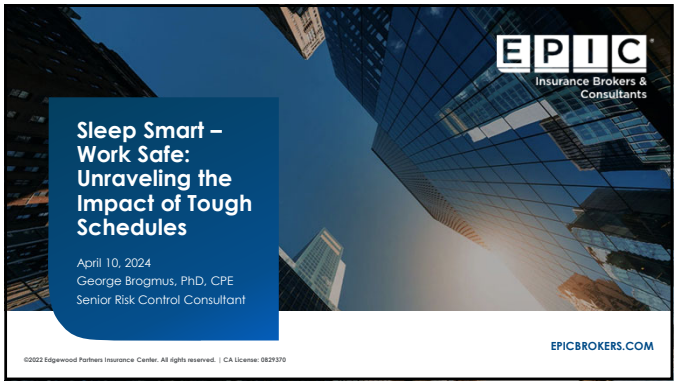
EPIC
Insurance Brokers & Consultants
Sleep Smart – Work Safe: Unraveling the Impact of Tough Schedules
April 10, 2024
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Senior Risk Control Consultant
EPICBROKERS.COM
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1


Session Overview
• Recognize the broad scope of adverse consequences of tough work schedules.
• Learn about the key work scheduling factors that impact injury risk.
• Familiarize yourself with work schedule analysis tools.
• See the importance of rest and sleep on workforce productivity, quality and safety.

2


We think we can get by with less and poorer quality sleep than we really need.

3

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Just because we are smart and/or highly educated doesn't necessarily help - might even make it worse!

4

What do these dates have in common?

April 20, 2010	August 27, 2006	October 19, 2004
March 24, 1989	April 26, 1986	January 28, 1986
Dec 3, 1984	March 28, 1979	April 14, 1912

5

Work Scheduling and Disasters

- BP's Macondo Well Deepwater Horizon Blowout – April, 20, 2010. Events started shortly before 9pm, explosions at 9:49pm.
- Comair Flight 5191 crash 6:07am in Kentucky Sunday, August 27, 2006 (air traffic controller worked 6:30am to 2:30pm Saturday, slept 2 hours and Returned at 11:30pm!)
- Corporate Airlines Flight 5966, October 19, 2004 (Pilots on their 14th hour)
- Exxon Valdez March 24, 1989 (occurred at 12:04am)
- Chernobyl Saturday, April 26, 1986 (occurred at 1:23am)
- Challenger January 28, 1986 (lack of sleep may have played a role in poor decisions to allow the launch)
- Bhopal 11pm Dec 2 (Sunday) – 1am Dec 3, 1984
- Three Mile Island March 28, 1979 (occurred at 4:00am)
- Titanic struck iceberg April 14, 1912 at 11:40pm (Sunday)

6

Consequences of Tough Work Schedules

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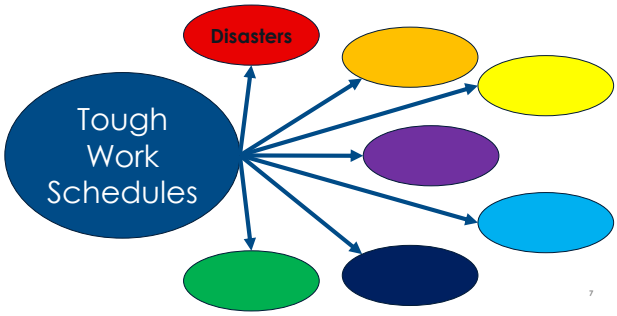

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7

Harvard's Healthy Sleep

https://sleep.hms.harvard.edu/education-training/public-education/sleep-and-health-education-program/sleep-health-education-41

https://sleep.hms.harvard.edu/education-training/public-education/sleep-and-health-education-program/sleep-health-education-45

8

The Broad Scope of Work Scheduling's Impact

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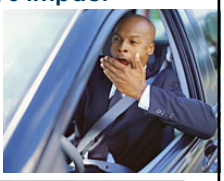
- Crashes due to Drowsy Driving (AAA, 2010)
  - 13% of hospitalization crashes
  - 17% of all fatal crashes
  - 41% of all drivers admit to having fallen asleep while driving – 4% within the last month and 11% within the year!
- 100-Car Naturalistic Driving Study
  - Driving drowsy increases the risk of crashes and near-crashes by 4-6 times!
  - Driving while drowsy is a contributing factor for 22 to 24 percent of crashes.



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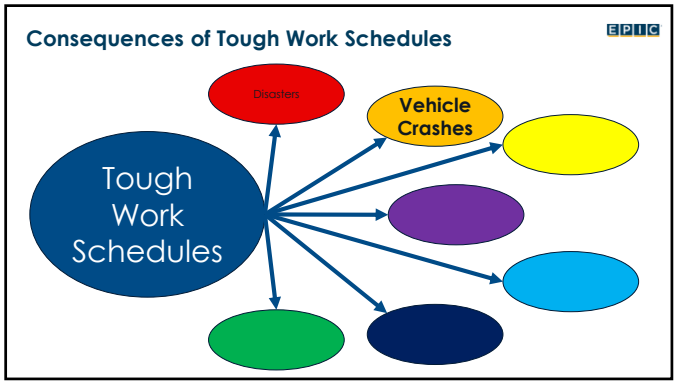

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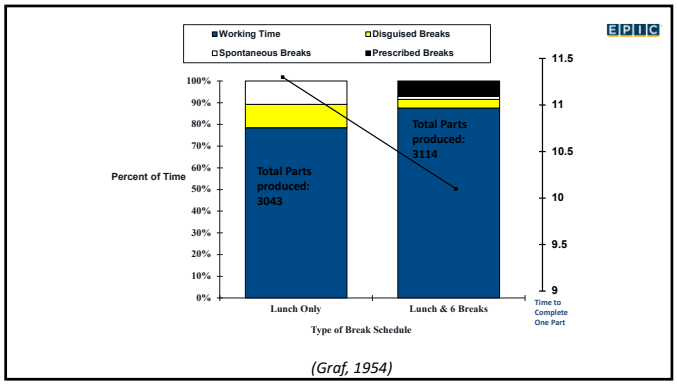


(Graf, 1954)

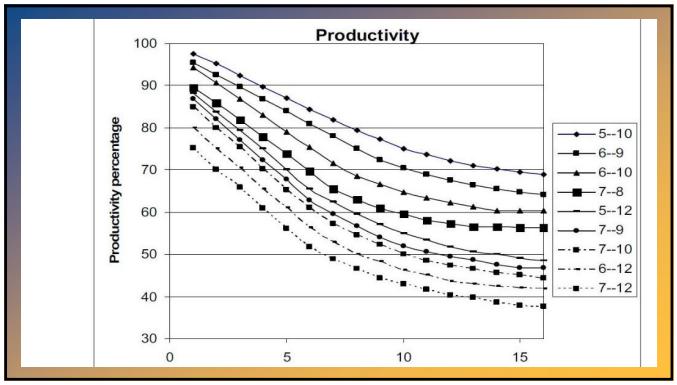
11

12

Impact of Extended Overtime on Construction Labor Productivity
(Hanna, Taylor and Sullivan, 2005.)

- 88 Construction Projects
- Ranging from 32h/wk to 67h/wk per worker
- As Hours/Week/Worker ↑, Productivity↓
- Approximately 4-5% drop in productivity for every 5 hours/week/worker over 40 hours

13



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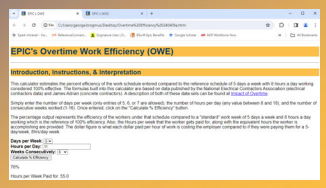
Introducing…



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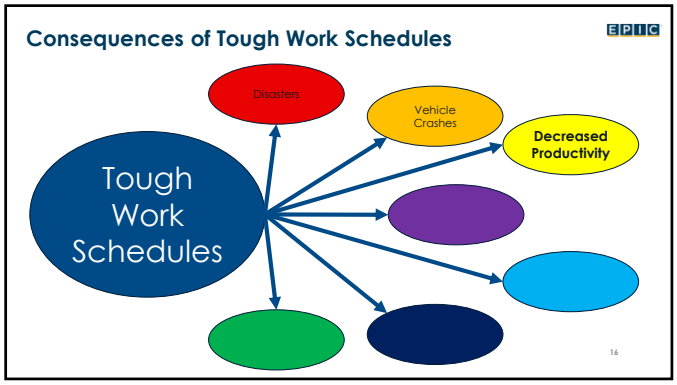

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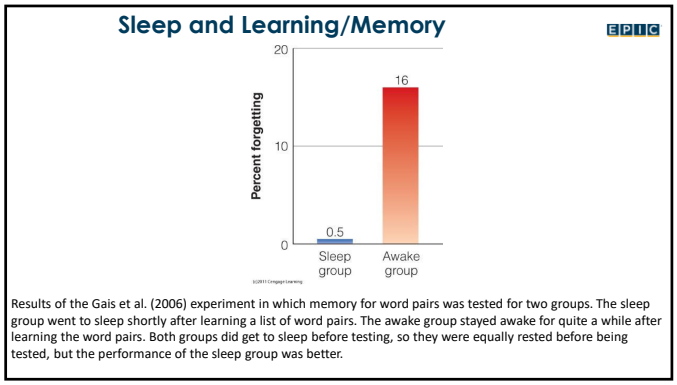
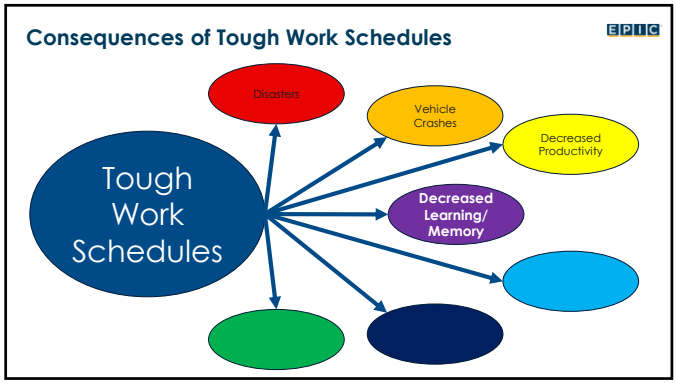


Results of the Gais et al. (2006) experiment in which memory for word pairs was tested for two groups. The sleep group went to sleep shortly after learning a list of word pairs. The awake group stayed awake for quite a while after learning the word pairs. Both groups did get to sleep before testing, so they were equally rested before being tested, but the performance of the sleep group was better.

17



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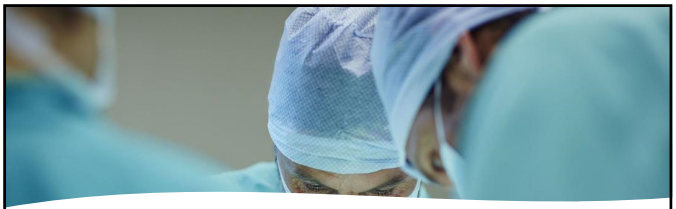

Impact of work schedules of senior resident physicians on patient and resident physician safety: nationwide, prospective cohort study. Barger, et al., 2023

Working between 60 and 70 hours per week was associated with:

- More than **twice** the risk of a medical error
- Almost **three** times the risk of preventable adverse events
- **Almost three times the risk of fatal preventable adverse events**

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- **Extended work hours increase risk of harm, regardless of resident physicians' experience levels. Czeisler, et al., 2023**

4/10/2024

A very concise, compelling summary of the history of "resident physician" work hours, the harm to patients, the harm to physicians, and how NO ONE LISTENS IN THE US – Neither the medical community nor our government.

Please Read https://www.bmj.com/content/381/bmj.p838.full.pdf

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Consequences of Tough Work Schedules

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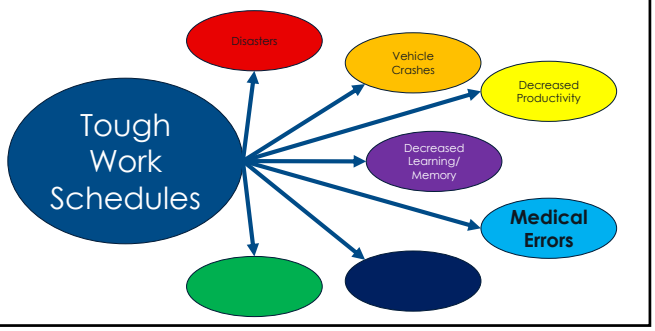

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Health Effects

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- **Obesity** - 14% Higher Rate among shift workers (Kubo, et al., 2010)
- Shiftwork declared by the WHO to be "Probably Carcinogenic" (Straif et al. 2007)
- **Cardiovascular disease** (40% higher risk – Boggild, et al., 1999; >50-60 hours per week - Spurgeon, 2003)
- **Gastrointestinal Disorders** (Frequently reported. Higher risk of peptic ulcer – see Spurgeon, 2003)
- **Possible Reproductive Effects** - Spontaneous Abortion, Pre-term birth (Nurminen, 1998; Figa`-Talamanca, 2006)
- **Immunity Compromise** (Ran, et al., 2020 and Belingheri, et al., 2020)

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Consequences of Tough Work Schedules

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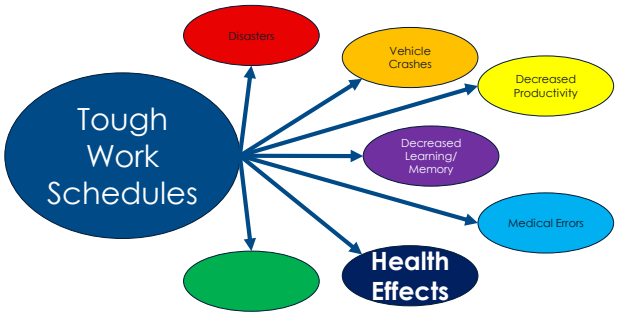

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Consequences of Tough Work Schedules

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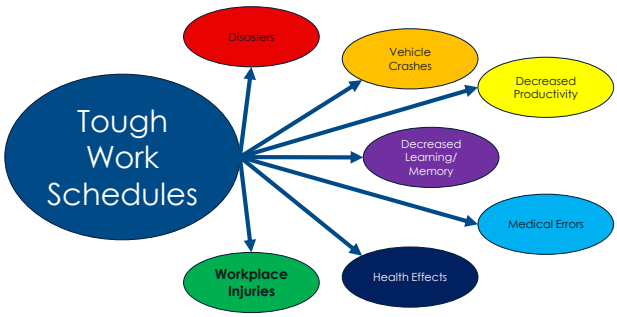

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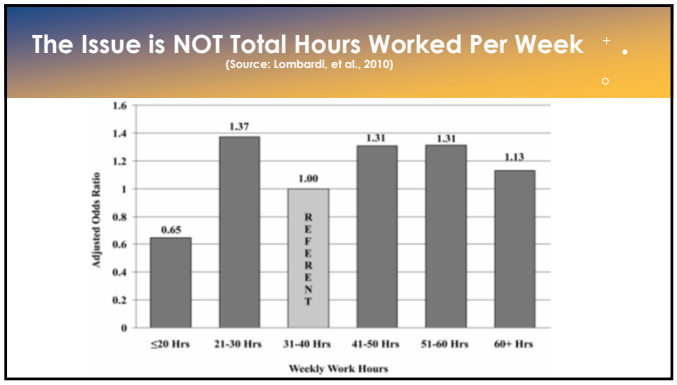
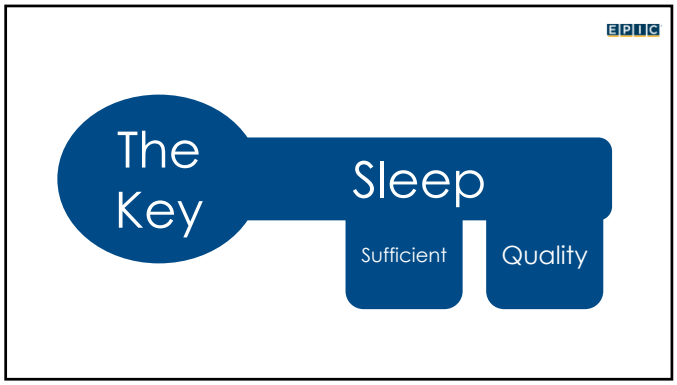

The Issue is NOT Total Hours Worked Per Week
(Source: Lombardi, et al., 2010)
Adjusted Odds Ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.65
1.37
1.00
REFERENT
1.31
1.31
1.13
≤20 Hrs
21-30 Hrs
31-40 Hrs
41-50 Hrs
51-60 Hrs
60+ Hrs
Weekly Work Hours

25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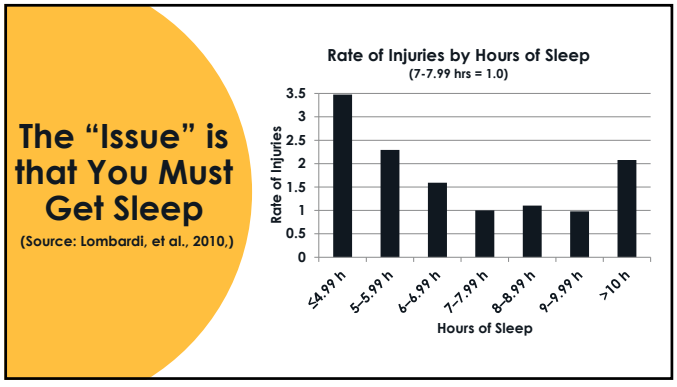
The Key
Sleep
Sufficient
Quality

26


The "Issue" is that You Must Get Sleep
(Source: Lombardi, et al., 2010,)
Rate of Injuries by Hours of Sleep
(7-7.99 hrs = 1.0)
Rate of Injuries
3.5
3
2.5
2
1.5
1
0.5
0
≤4.99 h
5-5.99 h
6-6.99 h
7-7.99 h
8-8.99 h
9-9.99 h
>10 h
Hours of Sleep

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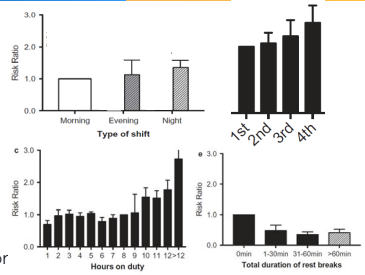
Updating the "Risk Index": A Systematic review and meta-analysis of occupational injuries and work schedule characteristics

Fischer, et al., 2017

- ***Time of Shift***: Night Shifts 36% Higher Injury Rate
- ***# Consecutive Shifts***: Exponential rate increase
- ***Shift Length***: Increases past 8th hour
- ***Rest Breaks:*** Risk decreases with increasing frequency and duration



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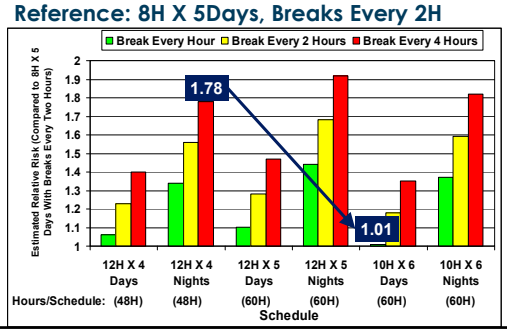
The Sleep Leeches

- The work schedule itself!
- Second (multiple) jobs.
- Sleep Disorders
- Personal Habits
- Light at the wrong time
- Poor Sleep Environment
- Laws – or lack thereof

29

It's TOUGH to tell if one schedule is more or less risk than another

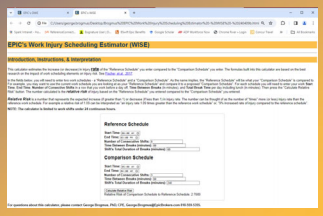
Reference: 8H X 5Days, Breaks Every 2H



30

Sleep Leech – The Work Schedule Itself

Introducing…



31

Sleep Leech – Multiple Jobs

Work in Multiple Jobs (Marucci-Wellman, et al., 2014, 2016).

27% higher work injury rate

34% higher non-work injury rate!

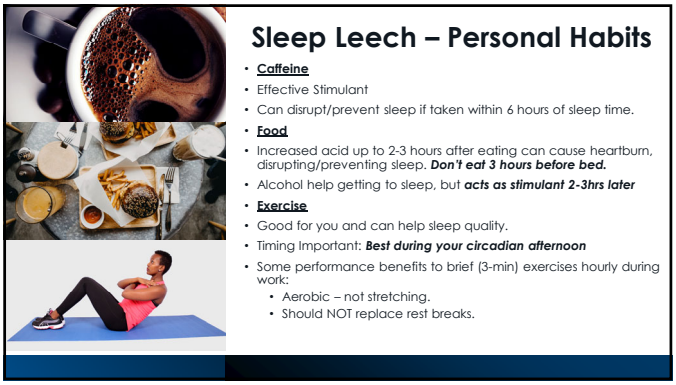
Multiple job holders (MJHs) had up to **1 hour less** sleep than SJHs.

32

Sleep Leech – Sleep Disorders - Sleep Apnea

- **Prevalence**:
  - 20 million adults in the United States
  - Up to 80% of cases remain unrecognized.
- **Symptoms/Consequences**:
  - Snoring
  - ***Waking – up to 300 times/night!***
  - Result – never get into essential deep sleep
- **Risk Factors**:
  - Obesity, Age (over 40), Genetics, Men, Smoking
- **Treatment/Control**:
  - Continuous Positive Airway Pressure (CPAP)
  - Oral Appliances
  - Lifestyle Changes
  - Surgical Interventions

33


Sleep Leech – Personal Habits
Caffeine
Effective Stimulant
Can disrupt/prevent sleep if taken within 6 hours of sleep time.
Food
Increased acid up to 2-3 hours after eating can cause heartburn, disrupting/preventing sleep. Don't eat 3 hours before bed.
Alcohol help getting to sleep, but acts as stimulant 2-3hrs later
Exercise
Good for you and can help sleep quality.
Timing Important: Best during your circadian afternoon
Some performance benefits to brief (3-min) exercises hourly during work:
Aerobic – not stretching.
Should NOT replace rest breaks.

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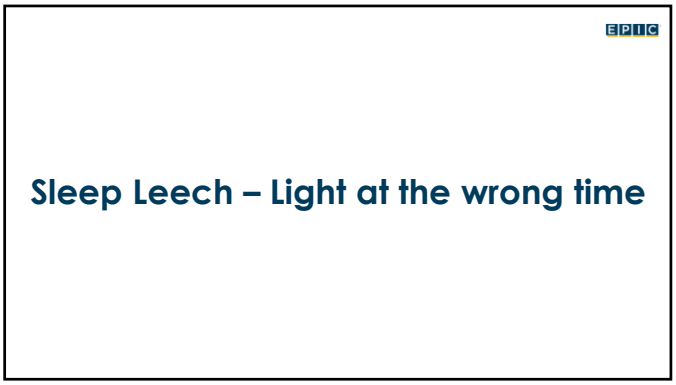
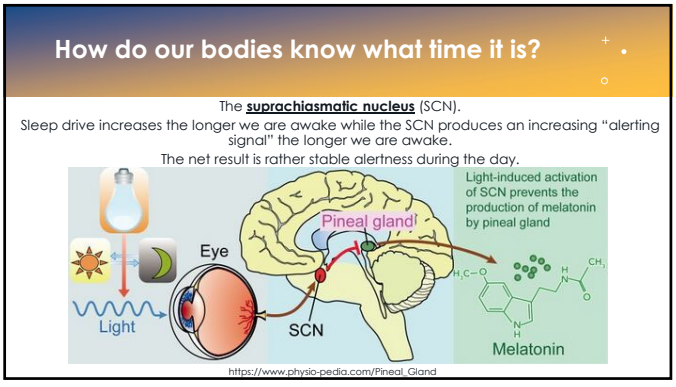

EPIC
Sleep Leech – Light at the wrong time

35


How do our bodies know what time it is?
The suprachiasmatic nucleus (SCN).
Sleep drive increases the longer we are awake while the SCN produces an increasing "alerting signal" the longer we are awake.
The net result is rather stable alertness during the day.
Light
Eye
SCN
Pineal gland
Light-induced activation of SCN prevents the production of melatonin by pineal gland
Melatonin
https://www.physio-pedia.com/Pineal_Gland

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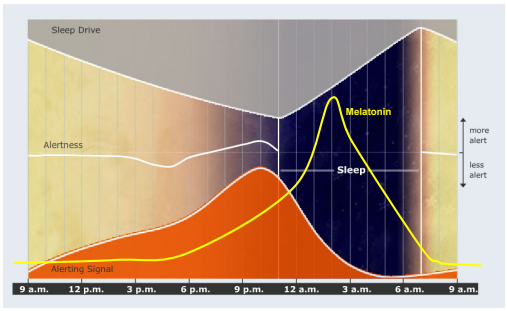
The Forces of Sleep



Adapted from https://sleep.hms.harvard.edu/node/75356

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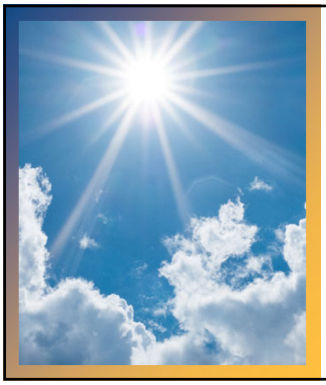

Light – Our Internal Clock's External Cue

- Bright light tells our brain it's daytime (time to be awake).
- Naturally occurs around noon (in the lower 48).
- ***Night shift workers need it around midnight. (About 10-11 hours before sleep window.)***
- Risk of sleep disruption if bright light exposure is within about 4 hours before sleep.
- Must be long enough (≥30min)
- Must be bright enough (>10k lux)

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Sleep Leech – Light at the wrong time

- **Get a dose of bright light at your circadian noon.**
- **Avoid bright light past your circadian late afternoon.**

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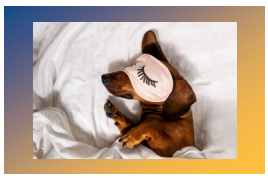

Sleep Leech – Poor Sleep Environment

- Good quality mattress?
- Is the sleeping area dark?
- Is the sleeping area quiet?
- Can their sleep be interrupted by people, cell phones, PA systems, etc.?
- "Tricks"
  - White noise or Fan
  - Sleeping mask.

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Summary

Adverse work schedules = Adverse consequences.

Workplace improvements are practical and effective without compromising productivity or quality.

There are personal interventions that informed workers can make to mitigate the effects of risky work schedules.

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Key Resources

Harvard Medical School	https://sleep.hms.harvard.edu/education-training/public-education/sleep-and-health-education-program/sleep-health-education
NIOSH's Plain Language about Shift Work	https://www.cdc.gov/niosh/docs/97-145/
Circadian	http://www.circadian.com
National Safety Council	https://www.nsc.org/fatigue

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