

# Cognitive Ergonomics: The Effect of Fatigue on Injury Risk

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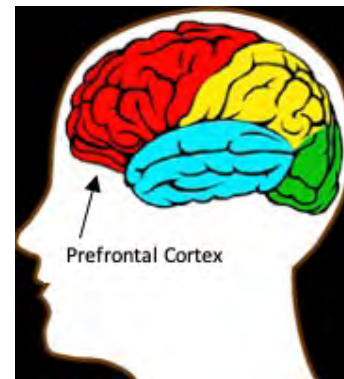
**F**rom grips to performers, costumers to carpenters, and everyone in between, the film industry is a demanding one, involving long hours, hard work, and erratic schedules. Fatigue is often the norm, not the exception.

But when we talk about work-related injuries, we tend to focus only on the physical nature of the job, turning to tried and true ergonomic principles designed to eliminate musculoskeletal hazards such as awkward postures or heavy material handling or excessive workloads.

What is often overlooked is the cognitive side of ergonomics, and how sleep-related fatigue also contributes to injuries.

## Sleep Debt and Injuries

If you haven't heard it yet, the science is clear. All adults need a minimum of 7-9 hours of sleep to fully recharge the body and brain. Anything less than is detrimental to safe work performance.



Let me explain.

When you're tired, whether from lack of sleep or from running around on your feet all day, the body goes into conservation mode. It does that by shutting down the biggest energy hog we have... our executive control center, known as the prefrontal cortex. That's the brain's engine, responsible for regulating our thoughts, emotional responses, and actions.

In the short term, cognitive impairments typically appear first in the form of

- flawed logic (I'm ok to drive home after an 18-hour day),
- working memory problems (did I check the weight limit on that sling?),
- lack of communication (it's not complicated, they'll figure it out),

- reduced tolerance (I'll do it, get out of my way),
- reduced situational awareness (not noticing the boom you walked into, or the spill on the floor),
- poor judgement (sure they're tired, but one more "take" and we'll wrap it up),
- poor hand-eye coordination (chuck that roll of duct tape, would you?), and
- less effective problem solving (let's just get it done already!).<sup>1</sup>

Simply put, our brain has us under-estimate risk and be more accepting of risk when we're tired.

Fatigue also has a direct effect on our physical capabilities. It reduces our muscle's ability to generate force and decreases joint proprioception and motor performance. In layman's terms, that means

- we feel functionally weaker (encouraging us to take more shortcuts that put us in harm's way),
- we have impaired equilibrium and coordination (meaning poor body mechanics and material handling techniques), and
- we lose our sense of balance (more slips, trips and falls).<sup>2</sup>

All of this translates into more injuries that are preventable, and we have the research that backs this.

| Hours of Sleep per Day        | <5   | 5-5.9 | 6-6.9 | 7-7.9 | 8-8.9 | 9-9.9 |
|-------------------------------|------|-------|-------|-------|-------|-------|
| # of injuries per 100 workers | 7.89 | 5.21  | 3.62  | 2.27  | 2.50  | 2.22  |

| Hours of Work per Week        | >60  | 51-60 | 41-50 | 31-40 | 21-30 | <20  |
|-------------------------------|------|-------|-------|-------|-------|------|
| # of injuries per 100 workers | 4.34 | 3.71  | 3.45  | 2.45  | 3.01  | 2.03 |

For example, in a study of 11,000 Americans over a 13-year period, jobs with overtime schedules had a 61% higher injury risk rate compared to jobs without overtime.<sup>3</sup>

The same study also found that working at least 12 hours per day was associated with a 37% increase in relative risk and working at least 60 hours per week was associated with a 23% increase.

In 2010, researchers examined four years of data and were able to demonstrate the

impact of sleep and working hours with the relative risk for having a work-related injury.<sup>4</sup>

### Are your people at risk?

Science reveals there are four key fatigue factors that influence our risk for injury.

1. Long work hours
2. Irregular schedules
3. Short sleep duration
4. Poor sleep quality

The more factors present, the higher your risk. Spending time training workers on how to lift properly will have little value with if they're constantly suffering from fatigue.

### What to do?

Productions still need to focus on reducing physical fatigue to reduce injury risk. That includes

- Incorporating material handling aids, like exoskeletons
- Suspending tools with jigs, vices, winches, tool balancers
- Job rotation to distribute heavy or repetitive work
- Longer or more frequent breaks for demanding work or challenging environments

Risk associated with sleep-related fatigue can be addressed by

- Incorporating schedules that accommodate for adequate recuperative sleep (consider commute times and their impact)
- On duty rest breaks in quiet areas
- Ensuring good housekeeping practices to reduce hazards that may go unnoticed when tired
- Improved lighting in darkened areas
- Increases in cross-checking and double-checking
- Incorporation of checklists to reduce errors and incidents
- Ensuring fatigued workers have safe transport home

Ultimately, preventing injuries requires multiple, overlapping ergonomic controls that address both physical and cognitive factors.