleeping <6 hours resulting in poorer vigilance outcomes and greater sleepiness. A cross-sectional study of 1,285 workers showed that noise-induced hearing loss (NIHL) significantly affected sleep quality with a coefficient of 0.263 (t=9.957, p<0.001) (Jo, 2024). Impactfully, a multi-group analysis revealed that workers who did not wear noise protection experienced more severe impacts on sleep quality compared to those who did, with statistically significant differences in sleep disorders (p=0.000).

Sleep, Shift Work, and Circadian Disruption

Shift Patterns and Sleep Disruption

A two-phase qualitative study of 85 shop floor workers in Mumbai using sleep diaries, actigraphy, the Epworth Sleepiness Scale, and the Pittsburgh Sleep Quality Index identified a compelling narrative that shift work fundamentally disrupts circadian rhythms, precipitating irregular sleep patterns, and chronic sleep deprivation (Das, 2024). Phase 2 qualitative interviews with 14 poorly sleeping workers, 4 plant managers, and family members revealed a significant decline in physical and psychological well-being. The framework developed in this study suggests targeted, evidence-based interventions to address sleep deprivation among shift workers. A systematic review and meta-analysis of 11 RCTs and non-RCTs involving 2,125 participants explored the effects of shift schedule adaptations (Hulsegge, 2023). Findings showed that forward versus backward rotation did not significantly affect sleep quality or off-shift duration but reduced sleepiness during shifts (MD -1.24 points, 95% CI -2.24 to -0.24). Faster versus slower shift rotation yielded low-certainty evidence of no difference in off-shift sleep quality, but very low-certainty evidence that faster rotation reduced off-shift sleep duration (SMD -0.26). Limiting shift duration to 16 hours in 80-hour workweeks yielded low-certainty evidence of increased off-shift sleep duration (SMD 0.50, translating to MD 0.73 hours more sleep per day) and moderate-certainty evidence of reduced sleepiness during shifts.

A prospective cohort study of 1,115 OSA patients demonstrated synergistic effects of combined short sleep duration (TST <6 hours/night) and metabolic syndrome on major adverse cardiovascular events (MACE) (Sun, 2026). During a median 42-month follow-up, MACE incidence demonstrated a significant ascending gradient across groups: Reference (7.5%), MetS

only (10.6%), SSD only (15.4%), and MetS-SSD (19.4%). Patients with both MetS and SSD showed significantly elevated MACE risk (HR = 3.014, 95% CI: 1.491-6.094, p = 0.002).

Chronotype and Social Jetlag

Mediation analysis on 3,917 wage workers explored the impact of chronotype on depressive symptoms and the mediating effects of sleep quality and sleep-related factors (Kim, 2023). Multiple logistic regression showed increased risk of depression in eveningness chronotype (OR: 2.96; 95% CI: 1.51, 5.86). Regarding mediation, the Insomnia Severity Index (ISI) mediated 28.44% of the association, the Pittsburgh Sleep Quality Index (PSQI) mediated 31.25%, and the Pre-Sleep Arousal Scale-Cognitive Score mediated 23.58%. Notably, social jetlag does not significantly mediate the relationship (percentage mediated = 0.75%). A study involving 26 male adults in a 24-hour sleep deprivation experiment revealed that individuals with higher morningness-eveningness questionnaire (MEQ) scores (stronger morning type tendency) showed inaccurate self-monitoring performance, particularly in the final quarter of the sleep deprivation experiment, due to overly optimistic predictions (Nishimura, 2025). These findings highlight the importance of considering individual chronotypes in workplace management, particularly in workplaces with irregular work timings and long working hours.

Sleep Management Interventions and Strategies

Non-Pharmacological Interventions

A cognitive behavioral intervention in 180 construction workers using a pragmatic non-randomized clinical trial design showed that long-term effects were reflected in the third measurement Epworth scores, with workers receiving the cognitive behavioral intervention showing reduced levels of sleepiness and fatigue (Araya, 2022). This intervention approach requires a multidisciplinary approach because the impact on sleep involves not only fatigue and sleep but also other health aspects such as hypertension, obesity, and metabolic problems frequently observed in construction workers. A study of 6,855 workers in Japan showed that securing morning light exposure and avoiding electronic displays in bed at night were powerful protective factors (Shimura, 2026). Participants who implemented these strategies did not show negative changes in sleep quality, and psychosomatic stress reactions and work productivity also improved under telework conditions. These findings underscore the importance of sleep hygiene measures, particularly light exposure management, in maintaining occupational health and productivity. A prevention review identified several non-pharmacological preventive measures for fatigue and insomnia in shift workers (Richter, 2016). Most recommendations include reducing shift scheduling, bright light exposure, napping, psychoeducation about sleep hygiene, and cognitive-behavioral measures. This review concluded that important coping strategies such as napping and bright light exposure have been investigated and generally approved, with some also providing good evidence of the efficacy of cognitive-behavioral techniques in the treatment of chronic primary and comorbid insomnia.

Workplace Interventions and Policy

Analysis of 88,343 Spanish workers showed that integrated workplace strategies promoting sleep hygiene, physical activity, and dietary quality can effectively reduce obesity risk (Valasco, 2026). Joint exposure analyses showed nearly fivefold higher odds of central obesity (OR 4.73, 95% CI 3.98–5.61) among workers with concurrent poor sleep, physical inactivity, and low Mediterranean diet adherence. Conversely, a composite healthy lifestyle score of 3 was associated

with 72–75% lower odds of BMI-obesity and high WHtR. The quality of work organization strongly impacts workers' psychological disorders and occupational stress, with stronger implications for female workers (Magnavita, 2024). Work justice was inversely associated with psychological disorders and absences from musculoskeletal disorders. Intrusive leadership and off-hours work were associated with occupational stress, workaholism, low sleep quality, anxiety, and depression, especially in women. These findings suggest that organizational-level interventions targeting work structure and management style can significantly improve sleep quality and mental health among workers.

DISCUSSION

Integration of Findings and Clinical Implications

Comprehensive evidence from this literature demonstrates that sleep is not only a biological need but also a critical determinant of occupational health and safety. Findings from over 100 studies analyzed in this review consistently demonstrate that poor sleep quality, short sleep duration (<7 hours/day), and long sleep duration (>8 hours/day) are all associated with an increased risk of adverse health outcomes among workers (Amiri, 2021; Chen, 2024; Hidayat, 2025). The mechanisms linking sleep disturbance to health outcomes involve multiple physiological pathways. Sleep deprivation induces persistent sympathetic nervous system activation, resulting in elevated blood pressure, increased heart rate variability indicating reduced vagal tone, and impaired glucose tolerance (Ikeda, 2025). Inflammatory markers such as C-reactive protein (CRP) and interleukin-6 elevate with sleep loss, potentially contributing to cardiovascular disease development (addo, 2024). Furthermore, sleep deprivation disrupts hormonal regulation, including dysregulation of leptin (appetite suppression hormone) and ghrelin (appetite stimulation hormone), which may contribute to weight gain and metabolic syndrome development (Pickering, 2006) From a cognitive-behavioral perspective, sleep disruption impairs executive function, attention, and decision-making through reduced prefrontal cortex activity, which contributes to decreased inhibitory control and increased risk-taking behavior (Hyndych, 2025). These impairments directly translate to increased workplace errors, safety incidents, and reduced productivity. Meta-analytic evidence quantifies the effect sizes of cognitive impairment: working memory impairment ranges from medium to large ($g = -0.71$), with practical implications for roles requiring sustained attention or complex problem-solving (Rajeev, 2025).

Mediating Pathways and Effect Modifiers

Mediation analyses from multiple studies reveal that the relationship between sleep disturbance and health outcomes is frequently mediated by intermediary factors. Anxiety is a prominent mediator between occupational burnout and poor sleep quality, explaining 33.08% of the total association (Gua, 2026). Depressive symptoms partially mediate the relationship between short sleep duration and cardiometabolic disease risk (Pan, 2025). Psychosomatic stress response is an important pathway between job stressors and presenteeism, which can be partially ameliorated through sleep improvement (Furuichi, 2020). Stratification analyses identify several effect modifiers that influence the strength of associations between sleep and health outcomes. Gender is an important modifier, with female workers consistently showing stronger associations between sleep disturbance and cardiovascular disease, metabolic syndrome, and mental health outcomes compared to male workers (Chen, 2020; Magnavita, 2024). Age also modifies associations, with stronger effects observed in adults aged 50 years and older (Cui, 2023).

Employment status and occupational category (blue-collar vs. white-collar) are associated with differential impacts of sleep disruption on health outcomes (Fattori, 2024; Wang, 2022).

Considerations for Specific Occupational Groups

Specific occupational populations demonstrate heightened vulnerability to sleep disruption and associated health consequences. Healthcare workers exposed to chronic occupational burnout and shift work exhibit particularly high rates of poor sleep quality and increased burnout risk with prolonged overtime, with an odds ratio of 3.14 for high personal burnout levels) (Chen, 2025) Construction workers exposed to occupational noise pollution exhibit a 61.40% prevalence of occupational fatigue and a 29.82% prevalence of cognitive decline, with synergistic effects between noise exposure and insufficient sleep on cognitive decline [35]. Shift workers, particularly night-shift workers, experience fundamental circadian rhythm disruption that contributes to chronic sleep deprivation and associated health risks. Meta-analytic evidence shows that adapting shift schedules—particularly limiting shift duration to 16 hours in 80-hour workweeks—can improve sleep duration and reduce sleepiness (Hulsegge, 2023). Occupational populations engaged in hazardous environments (oil and gas workers, construction workers) show heightened vulnerability to combined exposures (sleep loss combined with physical hazards, noise, vibration) which synergistically increase the risk of accidents and injuries (Sathvik, 2024).

Implications for Occupational Health Policy and Interventions

The findings in this review support a comprehensive, multi-level approach to sleep health promotion in the workplace. Individual-level interventions include sleep hygiene education, light exposure optimization, and cognitive-behavioral therapy for insomnia, with a strong evidence-base for the efficacy of digital interventions in improving sleep and workplace productivity (Russell, 2026). Organizational-level interventions include schedule flexibility, reduced work hours, improved work organization quality, and leadership interventions targeting intrusive management practices (Dugan, 2022; Magnavita, 2024). Environmental modifications can effectively support better sleep outcomes. Securing morning light exposure and minimizing evening light (particularly from electronic devices) are powerful protective factors (Shimura, 2026). Noise control in the workplace can reduce sleep disturbance and improve health outcomes, with workers wearing noise protection showing significantly better sleep quality compared to non-protected workers (Jo, 2024). Occupational exposure to electromagnetic fields or magnetic fields in certain industrial settings also represents modifiable occupational exposures that can contribute to poor sleep quality (Rahimimoghadam, 2025). Integrated interventions combining multiple strategies show synergistic benefits. Joint exposure analyses show that combined healthy lifestyle interventions (sleep optimization, physical activity, and dietary quality) result in a greater risk reduction of metabolic syndrome compared with single interventions (Valasco, 2026). Healthcare systems and employers can achieve substantial economic benefits through sleep-focused interventions, with estimated annual productivity savings of $12,376 per employee with digital CBT-I implementation (Russell, 2026).

Gaps in Knowledge and Future Research Directions

Although a comprehensive literature is available, several gaps in knowledge remain. The majority of studies are observational, limiting causal inference. RCTs investigating specific occupational sleep interventions particularly adapted interventions for different occupational groups and shift work schedules remain limited. Mechanisms linking specific dimensions of sleep (sleep timing, sleep regularity, sleep efficiency) with specific health outcomes require further investigation, particularly using a multidimensional sleep health framework (St-Onge, 2025). Long-term longitudinal studies investigating stability versus change in sleep patterns and associated health consequences are needed to better understand the cumulative effects of chronic sleep disruption. Research investigating protective factors that might buffer the effects of short sleep including certain occupational cultures, social support systems, or individual resilience factors could inform targeted interventions for high-risk populations. Finally, implementation research examining the effectiveness of workplace sleep interventions in real-world occupational settings remains critically needed.

CONCLUSION

Recent developments in sleep research in working populations clearly demonstrate that sleep quality and duration are critical determinants of occupational health, safety, and productivity. The high prevalence of sleep disorders (30-56%) among global workers, combined with well-documented health consequences, underscores the urgency of addressing sleep health in occupational health programs. Comprehensive evidence indicates that the relationship between sleep and health outcomes involves multiple biological pathways—including sympathetic nervous system activation, inflammatory pathway dysregulation, hormonal imbalances, and cognitive function impairment—with clinical manifestations including cardiovascular disease, metabolic syndrome, poor mental health, and reduced workplace safety. Importantly, these associations are mediated by various factors, including anxiety, depressive symptoms, and psychosomatic stress responses, suggesting opportunities for targeted interventions at multiple points in the causal pathway.

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