



# Fatigue: What is it?

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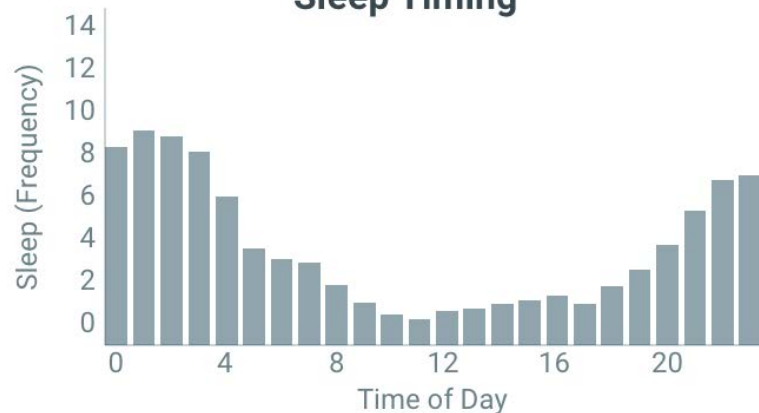
# What is Fatigue? What is Sleepiness?



## Fatigue is related to a task failure

- Aloha Airlines Flight 243
- NTSB concluded cause was metal fatigue
- B 737 (19 years old) 89,680 GAG cycles
- Current standard 34,000 GAG cycles

## Sleep Timing



## Sleepiness is sleep propensity

- 41 sailors
- Working 18h shift rotations
- Sleep maintains 24h pattern

# Key Operational Fatigue Stressors



## Sleep Debt

We all need about 7-9 hours of sleep to recharge our sleep battery every day.

When we go day after day without getting enough sleep we accumulate a sleep debt.



## Time of Day

When we are awake and on duty at night we experience more fatigue because our bodies are programmed to be sleepy at night.



## Long Days

When we sleep we recharge our sleep batteries—resulting in reliable alertness for about 16 hours.

Fatigue impairments accelerate after being awake for longer than 17 hours.



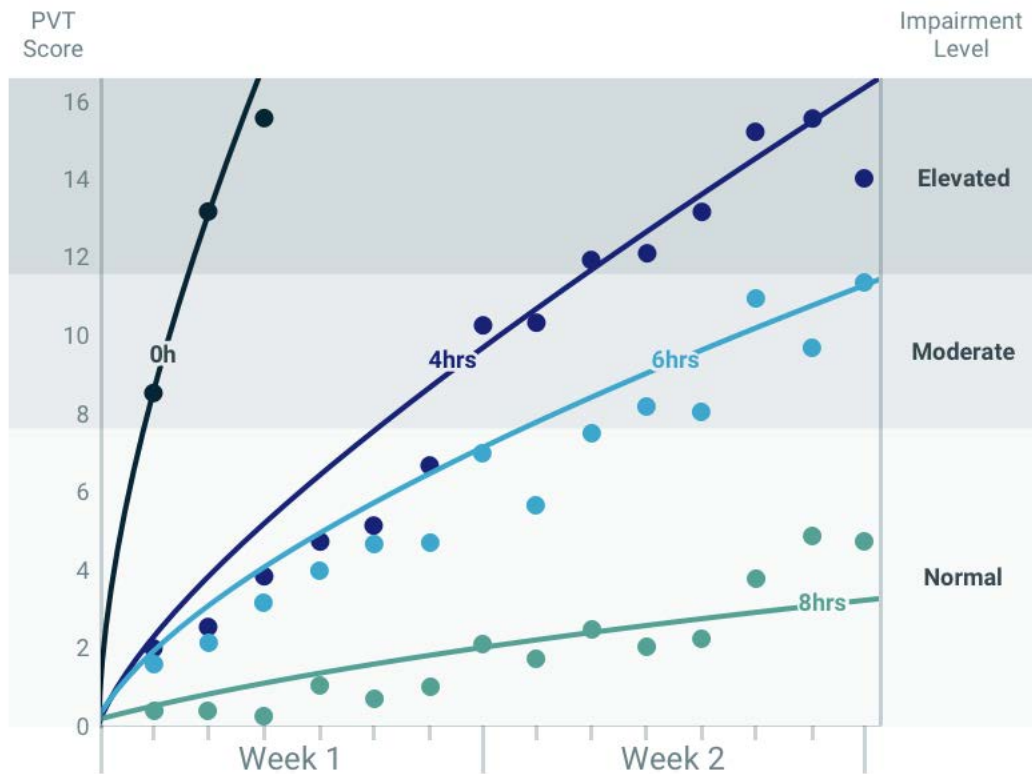
## Sleep Debt

When we go day after day without getting enough sleep we accumulate a sleep debt.

The only way to pay off a sleep debt is to get the sleep that you need plus some extra sleep over a period of several days.

## 14 Day Sleep Restriction Study

Sleep periods were restricted to **0h**, **4h**, **6h**, **8h** per day.

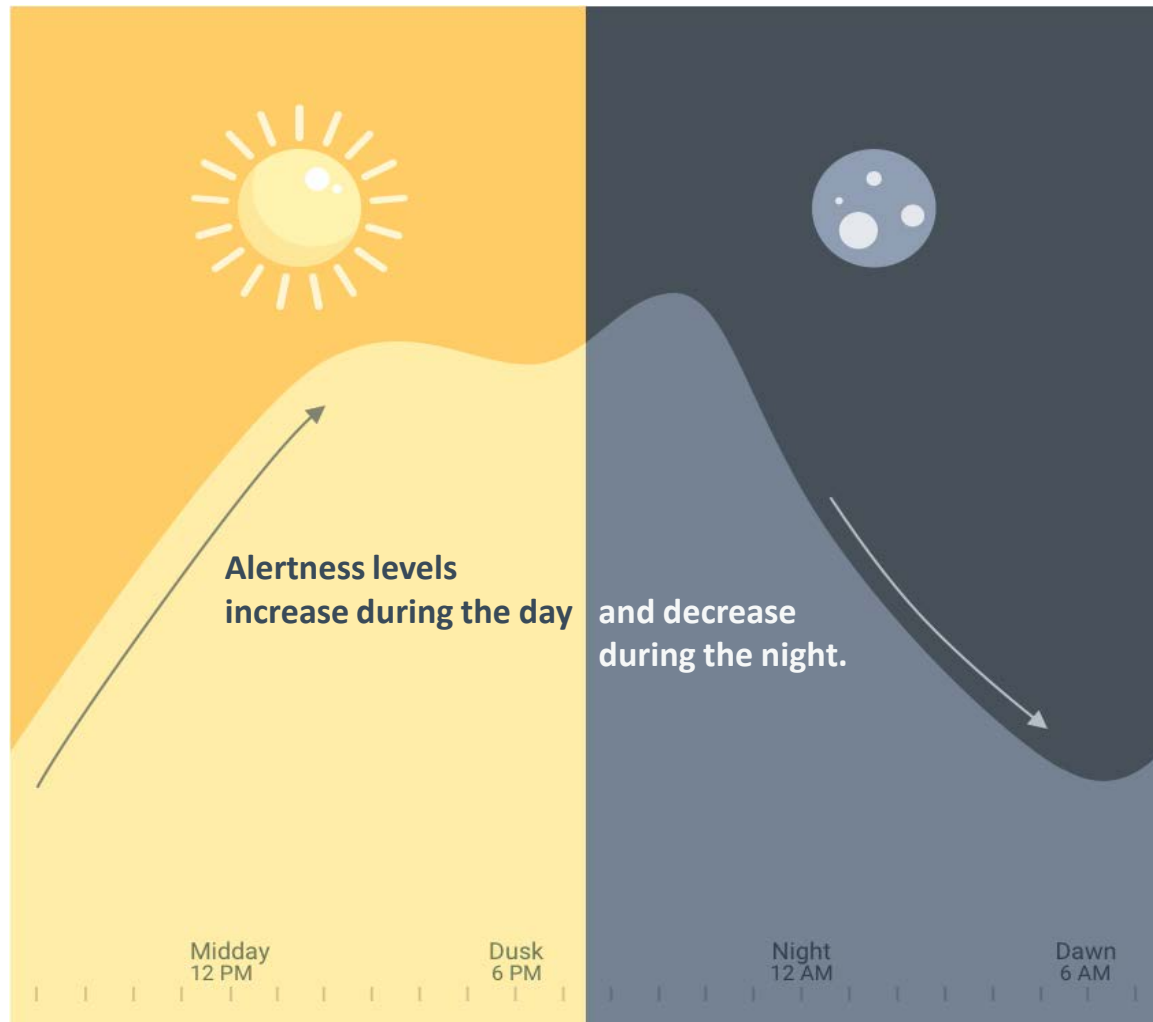




## Time of Day

Our circadian rhythm promotes alertness during the day and sleepiness during the night.

Some adaptation to night work can occur, but most people do not fully adapt because daylight resets the biological clock.



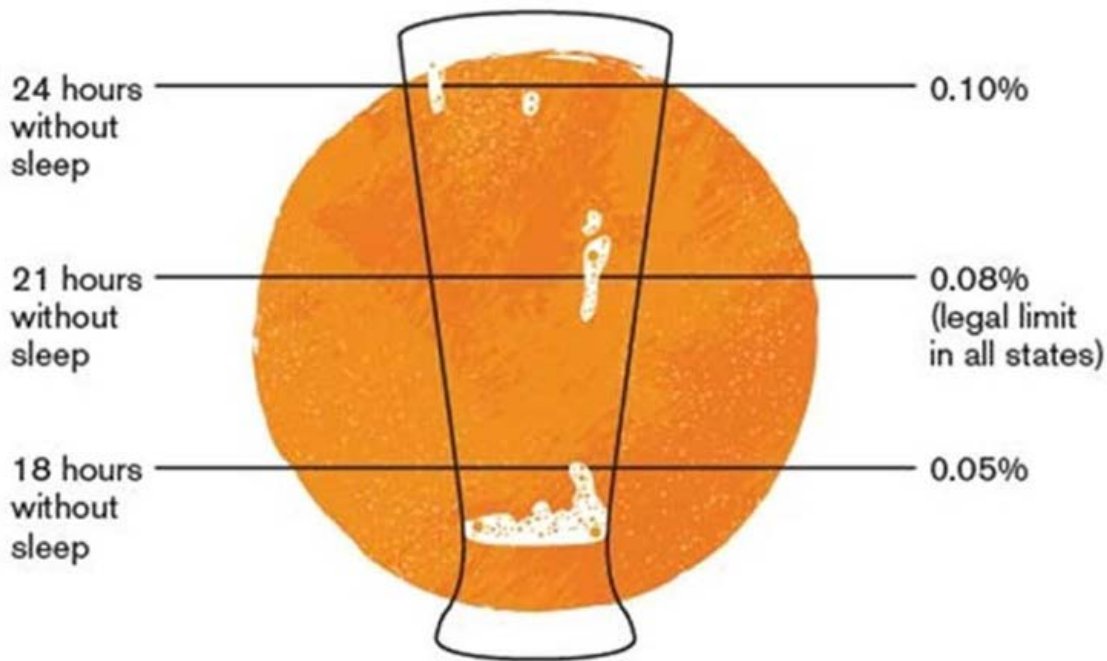


## Long Days

Fatigue deficits accelerate after being awake for longer than 17 hours.

For example, if you wake up at 8:00am you will experience alertness impairments by 1:00am that are similar to the state of being intoxicated.

## Lack of Sleep Mimics Blood Alcohol Concentration



Source: Dawson et al., 1997



# Thank You

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