

INDUSTRY WHITE PAPER:

MANAGING FATIGUE IN THE WORKPLACE

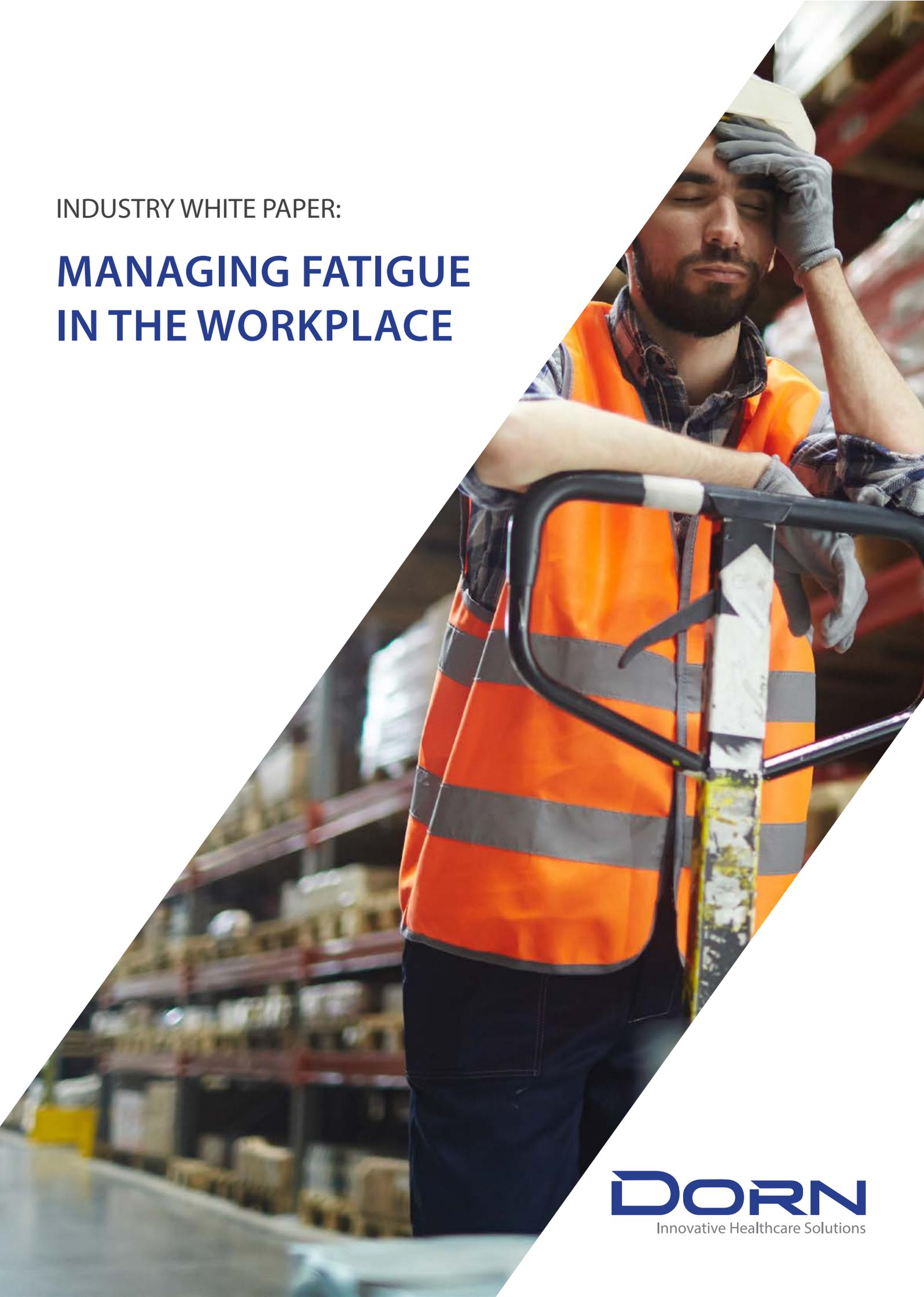


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ABSTRACT

More than a feeling of sleepiness or momentary exhaustion, fatigue is a persistent syndrome that results from the accumulation of many disparate factors. In the workplace, fatigue is an ever-looming issue, one that can limit worker productivity and, in many cases, lead to injury on the job. The causes of fatigue are myriad, some based in the job itself and some related to conditions outside the workplace—social and emotional factors are powerful obligations for humans, and when paired with an aggressive work schedule, unusual shift hours, repetitive labor, and extended mental and physical exertion, the results can be staggering.

For employers, this implies a host of costs both financial and organizational, with fatigue drawing billions of dollars from company budgets worldwide in direct costs and ancillary losses in productivity, morale, and overall operational flow. However, by utilizing a deep understanding of the topic and analysis of the workforce, organizations can help their employees achieve adequate rest, avoid fatigue-inducing work practices, and maintain healthy energy levels. With a holistic perspective, fatigue management can effectively reduce rates of injury and the surrounding costs for a healthier overall outlook.

INTRODUCTION

The modern workplace can be a busy place—whether workers are putting in extra hours or simply staying on top of their normal responsibilities, they're human, and they need rest in order to function. But for many, rest can be hard to come by. Fatigue grows out of a combination of factors, some of which arise as direct results of the job itself: repetitive tasks, unusual shift hours, or intense exertion, either mental or physical. Potentially even more powerful are the causes that exert their influence outside the workplace. Today's world is fast-paced and often stressful, even before considering the unique emotional and social pressures that each individual experiences. Unfortunately, when life presents challenges, the most common thing people sacrifice is their much-needed time for sleep, exercise, and good nutrition. The result is fatigue, either chronic or acute, a burden that makes workers vulnerable to injury—and both the individual and the organization alike must face the costs.

Fatigue is a global challenge, affecting manufacturers, service companies, municipalities, and other organizations at virtually every level. From the factory floor to the office suite, employees deal with the effects of fatigue while they manage their job responsibilities—it's a constant distraction, with an array of physical and mental symptoms that can keep workers from performing to their potential. For the worker, this implies a host of safety risks that can lead to injury, not to mention that fatigued workers are also more prone to other health problems, including chronic pain and discomfort that also diminish performance. For employers, the risks are manifold. Financially, the issue can place a major burden on organizations; in fact, costs related to fatigue have amassed to over \$77 billion per year in the United States ([Source](#)). On top of the claims and health care costs, employers must contend with increased absenteeism and reduced productivity among their workers. It is a complex problem with myriad causes, and since measuring the symptoms can be challenging, solutions often seem elusive. Consider the following facts about fatigue:

- The American Academy of Sleep Medicine states that adults should sleep for a minimum of seven hours per night. However, the National Institute for Occupational Safety and Health reports that up to 38 percent of the working population regularly falls short of that mark ([Source](#)).
- Fatigue's effects on the human body are similar to those of inebriation. In fact, spending 17 hours awake is roughly equivalent to a blood alcohol level of 0.05 ([Source](#)).

- Huge swaths of the population are prone to fatigue for health reasons. Fifteen to 20 percent of Americans suffer from a sleep disorder of some kind ([Source](#)).
- Up to 38 percent of workers report suffering from "low levels of energy, poor sleep or a feeling of fatigue," according to a study in the Journal of Environmental and Occupational Medicine ([Source](#)).
- Losses in productivity due to fatigue account for about \$2,000 per worker in costs to employers annually ([Source](#)).

The effects of fatigue vary by worker, making it a difficult problem to tackle from an organizational perspective. Fatigued workers are more easily distracted and prone to lapses in concentration, which can lead to slower work, reduced productivity, and in many cases, injury on the job. Likewise, anxiety and depression appear more frequently among individuals who are consistently tired at work, and the compounding effects of those and other health conditions can keep the employee out of work at an increasing rate. Additionally, fatigue diminishes motor skills and psychometric coordination, leading workers to make mistakes and put themselves at risk of injury.

So what can employers do to combat the fatigue problem? The answers lie in robust wellness and safety programs that take into account the worker's entire experience, from their time on the job to their lives outside of work. A successful solution requires an understanding of the workforce as a whole, along with consideration toward every type of worker and the unique challenges that contribute to their fatigue, including but not limited to environmental factors, workstation setup, and job design.

This white paper will delve into the physical and emotional factors that contribute to worker fatigue, and will examine the physical, cognitive, and social symptoms that often result. Likewise, we will explore the organizational consequences of a fatigued workforce, dissecting how fatigue influences operations at the human level and leads to significant financial costs on the part of employers. Lastly, we will discuss strategies for tackling the fatigue problem, from identifying the issue to implementing the various administrative, behavioral, and environmental changes that can lead to well-rested employees and a healthier financial outlook.

DEFINING FATIGUE

What is Fatigue?

Though a definition of fatigue may seem self-evident at first glance, it is far more than simply a feeling of tiredness. Instead, fatigue is a state of physical or mental exhaustion that results when an individual suffers from a lack or loss of sleep. The specific causes can be varied and differ by person, but generally speaking, **fatigue occurs when an individual performs extended periods of physical or mental exertion without taking time to rest, recover, and most importantly, sleep.** Likewise, fatigue is not defined merely by a transient feeling of drowsiness but rather by a reduction in performance. It includes impairment in cognition, response time, and attentiveness, and often results in any of the following symptoms:

- **Reduced motor skills and fine coordination:** Workers who perform skill-specific physical tasks may struggle to perform when fatigued; impaired muscle coordination often leads to mistakes or just plain failure of the body to perform the needed tasks.
- **Poor judgment:** Though a difficult symptom to quantify, workers who are fatigued can have difficulty with making decisions, either over long periods of time or in snap judgment situations when quick thought is required.
- **Impaired concentration:** When fatigued, workers can struggle to focus on their tasks, often leading to slow delivery times, a reduction in work quality, and more critical mistakes.
- **Poor communication:** Whether a worker is delivering crucial information or listening to instructions from a colleague or supervisor, fatigue can obstruct communication and lead not only to logistical problems and work errors, but also social tension and reduced morale.
- **Dysregulated emotional response:** Consistent tiredness and insufficient sleep can also affect a worker's emotional state. Anger, sadness, depression, and anxiety are all more common under a state of fatigue, and workers are often moody and prone to intense emotional swings when extremely exhausted.
- **Physical pain and discomfort:** Research has linked fatigue to headaches, dizziness, muscle pain, loss of appetite, impaired immune system function, blurred vision, even hallucinations.
- **Other health issues:** Chronic fatigue can contribute to serious health issues such as heart problems, hypertension, disorientation, and in extreme cases, dementia or death.



WHAT CAUSES FATIGUE?

Though fatigue is a recognized medical condition, the rather vague nature of the ailment can make it difficult to pinpoint specific causes. Still, research has identified a variety of factors that can contribute to workers experiencing fatigue on the job. **From previously existing medical conditions to work stressors, emotional factors, and lifestyle, there exists a wide range of catalysts that can lead to reduced performance at work.** However, when developing a long-term strategy for combating fatigue in the workplace, organizations must start at the very beginning of the fatigue cycle to address the root causes.

Where Fatigue Begins

To understand the origins of fatigue, it's essential to first examine how humans rest. Sleep is one of the most essential human functions, playing a role in many of the body's critical systems. Sleep helps the body heal tissue damage, repairing the heart and blood vessels. Likewise, the body relies on sleep to support the immune system, and sleep deficiencies can compromise the body's defenses against common ailments like colds, the flu, and other conditions that may lead to missed work time.

The human sleep cycle is based on **circadian rhythms**. These cycles, which usually last about 23-25 hours, determine the human body's need for sleep and contribute to a person's natural feelings of energy or tiredness throughout the day. On a more granular level, circadian rhythms are responsible for such regulating processes as brain wave activity, hormone production, and cell regeneration ([Source](#)). On a normal circadian rhythm, an individual typically experiences increased tiredness near the middle of the night (between 2:00 am and 4:00 am, usually) and just after the midday meal (between 1:00 pm and 3:00 pm). For most people, **this means that 7 hours is the minimum threshold under which symptoms of fatigue can begin to appear.** Even further, it is recommended that adults sleep for 8 hours per night, while children and adolescents should sleep for 9-10.

However, research shows that large portions of the general population and the workforce regularly fail to meet the 8-hour mark. More than one third of the general population (38 percent) in the United States sleeps for fewer than the recommended 7 hours per night, according to a 2016 report by the Centers for Disease Control and Prevention that splits sleep loss figures by ethnicity, location, and employment status ([Source](#)).

Why Aren't People Sleeping Enough?

Modern life continues to accelerate, and workers who spend at least eight hours per day at work are also likely to be busy dealing with daily responsibilities and family life. Work duties remain a major factor—a study conducted at the University of Pennsylvania in 2007 reports on the influence of work over sleep time: "Work time is the largest influence on how long an individual sleeps on both work and leisure days. The more hours worked the less sleep achieved" ([Source](#)). Specific issues related to work that contribute to fatigue include:

- **Extended work hours:** The United States Department of Labor defines an extended or unusual work shift as one that requires more weekly hours, more consecutive days of work, or additional work during the evening. Organizations often implement extended hours in order to maximize limited resources or to meet higher than usual demand. These changes in a worker's workload disrupt the individual's circadian rhythms and often result in loss of sleep hours ([Source](#)).
- **Early or late shifts:** When a worker's job requires them to begin work at an exceptionally early hour, their sleep patterns can suffer. Nearly one out of four adults (24%) reports having difficulty getting out of bed for work two or more work days per week—adding irregular shift hours exacerbates the problem.



“Individuals find it difficult to switch rapidly between day and night shifts. It’s common in Australia for workers to put in 12-hour shifts during the day for a week or two, and then switch to the night shift. But it’s difficult to make changes, too, because workers like having longer periods off. Timing matters: Day shifts shouldn’t start before 6 in the morning, and night shifts shouldn’t end too late in the day. Workers need quality time to recover.”

— DR. GEMMA PAECH,
Department of Sleep and Respiratory Medicine, John Hunter
Hospital, Newcastle, Australia

- **Job design:** The very nature of the employee’s job can infer greater risk for chronic fatigue upon the worker. Repetitive work has been shown to contribute to fatigue, especially when the work is physically demanding. The design and quality of a worker’s equipment can also be risk factors for fatigue—when a worker’s tools do not function properly or they require physical strain to operate, the worker’s performance often suffers. Further, ergonomic factors such as workstation design can place strain on the worker’s body, as can poor technique when executing tasks. This part of the problem is especially significant when taking into account the fact that repetitive work that leads to body stress can account for up to 40% of workplace injuries ([Source](#)).
- **Environmental factors:** The physical environment can also take a toll on workers. Excessively high or low temperatures can lead to fatigue as workers are forced to exert more energy to accomplish the same work, while abnormal temperatures also impact hydration and concentration. Workers whose tasks occur in noisy or low-light environments can also be more prone to fatigue.

“Humans are a diurnal species. People think that you can simply adjust to a night shift work schedule, but as a species, we simply can’t do that. We will always function better during the day, and we can never fully adapt to night work. Our physical and mental functioning will always be at its lowest during night time hours, particularly between 3 and 5 AM.”

— MIKE HARNETT,
Vice President Human Factors, Six Safety Systems

The Effects of Shift Work

Though fatigue affects workers in virtually every industry and circumstance, shift workers are among the most impacted people in the workforce. According to the US Bureau of Labor Statistics, about 15% of full-time employees work on shifts ([Source](#)). That amounts to some 22 million American workers on evening, swing, rotating, or on-call shifts. **Some of the most prominent workplace accidents of the past several decades can be attributed directly to fatigue among shift workers** who are on the job during irregular or extended hours for long periods of time. The Chernobyl nuclear power plant meltdown of April 1986 features as the most prominent example, along with the accidents at Three Mile Island (1979) and the wreck of the Exxon Valdez (1989), each of which occurred at exceptionally late hours when workers were fatigued.

These examples stand out as cautionary tales against the dangers of fatigue among shift workers, but the real issue is usually much more consistent and considerably less obvious. According to the National Safety Council, at least 62% of night shift workers complain about experiencing sleep loss, another signal of how irregular hours can disrupt circadian rhythms ([Source](#)). Across industries, shift workers face the most significant fatigue challenges of any part of the workforce, including equipment operators (58%), railroad workers (53%), plant operators (50%), food service employees (49%), [and nurses and medical aid staff \(43%\)](#). Moreover, shift workers are especially prone to injuries, and the risk of injury increases by 36% when a worker has committed to four or more consecutive nights of work.



Stratification of Workload

Workload may seem like a basic concept, but it’s a powerful determining factor in how employees experience fatigue. Defined simply as the amount of work an employee must perform in a given time, workload can be split into three categories for careful examination: physical load, environmental load, and mental load.

Physical Load	Mental Load	Environmental Load
Forceful exertion	Irregular work hours	Temperature
Awkward posture	Coworker relationships	Light
Repetitive movement	Job demands	Noise
	Decision autonomy	Vibration and humidity

Non-Work Factors in Fatigue

From an employer’s perspective, it may seem that the workplace alone is the primary cause of fatigue, or at least the sole factor that managers can influence with new programs and education. However, there are many influences outside the job site that can contribute to worker fatigue, including:

- **General health and fitness:** Workers who are in relatively poorer health are more likely to face fatigue on the job, as health issues can contribute to sleep loss and reduced energy at work. Likewise, up to 20% of workers are already at elevated risk because they suffer from a diagnosed sleep disorder such as sleep apnea or chronic insomnia.
- **Chronic pain:** [Workers who deal with pain](#) on a regular basis are more prone to experience fatigue that lessens their performance at work. Pain interferes with work at virtually every level, forcing employees to adjust to their physical limitations.
- **Emotional issues:** Factors such as relationship pressures, grief, anxiety, and depression can all contribute significantly to fatigue. Depression, for example, fuels fatigue in many individuals, and creates a vicious cycle in which a depressed person experiences fatigue, which can exacerbate depression and lead to further loss of sleep.
- **Age:** [Older or long-tenured workers](#) are more likely to experience changes in hormone regulation, along with other pre-existing medical conditions that may make them more prone to experiencing fatigue.
- **Sleep disturbances:** A worker’s sleep can be interrupted for many reasons; snoring, either one’s own or a partner’s, young children, and outside noise can disrupt rest patterns and lead to poor sleep quality.
- **Miscellaneous factors:** Outside these specific issues, there are many other factors that can cause or worsen a worker’s fatigue. Among them are the presence of a second job, excessively long commuting times, heavy social or family obligations, and a high level of after-work or community activities.

THE EFFECTS OF FATIGUE IN THE WORKPLACE

Regardless of industry, workers both in the United States and around the world are increasingly dealing with the consequences of fatigue. Both physical and psychological, these effects can diminish a worker's performance on the job **by inhibiting the worker's physical abilities or interfering with their capacity for critical thought.** Studies have shown that fatigue is consistently a factor in job performance for large portions of the workforce; one half (51%) of workers report that sleepiness on the job negatively affects their productivity.

Fatigue and Injury Rates

Fatigue takes an immediate and persistent toll on the worker's ability to function. A report by the International Labor Organization indicated that 68% of adults report that fatigue interferes with their ability to concentrate, while 66% relayed that they had more trouble dealing with stress when fatigued ([Source](#)).

These losses in performance ability come introduce new risk factors to the work environment. Research has shown that sleep loss is directly correlated with an increase in injury rates. Studies report that the average rate of injury per 100 workers who regularly sleep for seven to eight hours per night is 2.27. However, workers who habitually sleep for less than five hours per night are injured at a rate of 7.89 per 100 individuals.

Additionally, 32% of employers have reported injuries or near misses as a result of worker fatigue ([Source](#)).

Organizational Fallout of Fatigue

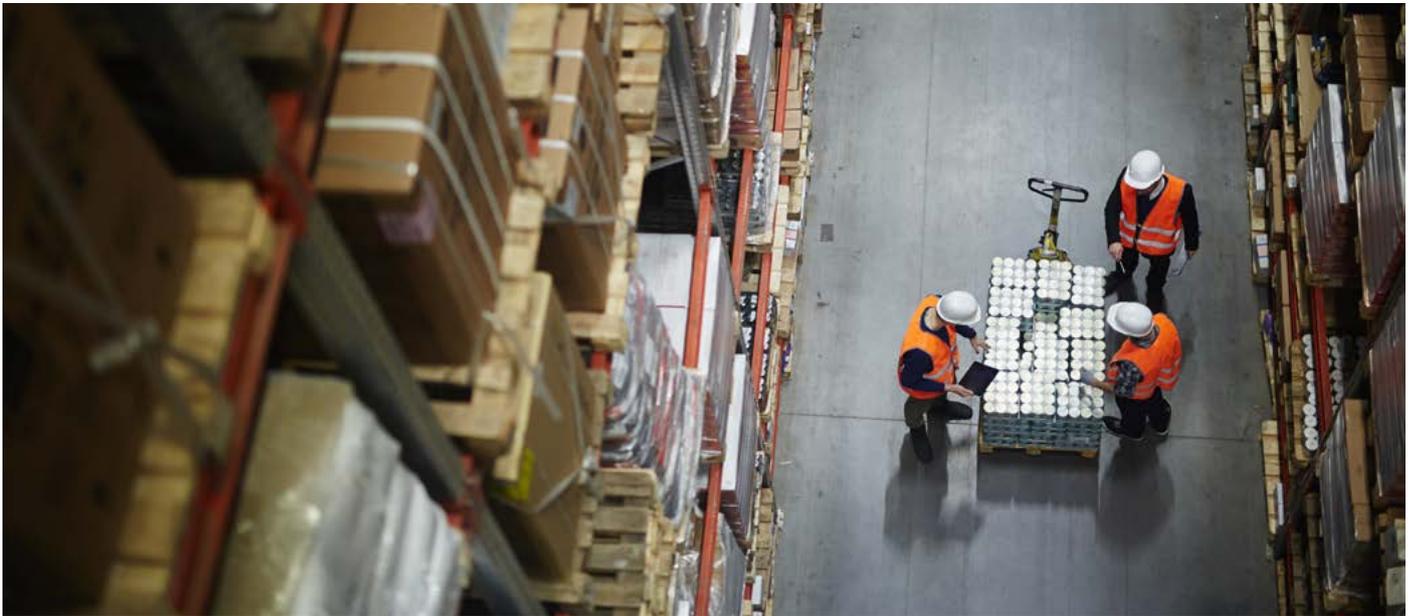
"Fatigue is a contributing factor in 70 percent of workplace incidents that result in a fatality."

— RAINENE MILLER,
DORN Vice President of Operations / Clinical Lead

Fatigue's significant impact on the individual worker implies a compounding effect on employers. As lasting fatigue becomes prevalent within an organization, injury rates escalate, leading to a variety of organizational consequences that can place financial and logistical burdens on employers.

A study from the National Safety Council indicates a number of startling facts about the prevalence of workplace fatigue. For one, 47% of employers have stated that they have experienced losses in productivity as a result of fatigue. Productivity is of central concern for employers looking to preserve their financial health; injury rates are already high (upwards of \$77 billion in injury costs nationwide per year from fatigue), and productivity losses alone account for another \$18 billion in costs each year ([Source](#)).





HOW EMPLOYERS CAN TACKLE FATIGUE

Preventing fatigue in the workplace can be a daunting task. Due to the nebulous nature of the condition, worker fatigue often goes unreported. Further, employees themselves are often unaware that their performance is being negatively impacted by fatigue, and those who do may not always be willing to admit that their fatigue causes struggles in the workplace. With those factors in mind, it is essential for employers **to take a proactive, holistic approach to fatigue management, one that includes preventative measures, education for workers, and supplementary solutions** that can mitigate the effects of fatigue in real time.

Identifying Fatigue Among Workers

As outlined, fatigue can be a challenging affliction to recognize. However, researchers have developed methods for identifying fatigue in the workplace that can be effective in helping employers define strategies for prevention.

- [Horne-Ostberg Questionnaire \(HOQ\)](#): This survey, comprised of 19 questions about sleep habits, aims to define an employee as either a “morning person” or a “night owl,” with the goal of helping employers better understand their employees. This data allows employers to assign shifts and work assignments according to best fit for their workers, alleviating some of the circadian rhythm disruption that leads to fatigue.
- [Symptom Distress Scale \(SDS\)](#): Another questionnaire, this tool consists of 13 queries that isolate specific

symptoms of fatigue, including pain, nausea, depression, and other common affects. By ranking symptoms on a five-point scale, the SDS provides employers with data on the severity of fatigue among their workers so that they can implement specific solutions.

- [Psychomotor Vigilance Task \(PVT\)](#): Also known as a psychomotor vigilance test, PVTs are designed to test for common symptoms of fatigue, specifically reaction time and neurological response. These basic tests are available for free online and have been used at the International Space Station to test astronauts.

A fatigue management program can't function effectively through prevention alone. You need an organizational culture that is fully bought in and committed to dealing with the fatigue problem—and the first step is acknowledging the organizational factors that contribute to fatigue.

— MIKE HARNETT,
Vice President Human Factors, Six Safety Systems

Fatigue Prevention

Fatigue is a multi-faceted problem, and therefore requires prevention strategies that examine the relationship between the worker, their job, and their life outside of work. However, employers can make progress against fatigue by targeting common root causes, the most prevalent of which is a disruption of the normal circadian rhythm. Strategies for preventing sleep loss include:

• **Implement work hours best practices:**

- Managers should work to understand their employees and apply scheduling practices that help workers perform at their best. Organizations that utilize a three-shift plan should consider moving to schedule night shifts after midnight so that workers can get more sleep. Shifts that begin before midnight interfere with the body's circadian rhythms and prevent quality sleep. Workers on this schedule sleep more and perform better.
- Limit overtime hours and avoid scheduling workers for late or unusually long shifts more than three days consecutively.
- Enforce minimums of twelve hours between shifts.
- For example, the airline industry has proven that stringent scheduling policies that limit consecutive long or irregular shifts can drastically reduce instances of fatigue on the job. Pilots are kept on tight schedules that provide time for quality sleep and are regularly checked for fatigue risk factors. Many trucking companies and organizations with a large contingent of drivers enforce similar scheduling rules and utilize technology to identify and predict fatigue while implementing strategies to combat it.

"A key to effective training is personalization. You have to lead the learner to take responsibility over their fatigue. This is important because the most influential factors in fatigue are non-work related. You can't manage other peoples' behavior—you can only lead people to do that for themselves, by offering the information they can relate to best."

—DR. LORI GUASTA,
Vice President of Consulting Services & Research, Predictive Safety SRP, Inc.

• **Provide education toward better sleep habits:**

Knowledge empowers workers to take charge of their health.

- Teach sleep hygiene, a system of guidelines that encourage quality rest that includes sleeping in total darkness, avoiding food and drink before sleep, avoiding alcohol and caffeine, and reducing screen time.
- Workers should avoid working or eating in bed, and should maintain a cool sleep environment, which helps regulate the body during rest.
- Humans need to maintain a neutral sleep debt in order to function well—if a worker misses three hours of sleep because of an early shift, they must

recover it in full before they are truly at normal rest levels.

- For example, one major insurance company implemented a wellness incentive that adds a significant monetary bonus at the end of each year if workers report and maintain quality sleep hours for themselves.
- Bring in experts to educate your employees on best practices and better self-care techniques. Many employers do this for smoking—why not for better sleep?

"It gives us a ray of hope when we see a 33% improvement in sleep patterns with the employees we work with."

— RAINENE MILLER,
DORN Vice President of Operations / Clinical Lead

• **Implement workplace health and fitness programs:**

Organizations can facilitate a more alert and productive workforce by incentivizing consistent health practices. Regular exercise and a balanced diet are essential elements of good sleep quality and have ancillary benefits of reducing the risk of other unrelated health problems. Likewise, pre-shift [stretching and mobility programs](#) and micro breaks can help mitigate the fatigue problem without introducing additional costs.

• **Address worker behaviors:** Not limited to factors within the worker's control, some behaviors and practices can exacerbate fatigue. [Perform work assessments](#) so that workers can be taught proper technique for their tasks and maintain their energy levels.

• **Assess environmental factors:** The workplace itself can contribute to fatigue. Employers should seek a risk assessment to eliminate hazards and risk factors in the environment. [An ergonomic review](#) can also highlight tools or techniques that require employees to exert more energy and recommend a solution.

"With ergonomics, we look at forceful exertion, awkward postures, repetitive movements, and physical load as risk factors. Those are controllable. Environment, temperature, noise—these are other things that we can also manage at the worksite. Overall, we're working to lessen the fatigue load and build on that through the culture of the worksite, coworker relationships, reducing stressors, and understanding the demands of the job."

— RAINENE MILLER,
DORN Vice President of Operations / Clinical Lead

Help from Technology

Along with adopting general best practices and a healthy workplace culture, employers can now **look to technology to help evaluate worker performance and check for signs of fatigue**. These strategies have already been used with success in the transportation and mining industries, and digital technology continues to present new opportunities for workforce improvement in all industries.

- **Drowsiness detection devices:** Optical technology can detect eye and eyelid movement to determine if a worker is feeling drowsy and alert the employee when dangerous levels of tiredness occur. Special glasses do this as a wearable solution, while dash-mounted devices have made progress in the transportation industry.
- **Predictive fatigue monitoring:** Organizations are now adopting devices that incorporate the workers' sleep pattern and circadian rhythm over the previous two weeks, combining with data from sleep questionnaires and alertness tests to calculate a worker's fatigue each day. If a worker begins a shift with a risk factor for fatigue present, the system predicts when the worker will face their most significant fatigue during the shift. By keeping employees aware of their fatigue, this technology allows organizations and employees to counter the effects with nutrition, exercise, naps, and other means. Once a worker passes the alertness test again, they are considered safe to work for two hours. After the two-hour safe period, an employee can be tested again for alertness. When patterns develop over the course of individual shifts, weeks, and months, employers have data to inform their scheduling and rostering decisions.
- **Artificial Intelligence:** [AI has become an essential tool](#) for employers seeking to reduce costs from all types of worker health issues, from accident-driven injuries to chronic pain to fatigue. AI can be integrated into wearables such as bracelets that collect ergonomic data and information about the [worker's health status and exertion levels](#) and deliver analysis to management for use in prevention strategies.

"A fatigue risk management system is more than just a static operating procedure. It must be dynamic, fluid, science-based, data-driven, and most importantly, the system itself must strive to improve results at all times."

— [CLINTON MARQUARDT](#)
Human Fatigue Specialist at PMI, Inc., Canada

Developing a Fatigue Risk Management Strategy (FRMS)

Unfortunately, the nature of fatigue makes it a difficult challenge to tackle from all angles. That's why some organizations have begun implementing full-scale risk

management programs that specifically tackle the risk factors that lead to fatigue. Based on sleep science, an effective FRMS should include five defensive layers:

- **Provide ample sleep opportunity:** Employers must review their shift policies, work rosters, and schedules to determine how much time is available for workers to sleep. Make sure to factor in time that employees need for outside obligations such as family activities and responsibilities. Although organizations cannot dictate how employees spend their off time, allowing them the opportunity to properly manage work, life, and sleep will in turn benefit both the employee and the organization.
- **Determine optimal minimum sleep and maximum awake times:** Employee response data is not always reliable; workers are capable of arriving at their jobs and doing their work on reduced or insufficient sleep but may not realize how their work performance deteriorates as a result. Managers must be aware of recommended minimum sleep times and maximum consecutive awake times to eliminate the variability in worker self-assessment. When an employer understands the minimum sleep needs for its workforce, it can help provide education and training to help employees learn how to improve their sleep patterns and take ownership of their fatigue.
- **Monitor behavioral symptoms of fatigue:** It is still possible for workers to experience fatigue even if they are devoting enough time for sleep, given the other factors discussed in this paper. Cumulative effects that take place over long periods of time may still inhibit or impair worker performance on the job; individuals have different sleep requirements, sleep disorders, and idiopathic factors that also contribute to fatigue. By using observation, wearables, and AI technology, managers can monitor real-time behavioral indicators for fatigue and address them before they worsen. Some technologies can measure baseline attention before and after shifts to identify fatigue before a shift and can help determine if the work is causing excessive fatigue. These technologies can even predict when fatigue might set in.
- **Establish and test against performance benchmarks:** Hard performance data is crucial in an effective fatigue risk management plan. Benchmarks for worker performance will help managers know what to expect from their employees, establishing a baseline of performance against which specific incidents can be tested. This is also useful for understanding how different parts of an organization's operations, such as manufacturing demand, can give rise to temporary or seasonal increases in fatigue in the workforce.
- **Incident investigation:** This level is intended to catch

and report instances in which the previous layers have failed, resulting in an accident, an injury, or a near miss for either. Systematic investigation can reveal whether or not fatigue was a major factor, a contributing factor, or uninvolved in the incident. This information will help managers improve operations to eliminate risk areas that cause fatigue-related injuries.

With this strategy, two possible approaches are available. First is the **fatigue reduction** option, which focuses primarily on the first three levels of defense in the FRMS, using preventative measures and analysis of the workforce to isolate risk factors for fatigue. The second option is **fatigue-proofing**, which involves taking steps to understand the catalysts of fatigue-related injuries and incidents and make changes so that risk factors, if they must remain, can be tackled at times when workers are alert and well-rested.

Fatigue Reduction:

- Review shifts and rosters
- Define best sleep practices and educate workers to help them manage their own patterns
- Monitor fatigue-related behaviors

Fatigue-Proofing:

- Analyzing feedback data to understand fatigue trends
- Investigating incidents to determine fatigue's role
- Evaluating the workplace for ergonomic stressors that lead to fatigue
- Facilitate **departmental stretching** to improve overall physical wellness

CONCLUSION

Fatigue is a multi-layered challenge, presenting obstacles in virtually all phases of operations. Modern workplaces are simply conducive to fatigue; economic growth and worker shortages have placed high demand on workers and pressured organizations to schedule more hours with less time for rest. By the time sleep deficit has accrued and management is made aware of a fatigue problem, the effects are usually already being felt. Moreover, workers face fatigue danger from all around. Repetitive tasks, stressful workloads, poorly designed equipment and workstations—all can contribute to fatigue and exacerbate the sleep debt problem. However, by

committing to observation, understanding the workforce, and implementing proactive, preventative solutions, managers and their organizations can alleviate the burden of fatigue. Most important, though, is an overall culture of wellness and openness to communication from workers; when employees feel comfortable taking charge of their safety and working with management toward better practices, they will feel empowered to address the factors in their own lives that contribute to fatigue. With this give-and-take relationship, both workers and employers alike can reduce fatigue and foster a positive, safe, and healthy workplace.



If you would like to schedule a free consultation about fatigue management and Total Worker Health® solutions at your organization, please feel free to contact us at info@dorncompanies.com or call (303) 641-8794



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