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Sleep is for the weak

and other lies we tell ourselves

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Sleep is for the weak

and other lies we tell ourselves

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https://mervfrench.wordpress.com/tag/night-harvesting/


https://www.agriculture.com/machinery/harvesting/where-a-combine-breaks-down


https://thefarmerslife.com/farm-week-pictures-11082014/

Heard during harvest...

I’m not tired

I can sleep when I’m dead

I just need a little caffeine

Too much work, not enough time

I’m used to it

I’ll catch up this weekend

Sleep is for the weak

Tired?

- 70% of Americans routinely get insufficient sleep
- 30% of U.S. workers and 44% of night shift workers report getting less than six hours of sleep on average
- United States loses 1.23 million working days each year due to insufficient sleep

  Sleep-deprived workers are twice as likely to miss work

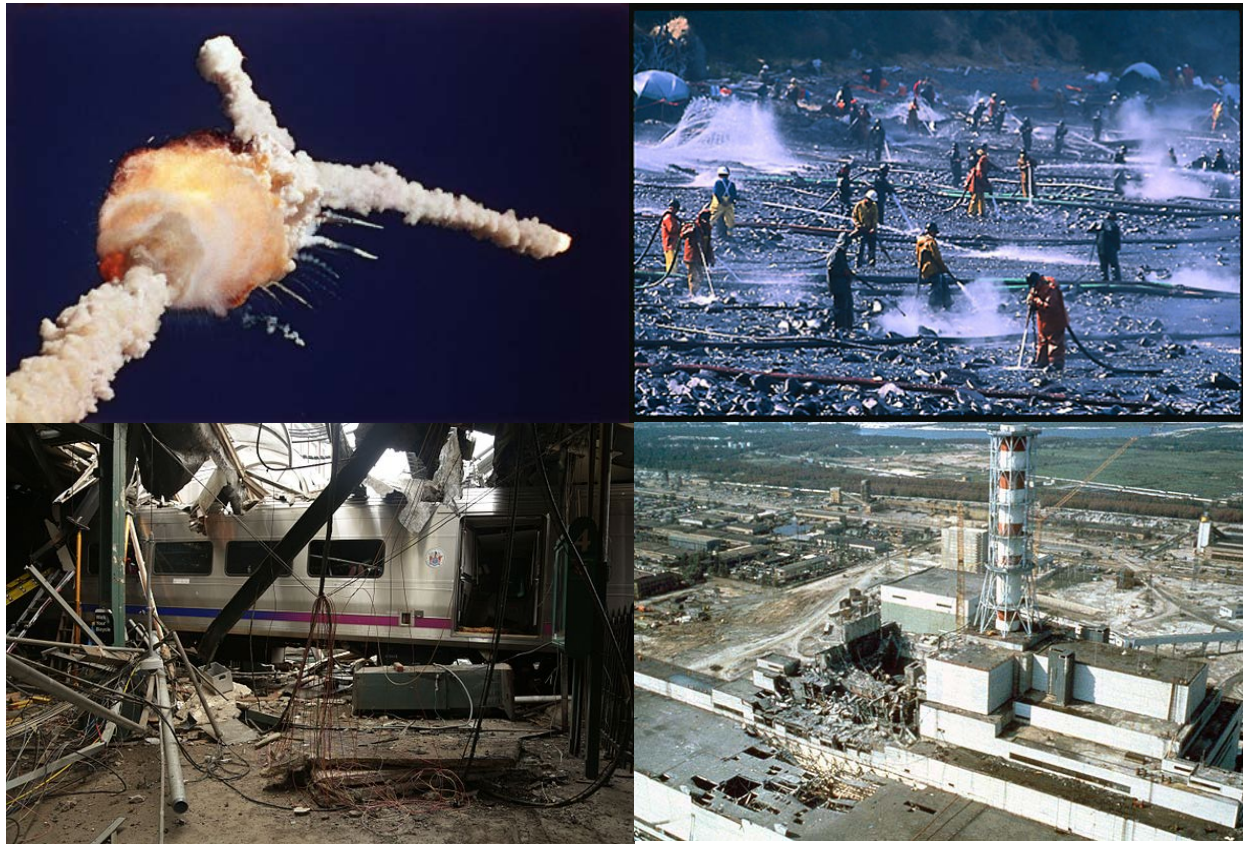
Major disasters associated with fatigue

Challenger explosion – Launch managers slept only two hours the night before.

Exxon Valdez oil spill - Captain was under the influence of alcohol and asleep at the time of the accident. Third Mate put in charge of ship only had a "catnap" in the last 16 hours leading up to the crash.

Hoboken train crash 2016 – Engineer operating the train was fatigued due to undiagnosed obstructive sleep apnea.

Chernobyl disaster - Fatigue associated with 13-hour work shifts was a leading contributor to the human error that led to the explosion.



Fatigue is a workplace hazard that must be managed!

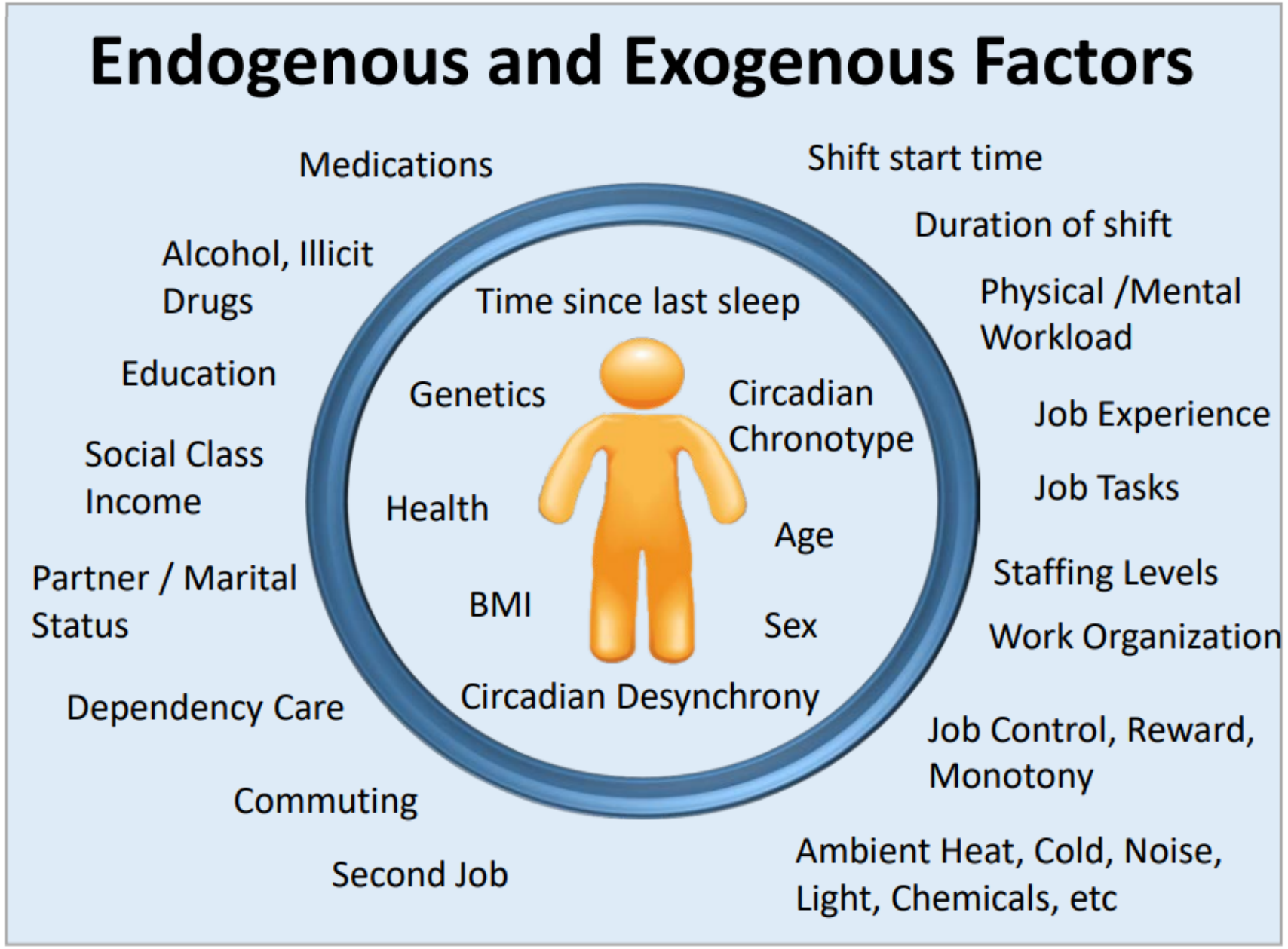
Goals for this session

- Fatigue and its causes
- Sleep and how much we need
- Short-term effects of sleep deprivation
- Health impacts of chronic deprivation
- Hazards associated with fatigue
- Addressing fatigue in the workplace

What is fatigue?

- Weariness from bodily or mental exertion – Dictionary.com
- While ***sleepiness*** is the tendency to fall asleep, ***fatigue*** is the body's response to sleep loss or to prolonged physical or mental exertion – Lerman et al. (2012)
- Fatigue is characterized by a lack of alertness and reduced mental and physical performance
- Fatigue may be caused or exacerbated by:
  - Lack of sleep, disruptive work/rest cycles, neurological conditions, excess mental or physical workload, exposure to extreme physical conditions, emotional stress, the use of drugs or alcohol, illness, and/or monotony – DOT Policy Statement on Fatigue (1999)
- Fatigue leads to decreased attention to detail, impaired judgment, and slowed response time

Endogenous and Exogenous Factors



Adapted from Di Milia (2011) https://www.cdc.gov/niosh/bsc/pdfs/BSC_May2021_Wong_CWFR-508.pdf

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What is sleep?

An *essential function* that allows your body and mind to recharge, leaving you refreshed and alert when you wake up

Four stages of sleep with different levels of brain activity

- Sleep cycles through these stages throughout the night
- Each cycle is about 90-120 minutes

Stages of sleep (REM and non-REM)

- Stage 1: 1-5 minutes – transition from awake to asleep
- Stage 2: 10-60 minutes – body temperature drops, muscles relax, breathing and heart rate slow
- Stage 3: 20-40 minutes – deep sleep, important to feeling refreshed, body recovery
- REM: 10-60 minutes – “Rapid Eye Movement”, dreaming, essential to cognitive functions, moving to long-term memory

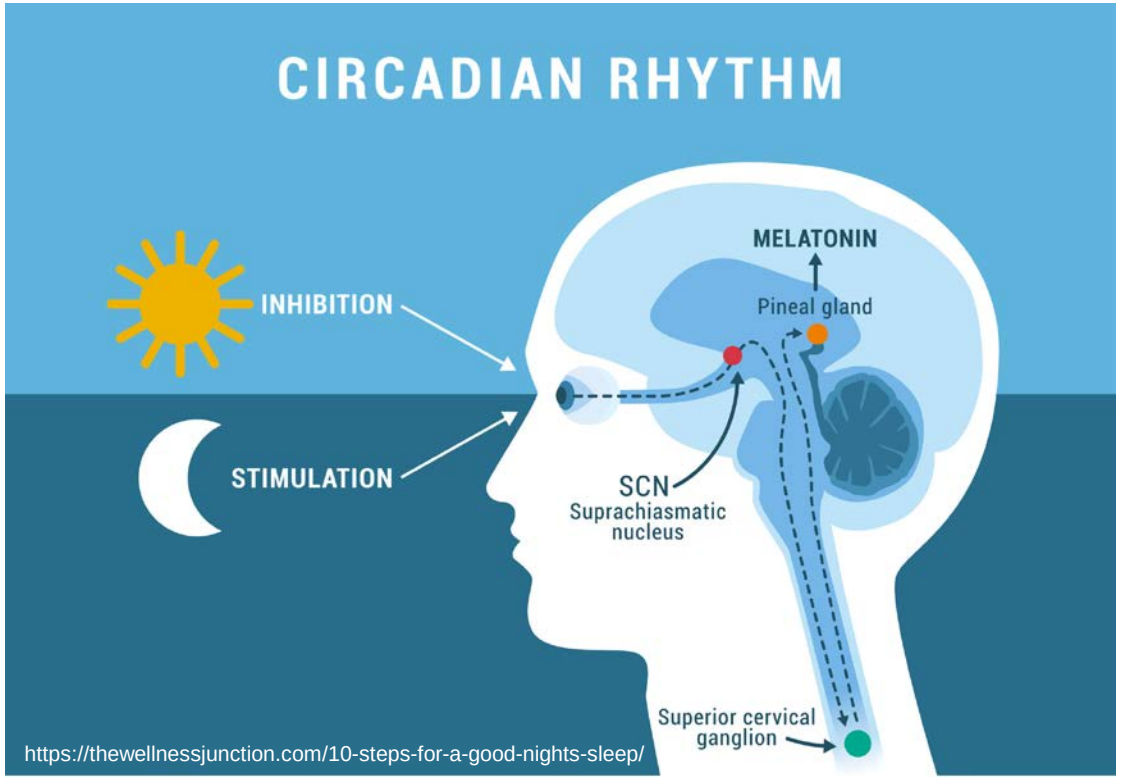
What causes us to sleep?

Circadian rhythm (biological clock)

- Roughly 24-hour cycle of sleep and wakefulness
- Suprachiasmatic nucleus in the hypothalamus is influenced by exposure to light
- Controls daily rhythm of sleepiness and alertness, body temperature, and secretion of hormones such as melatonin

Homeostatic sleep drive (urge to sleep)

- Urge to sleep increases at night and peaks in early morning – smaller peak occurs in mid-afternoon
- The longer sleep deprivation lasts, the stronger the drive to sleep becomes
- May be linked to a chemical called adenosine that accumulates during the day and is depleted during sleep
    - Stimulants like caffeine block adenosine receptors in the brain



How much sleep do I need?

Most adults need **7-9 hours** of good quality sleep per night

- Disrupted sleep due to sleep apnea, chronic pain, stress, etc. can inhibit the entry into deeper levels of sleep needed to feel refreshed

Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society on the Recommended Amount of Sleep for a Healthy Adult

- At least 7 hours in a 24-hour period
- Meta-analysis of research studies and expert panel considering health effects and cognition
- Split-sleep schedules are acceptable if at least 7 hours are obtained in 24-hours

Shift work presents challenges

Shift work includes

- Working hours outside of the normal 7am – 6pm
- Overtime work (more than 40 hours a week)
- Extended shifts (longer than 8 hours a day)

BLS data from 2017-18

- 16% of workers had a non-daytime schedule
- 6% worked evenings (shift includes 6pm-10pm)
- 4% worked nights (shift includes 11pm-3am)
- Remainder had a rotating shift, a split shift, an irregular schedule, or some other schedule

Long-term impact of sleep deprivation

Numerous research studies link chronic sleep deprivation to medical conditions

- Diabetes – impacts release of insulin and how glucose is processed
- Cardiovascular disease – increased heart rate, blood pressure, and inflammatory compounds
- Reproductive issues – lower testosterone and decreased fertility
- Obesity – reduced levels of leptin (feel full) and increased level of ghrelin (feel hungry)
- Cancer – still unclear, may be linked to other diseases, reduced immune function, alterations in cell function, and DNA damage

Economic loss in the US estimated at $816 billion per year

- CDC Center for Work and Fatigue Research

Fatigue leads to injury

- Having sleep problems increased the relative risk of being injured at work by 1.62 times
- Approximately 13% of work injuries due to sleep problems
- Non-standard shifts found to have a higher risk for occupational injuries and illnesses than conventional day shifts.
  - 1.43 for evening shifts
  - 1.36 for rotating shifts
  - 1.30 for night shifts
  - 1.15 for irregular shifts
  - 1.06 for split shifts (not significantly different than standard)
- Overtime risk
  - Working at least 12 hours per day was associated with a 37% increased hazard rate
  - Working at least 60 hours per week was associated with a 23% increased hazard rate

	Estimated Annualized Injury Rates / 100 Workers						
Hours of sleep	<5	5-5.9	6-6.9	7-7.9	8-8.9	9-9.9	>10
Injury rates	7.89	5.21	3.62	2.27	2.50	2.22	4.72

Lombardi et al. (2010)

Hazards associated with fatigue

Improper safety enforcement and major injury

- Long shifts diminishes worker ability to remain focused and alert

Impaired motor skills

- Sleep-deprived workers have poor hand-eye coordination, depth perception, and balance

Poor decision making and risk taking

- Lack of sleep can alter judgment and lead to riskier behavior like failing to wear personal protective equipment due to discomfort
- OSHA cites increased errors in patient care and occupational injuries, including needlesticks and exposure to blood and other body fluids

Poor memory and information processing

- Tiredness can make it difficult to focus and retain new information on the job
- Distractions, impaired short-term memory, and lack of problem-solving skills can lead to costly mistakes and health and safety hazards

Hazards associated with fatigue

Falling asleep on the job

- If a worker falls asleep on the job, they will not be able to react to a potential hazard
- Microsleep – the brain flips quickly between being asleep and awake

Special risks of shift workers

- Challenges associated with daytime sleeping
- Reduced vigilance during times of high sleep pressure (circadian rhythms)

Inability to deal with stress

- Irritability and prone to outbursts that can reduce productivity
- Sleep deprivation may cause anxiety, depression, and lack of motivation

Reduced productivity

- Increased absences, reduced productivity, increased likelihood of accidents

Individual strategies for better sleep

Make sure you have a good sleep environment

- Comfortable mattress, pillow, and bedding
- Dark, quiet room
- Not too hot or cold – cooler temperatures in general

Sleep schedule

- As much as possible, have a consistent wake/sleep schedule
- Budget time for at least 7 hours of sleep per day
- Be careful with naps – best after lunch in early afternoon – about 20 minutes

Pre-bed routine

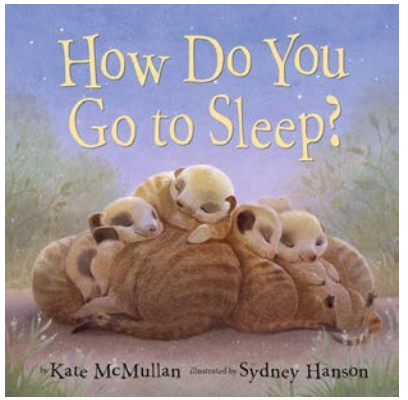
- Having a consistent routine signals the body it is time for sleep
- Try to begin 30 minutes before bedtime
- Lower lighting, calming activities, disconnect from devices

During the day

- Exposure to natural sunlight during the day
- Exercise (but not close to bedtime)
- Avoid caffeine, alcohol, smoking, heavy meals before bedtime

Can’t fall asleep?

- Relaxation techniques
- Get out of bed and do something relaxing in low light
- Talk to doctor to address any potential health issues



Corporate strategies to address fatigue

Early efforts focused on hours-of-service guidelines

- Airline pilots, commercial truck drivers, etc.
- Compliance-based and does not address other factors we have discussed and may not ensure employees are fit for duty

Fatigue Risk Management System

- Like a safety management system
- Risk-based, data-driven, subject to continuous improvement
- What is the likelihood and consequence of fatigue?

Fatigue management is a ***shared responsibility*** between the organization and the employee

- Critical to engage workers in managing risk associated with fatigue
- Like other safety topics, the management support is critical

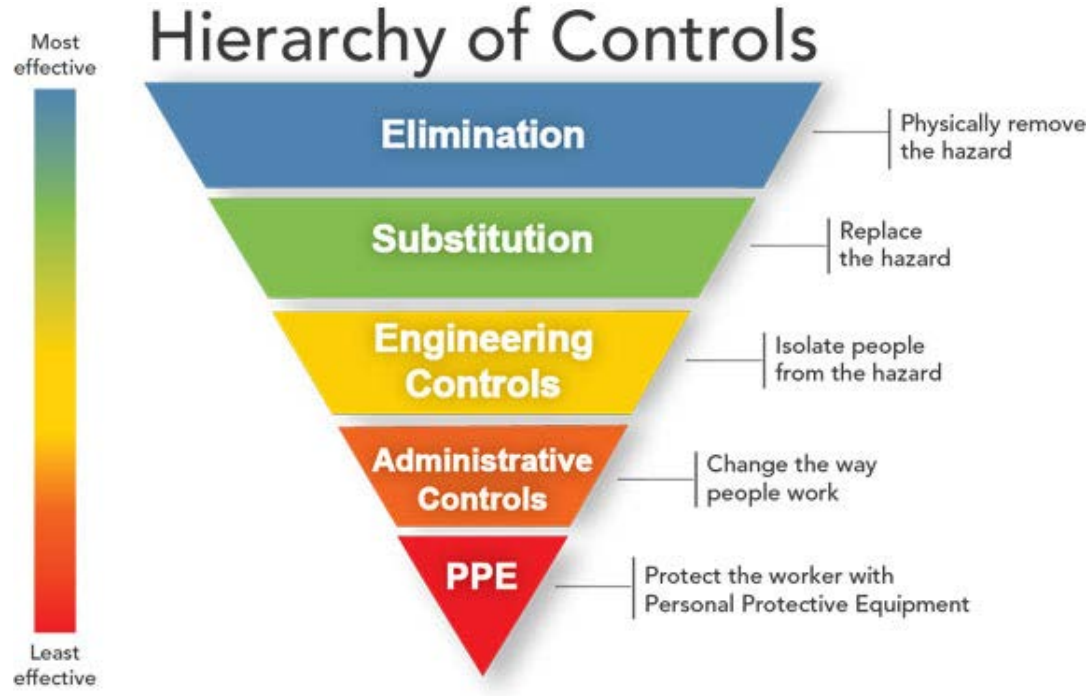
Fatigue risk management

Identify fatigue-related hazards

- What factors are associated with fatigue?
  - Physical and mental
- What hazards interact with fatigue?
  - Operating heavy equipment, driving, etc.
- Review records
- Meet with employees

Assess fatigue risks

- How likely is fatigue to occur?
- How severe are possible consequences?
- What controls are in place and how effective?
- Can help to identify where to start – most urgent



What controls should be implemented to address the fatigue-related hazards?

Fatigue management considerations

Do staffing and workload support adequate time for rest of employees?

Are there shift related issues that can be addressed?

- Schedule permits frequent opportunities to obtain nighttime sleep
- Consider shift type, length, transitions (such as clockwise vs counterclockwise)

Provide training and education of employees and help to address sleep disorders

- Hazards of working while fatigued, impact of chronic fatigue, managing shift work schedules
- Screen for sleep disorders and assist in diagnosis and treatment

Address work environment

- Light, temperature, humidity, noise and ergonomics can impact alertness
- Schedule critical tasks during peak times of alertness
- Timing of breaks and meals to combat fatigue

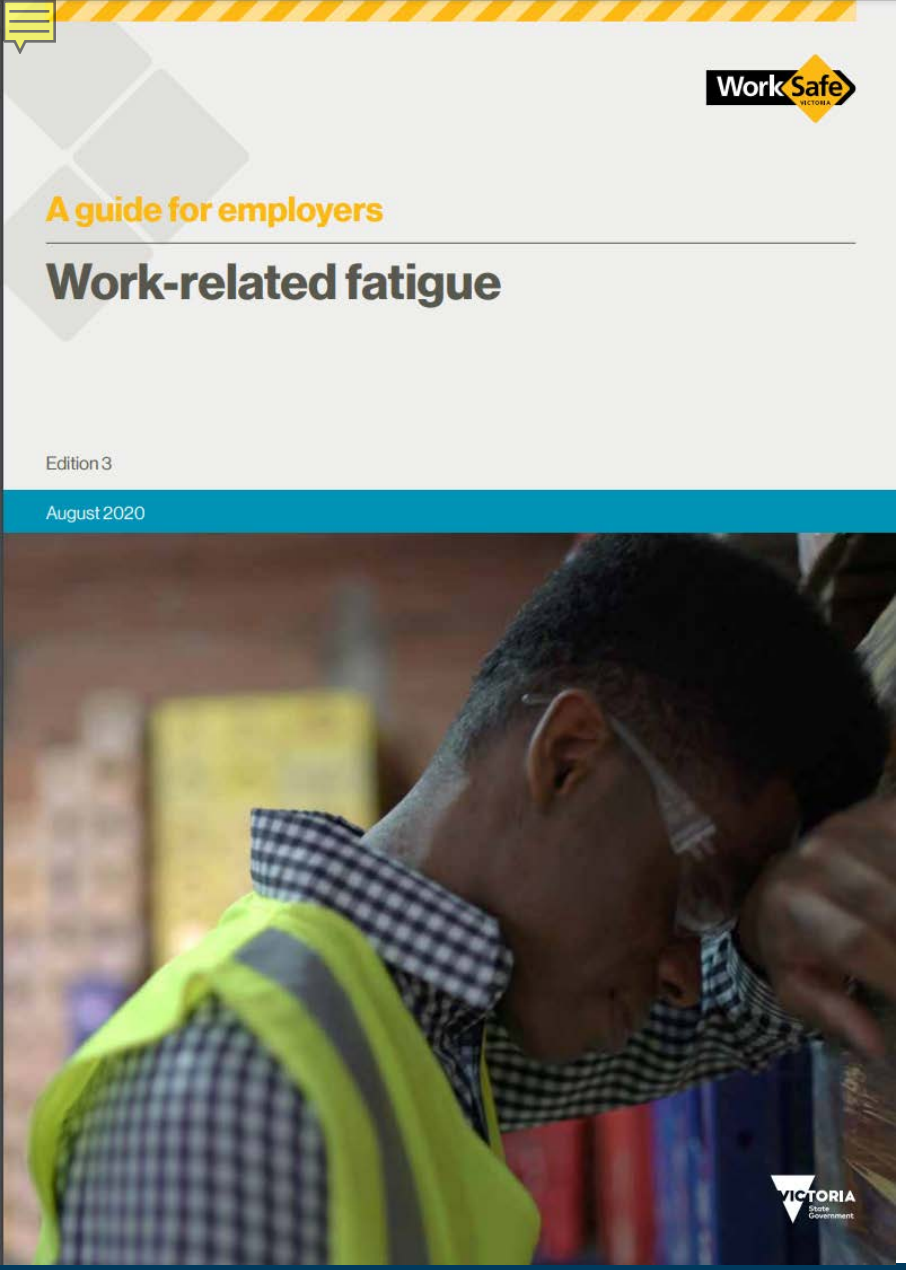
Individual risk assessment and mitigation

- Employees, coworkers, and supervisors alert to signs of excessive fatigue
- Establish safety culture supportive of peer-to-peer safety engagement
- Work to address underlying problems associated with chronic fatigue

Collect data on fatigue in the workplace and focus on continuous improvement

- Keep employees engaged in the process
- Include fatigue as a possible factor and related causes of fatigue when investigating incidents

Lerman et al. Fatigue Risk Management in the Workplace (2012)



Sample controls

- Schedule safety critical work outside 2am-6am
- Redesign the job to include a variety of tasks
- Avoid work arrangements that incentivize excessive work hours
  - Limit overtime, shift-swapping, etc.
- Use workforce planning to appropriately schedule leave for sickness, vacation, training, etc.
- Use forward rotation when changing shifts
- Provide consecutive days off to shift workers to facilitate recovery
- Use buddy system and encourage fatigued workers to speak up
- Use well-lit environment and use heating/cooling as appropriate

Final thoughts

Fatigue is a hazard that must be managed

Managing fatigue is a shared responsibility

Familiar tools like risk assessment and the hierarchy of controls can be used to address fatigue

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