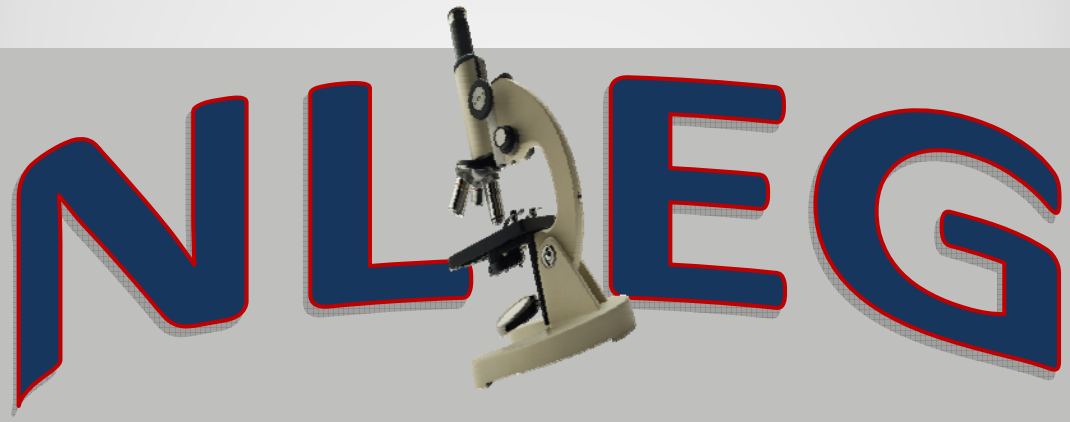
Managing Shift work and Fatigue



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  Massey University, Wellington

- Dr Sarah Jay
- Professor Philippa Gander

SLEEP / WAKE RESEARCH CENTRE

- Changes to Occupational Health and Safety Legislation
  - Positive duty to proactively manage H&S in the workplace.
  - Fatigue and Stress are workplace hazards
  - Consequential health risks also a potential issue
  - Requires the employer to share relevant information, give employees the opportunity to express views and contribute to decision making.
- Impact on people's lives, health and wellbeing
- Time spent, frustration, source of aggravation in the workplace

Why is this important?

A reduction in physical or mental ability as the result of physical, mental or emotional exertion that may impair nearly all physical abilities including strength, speed, response time, coordination, decision making and balance.

What is Fatigue?

What causes Fatigue?

- Fatigue is caused by:
  - **insufficient sleep**
  - **excessive wake**
  - **time of day (body clock)**
- Influenced by both work and non-work factors:
  - **Hours of work**
  - **Workload**
  - **Breaks**
  - **Sleep and other medical conditions**
  - **Family and social commitments**

Sleep

Sleep is Vital; no sleep = death

Puppies

4 to 6 days

Dogs (adult)

9 to 17 days

Rabbits

4 to 5 days

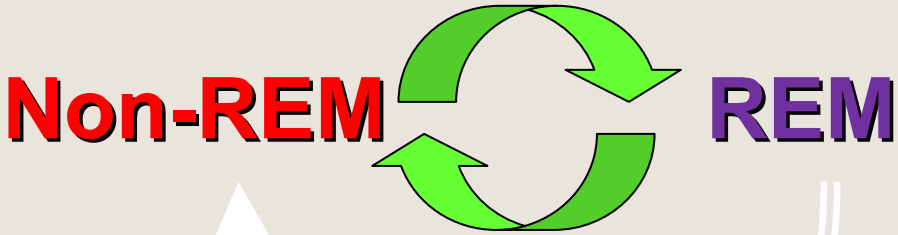
Rats

17 to 19 days

Human

> 10 days ?

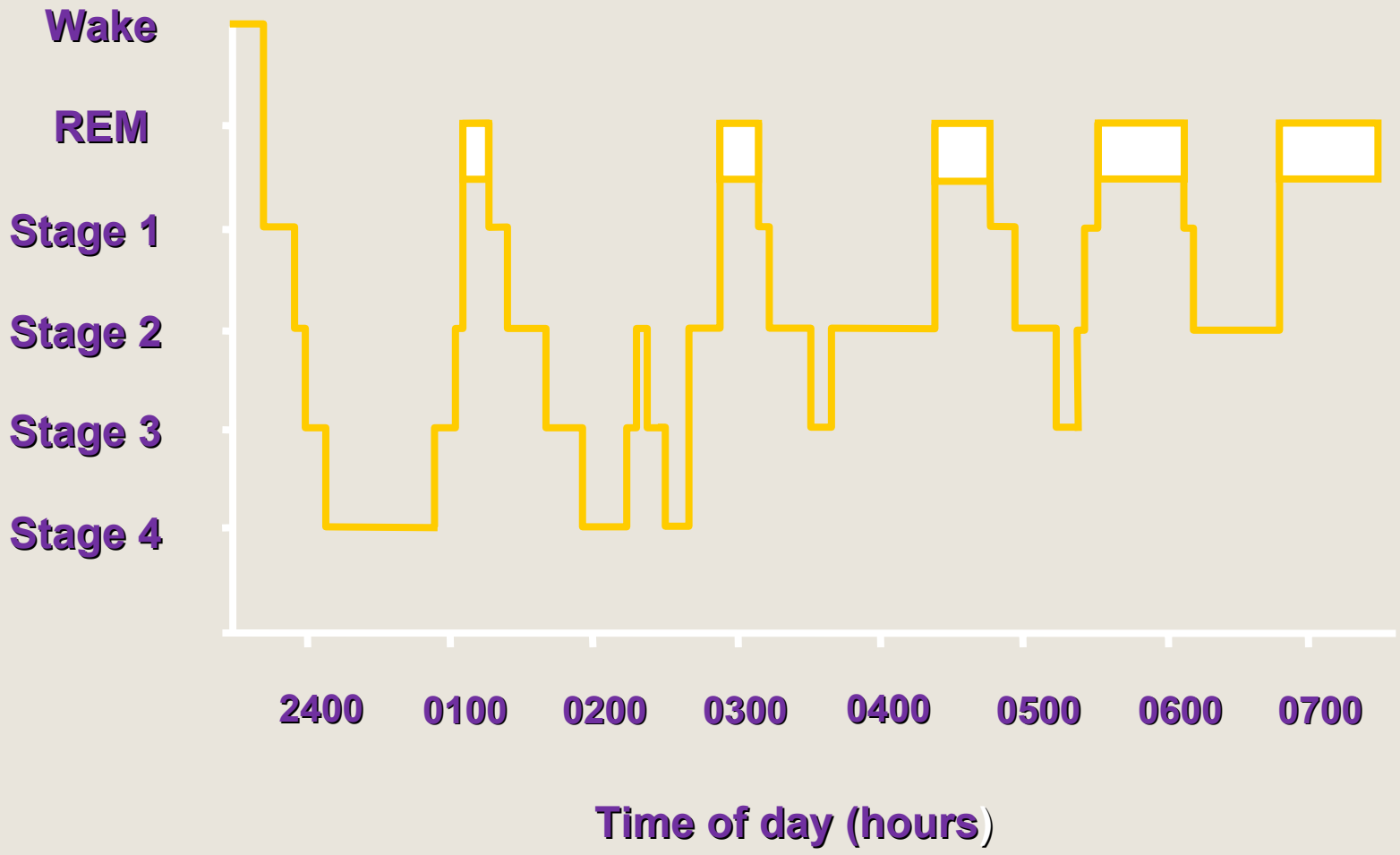
2 Types of Sleep



- deeper as brainwaves slow down (stages 1-4)
- slow, regular heart rate
- slow, regular breathing
- sleep inertia waking from stages 3-4

- rapid brain waves
- eyes moving under eyelids
- vivid dreaming
- uneven heart rate
- uneven breathing
- twitching
- paralysis

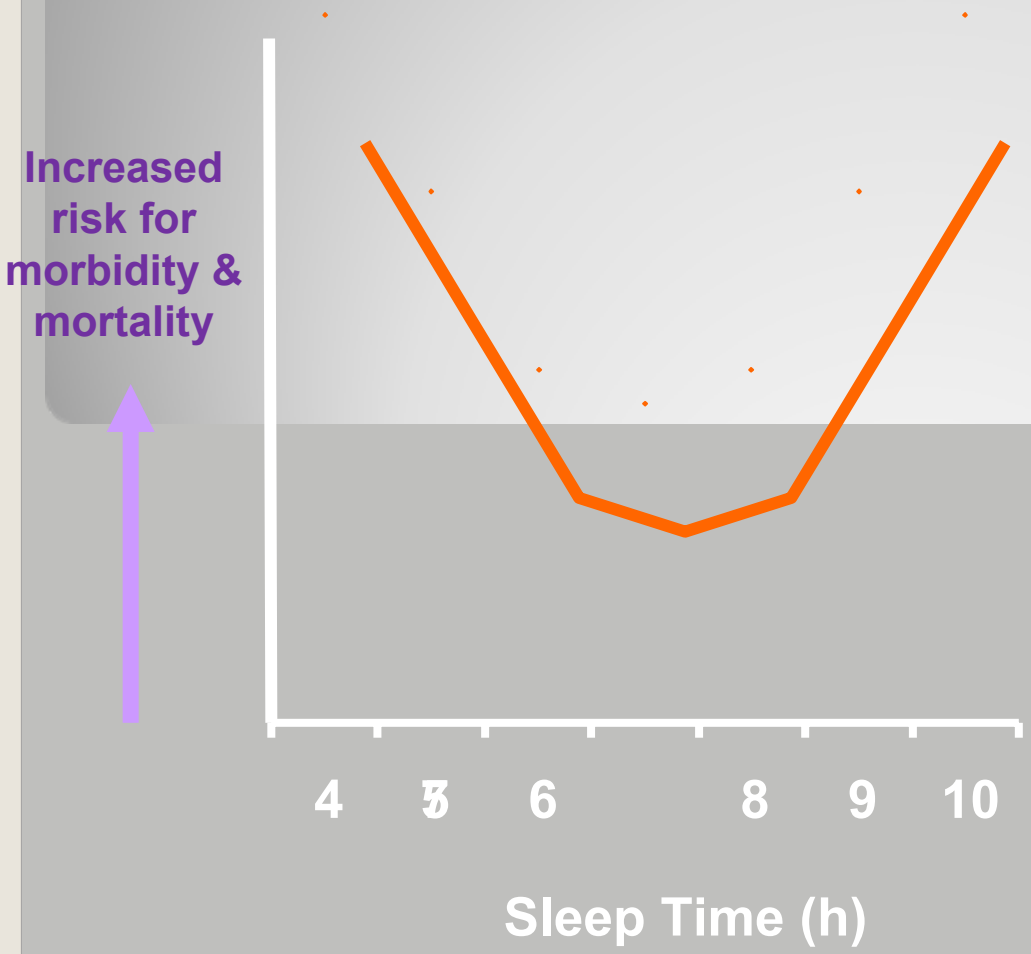
Non-REM / REM Cycle



- should aim to get around 7-8h each night
- there are consequences for our daytime functioning when we regularly restrict sleep below about 6h per night

Sleep Quantity

Sleep Quantity



Epidemiological studies suggest that there is a U-shaped curve associated with sleep durations

Both long and short sleep are associated with an increased risk of morbidity and mortality

The factors mediating these relationships are unknown

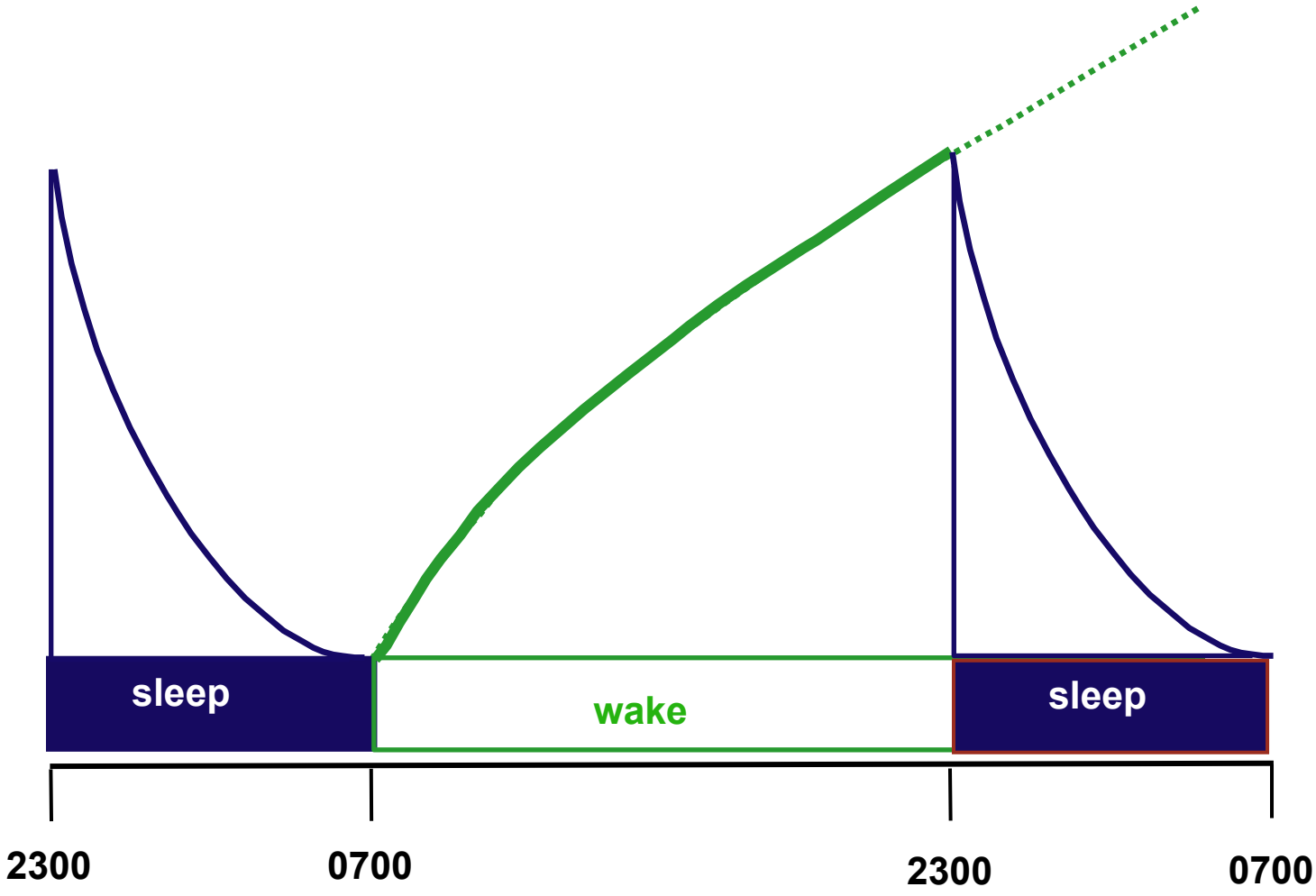
Sleep Quality

- Depends on sleep structure and continuity
- Less restorative if:
  - increased awakenings and arousals
  - frequent shifts to lighter stages of sleep
- Broken sleep does not restore you like solid sleep
- Factors affecting sleep quality:
  - Age
  - Drugs
  - Caffeine
  - Sleep environment
  - Sleep disorders

Sleep Loss

The Sleep Homeostat

less we sleep the harder it is to resist!

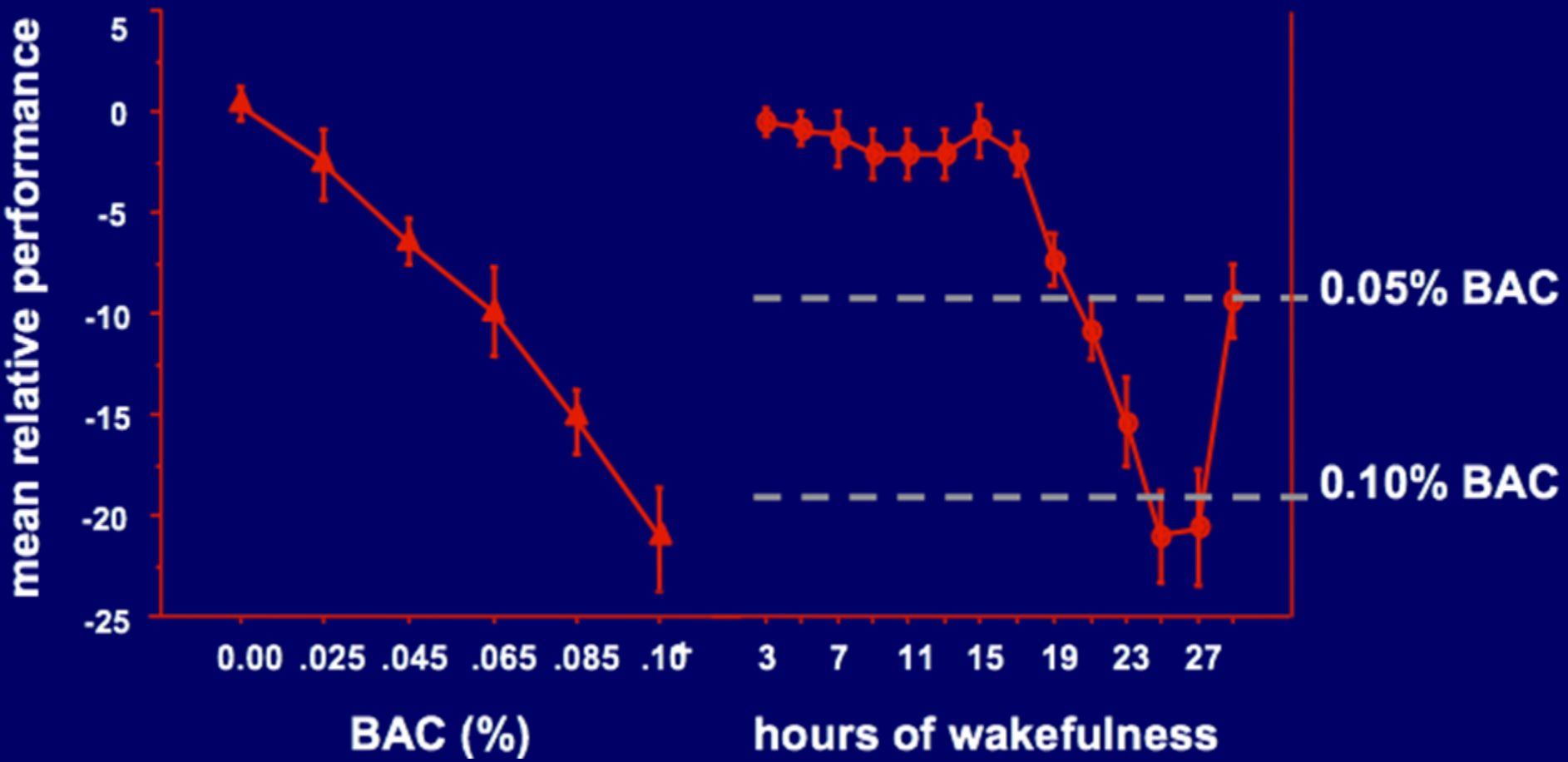


Effects of Sleep Loss

- Not enough sleep affects the brain
  - feeling sleepier
  - difficulty staying alert
  - getting irritable
  - slower reactions
  - poorer coordination (clumsiness)
  - poorer decision making
  - harder to concentrate
- Not enough sleep affects the body
  - increased appetite
  - glucose intolerance
  - weaker immune system
  - Gastrointestinal impacts…..

Total Sleep Deprivation

Sleep Loss v Alcohol Intoxication

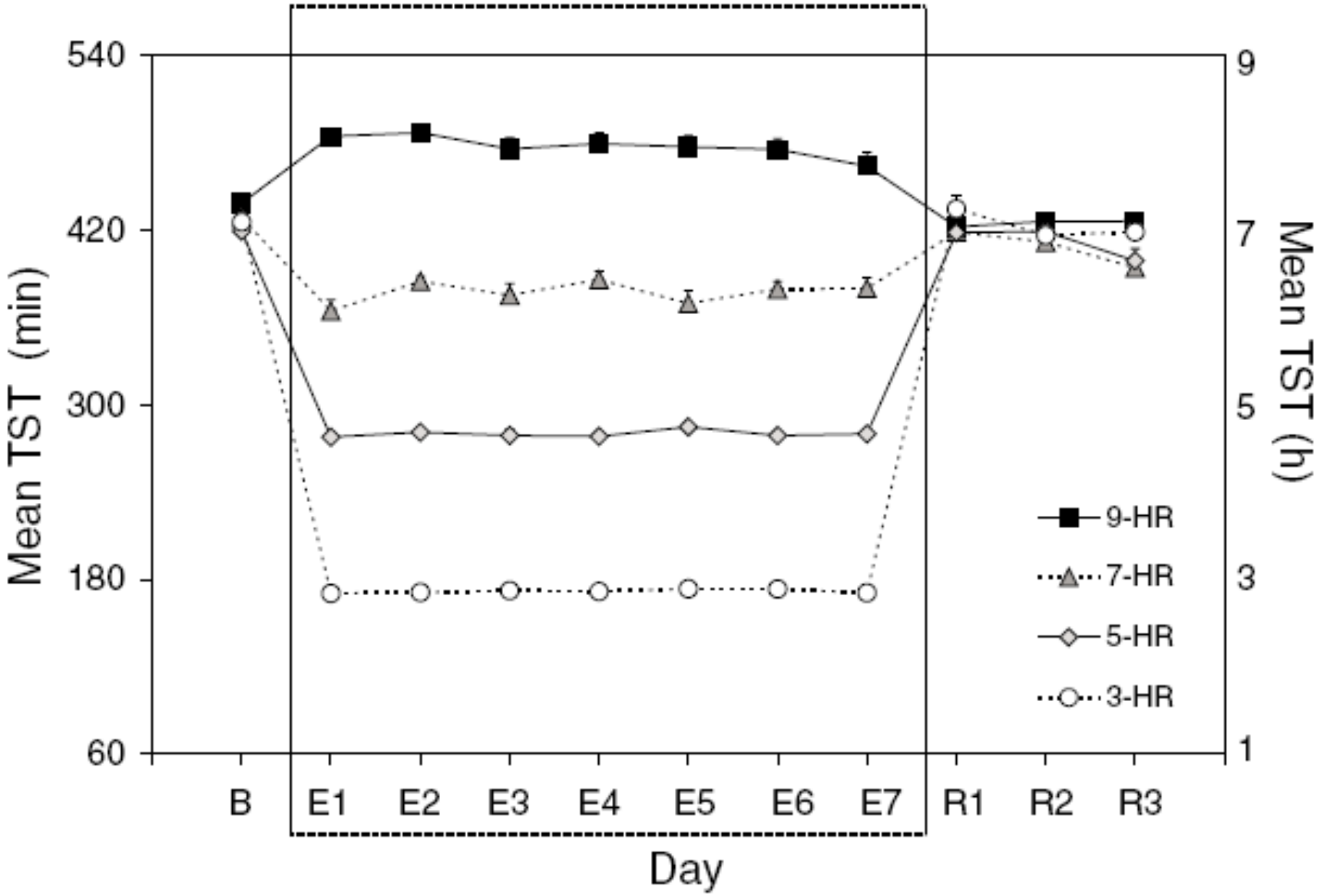


Lamond & Dawson (1999), Journal of Sleep Research

Chronic Sleep Restriction

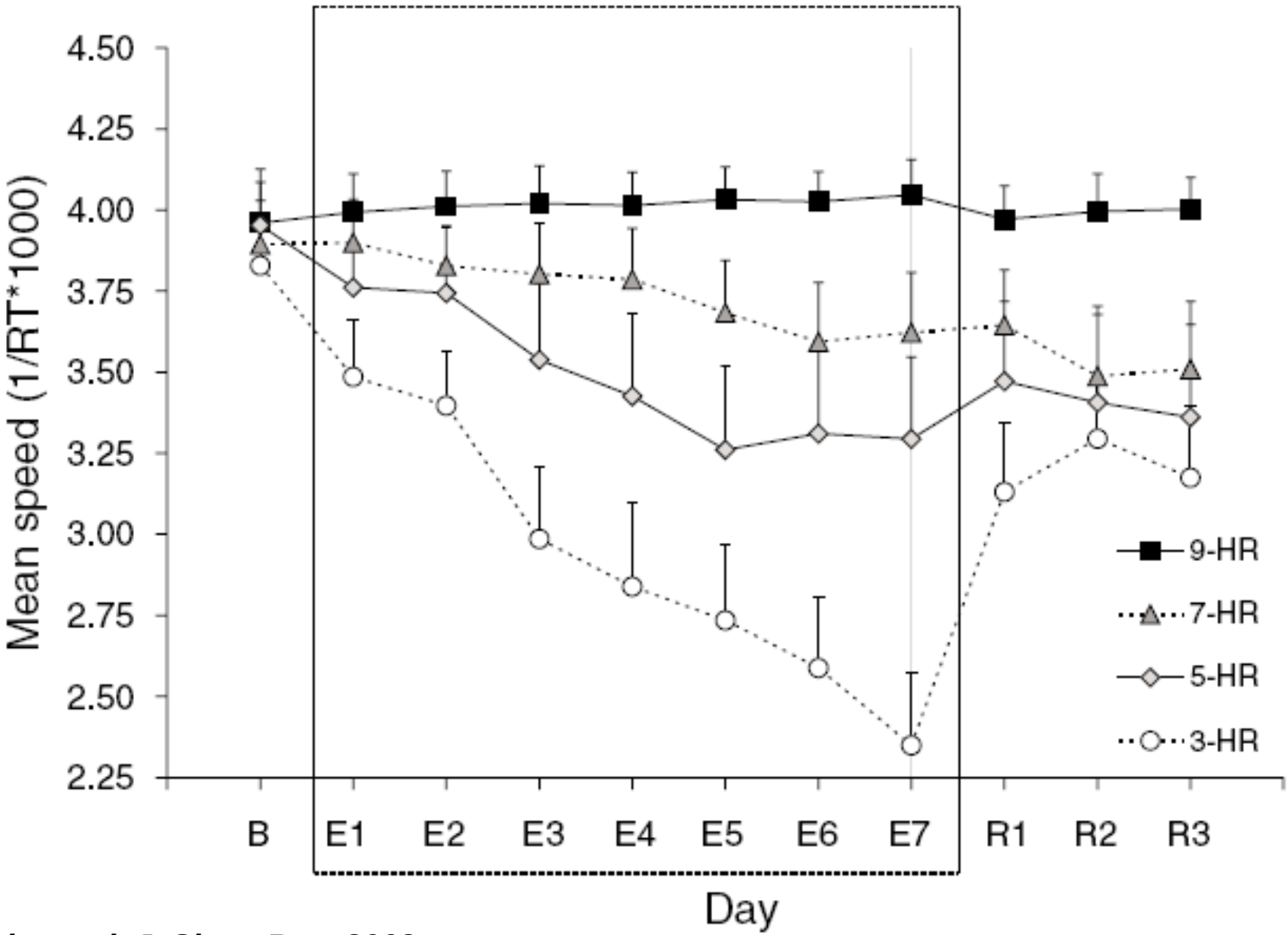
- Not getting enough sleep over several nights/days (<6h per night)
- Accumulate a sleep debt
- Consequences can be as severe as those associated with total sleep deprivation

TOTAL SLEEP TIME



Belenky et al, J. Sleep Res, 2003

RESPONSE TIME PERFORMANCE



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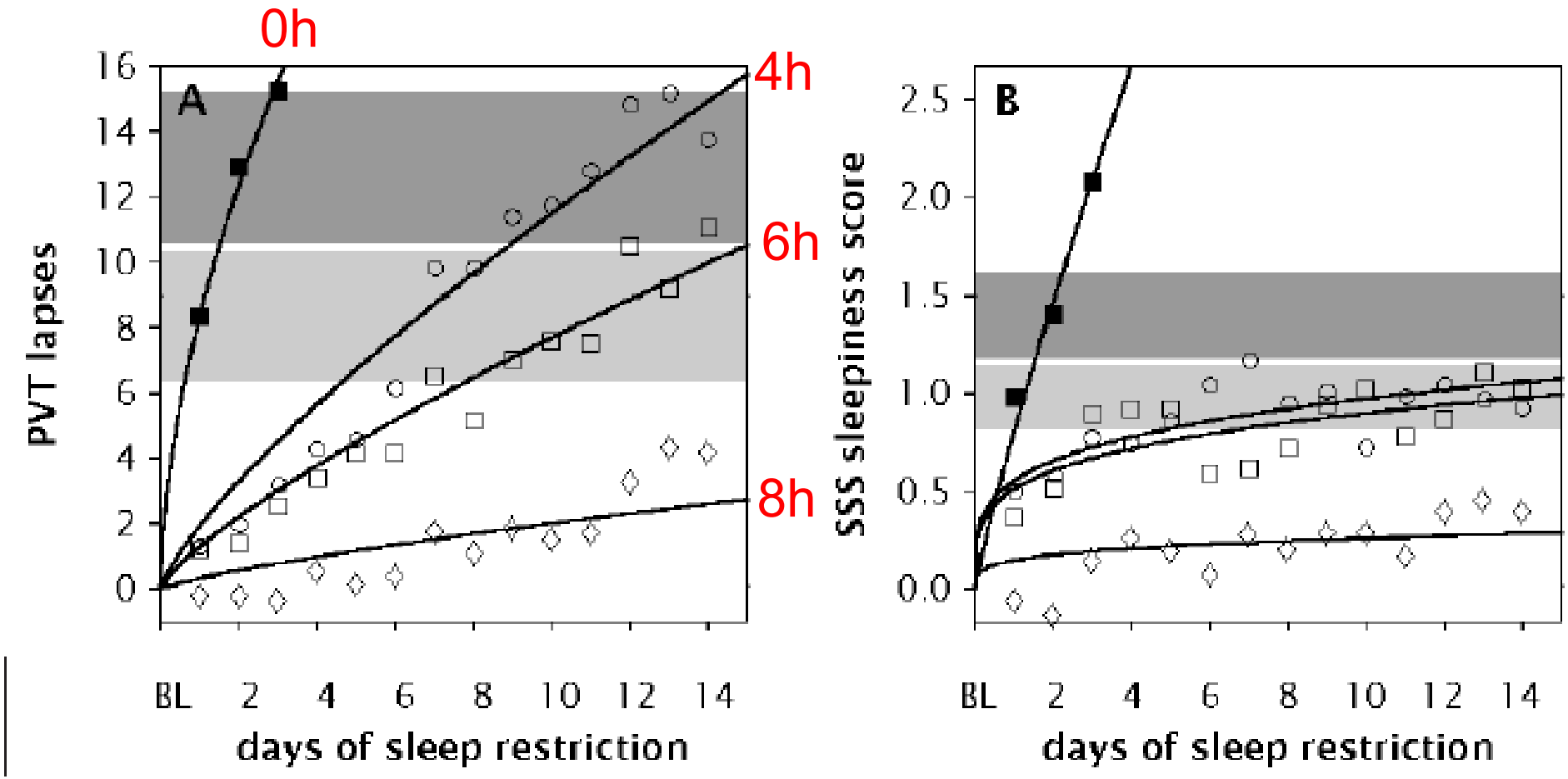
Chronic Sleep Restriction v Total Sleep Deprivation



Van Dongen et al, Sleep, 2003

Time of Day

Circadian Rhythms

physiological processes that occur rhythmically and persist with an endogenous period of approximately 24-hours in the absence of environmental time cues

Circadian clock is synchronised by external cues:

day/night cycle
social cues
work patterns

The Circadian Clock

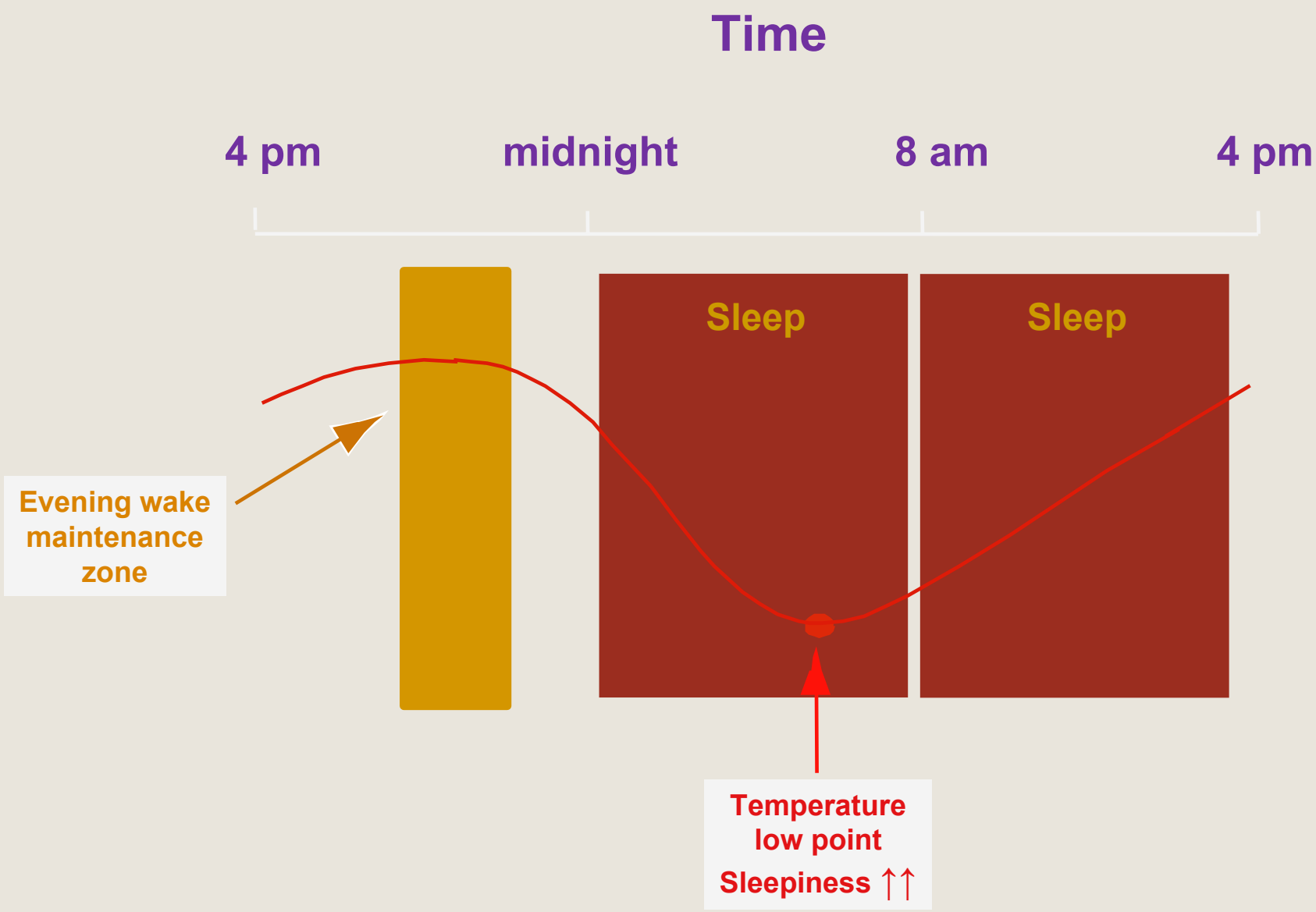
- The circadian clock regulates many of our physiological and behavioural processes of which sleep is only one

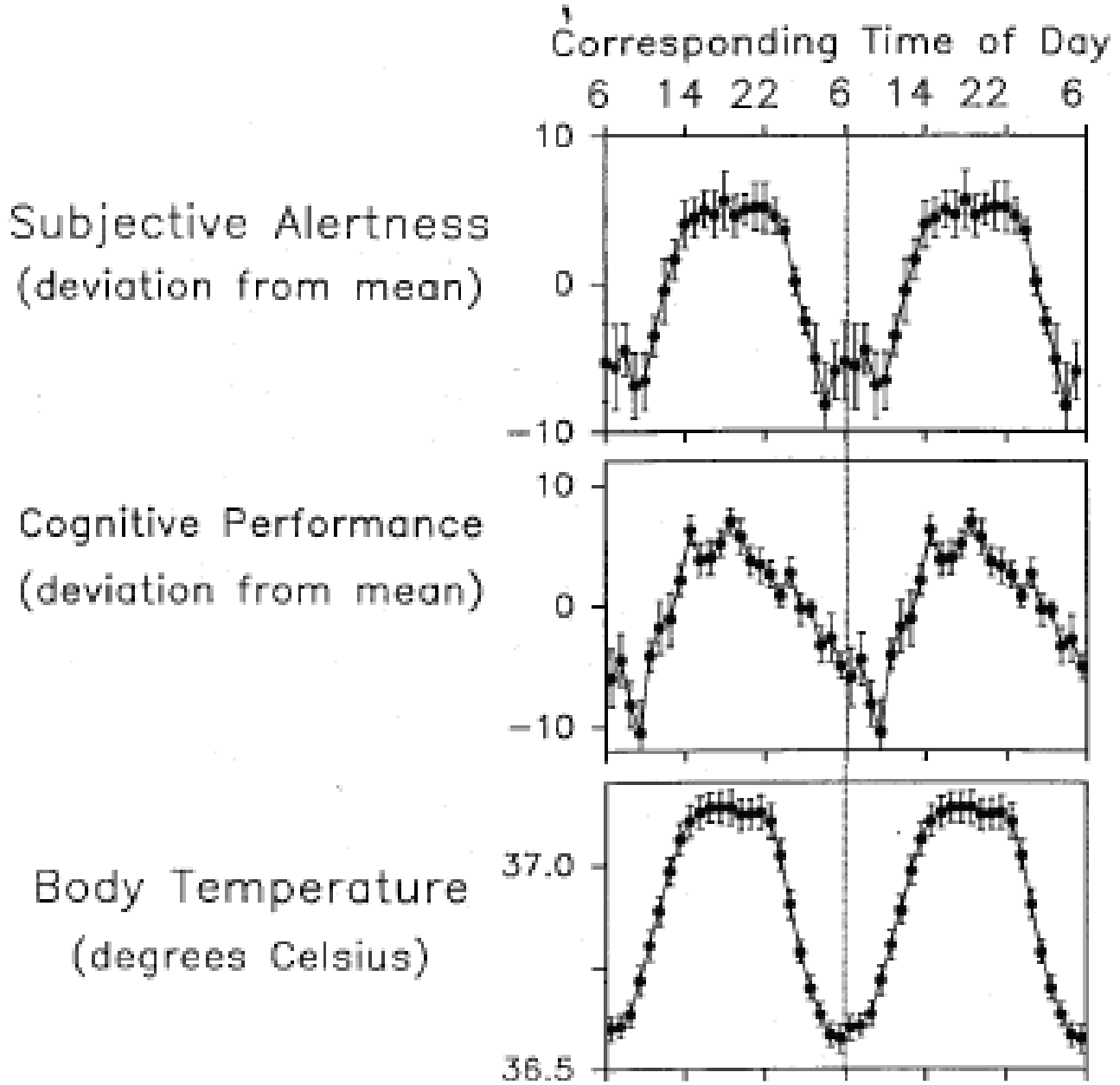
e.g core body temperature

hormone production

alertness/sleepiness

performance


Time
4 pm
midnight
8 am
4 pm
Sleep
Sleep
Evening wake maintenance zone
Temperature low point
Sleepiness ↑↑



Dijk & Edgar, 1999

Shift Work

- Not just night work
- Not just rotating schedules but fixed schedules as well

“any work pattern that requires you to change your sleep pattern”

Shift Work: physiological definition

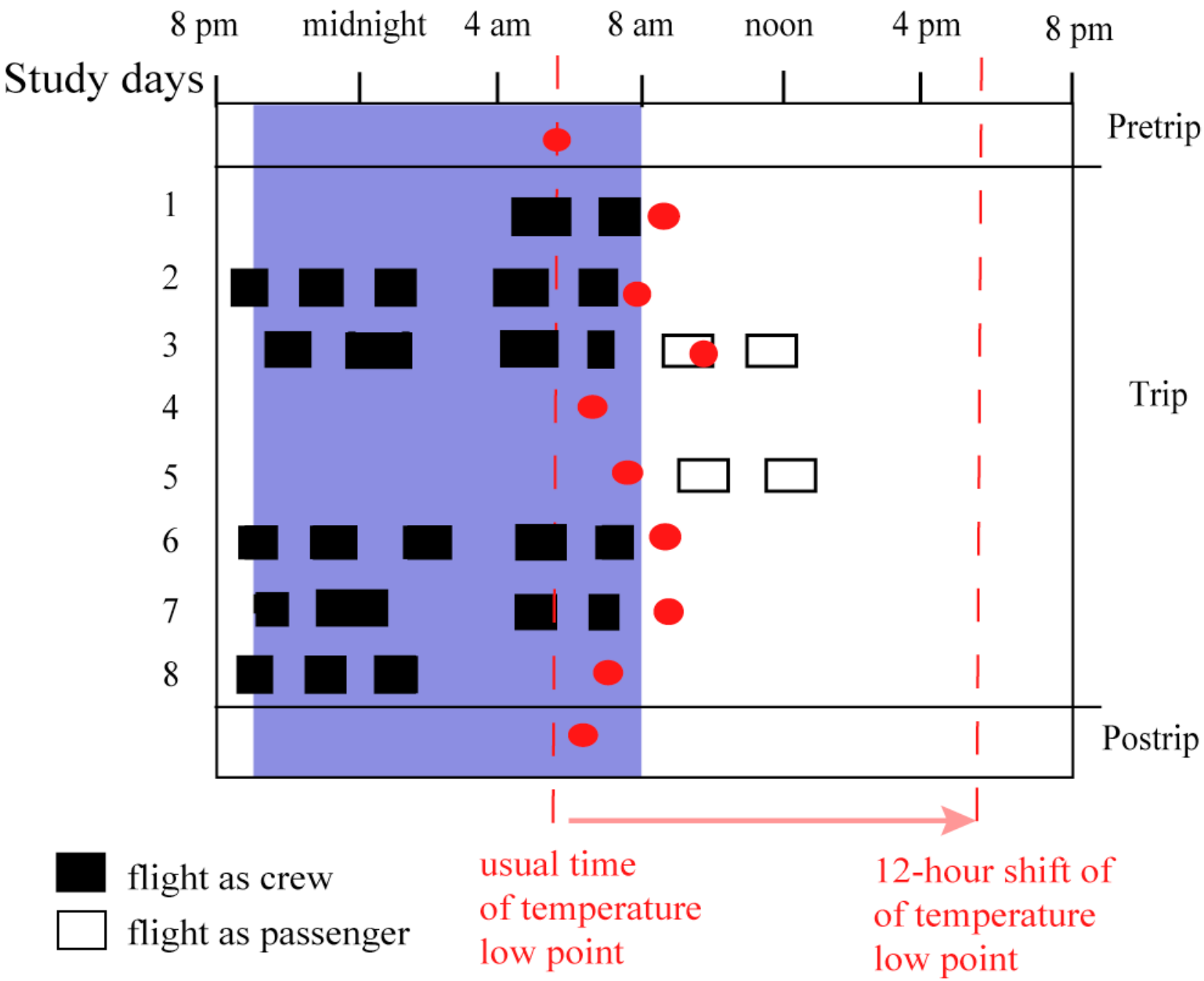
- Easier access to shopping, recreation & government facilities
- Reduced reliance on paid child care
- Greater attendance at family, social & school functions during the day
- Travelling outside of peak times
- Increased income
- Greater flexibility of work-times

Advantages of Shift Work

Problems With Shift work

- The clock can’t adapt
  - the day/night cycle and the rest of society don’t change
- Trying to work when least functional
- Trying to sleep when primed for wake

Clock can’t adapt



Shift Work and Sleep

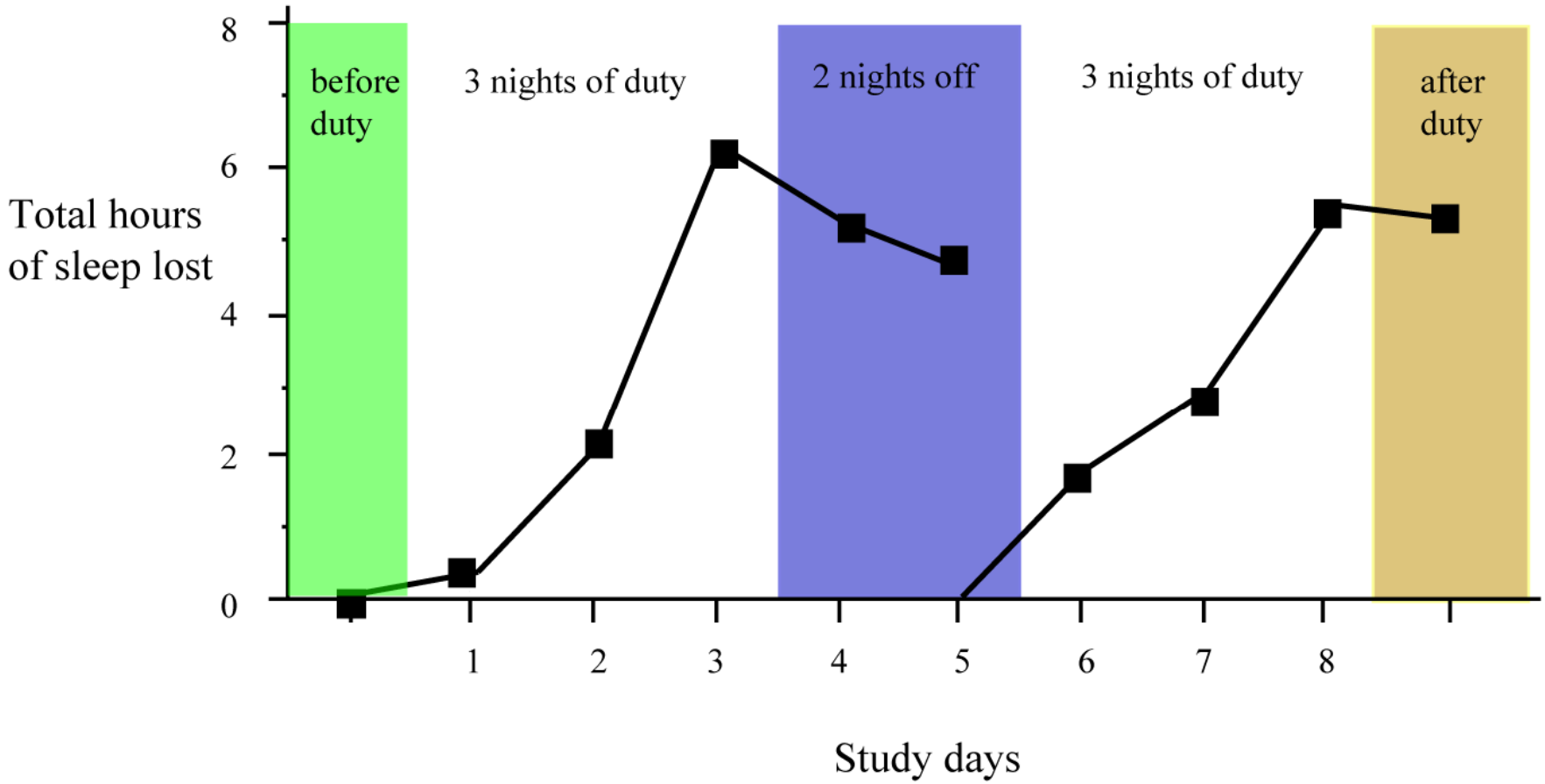
- Trying to sleep when primed for wake
- Trying to sleep when there is most distraction
  - other time demands
  - noise
  - light
  - heat
- Over the course of a roster may accumulate a significant sleep debt

Sleep Debt

- Total sleep time when working night shifts and/or morning shifts is typically reduced compared to day shifts

- Shift workers are a risk of accumulating significant sleep debt

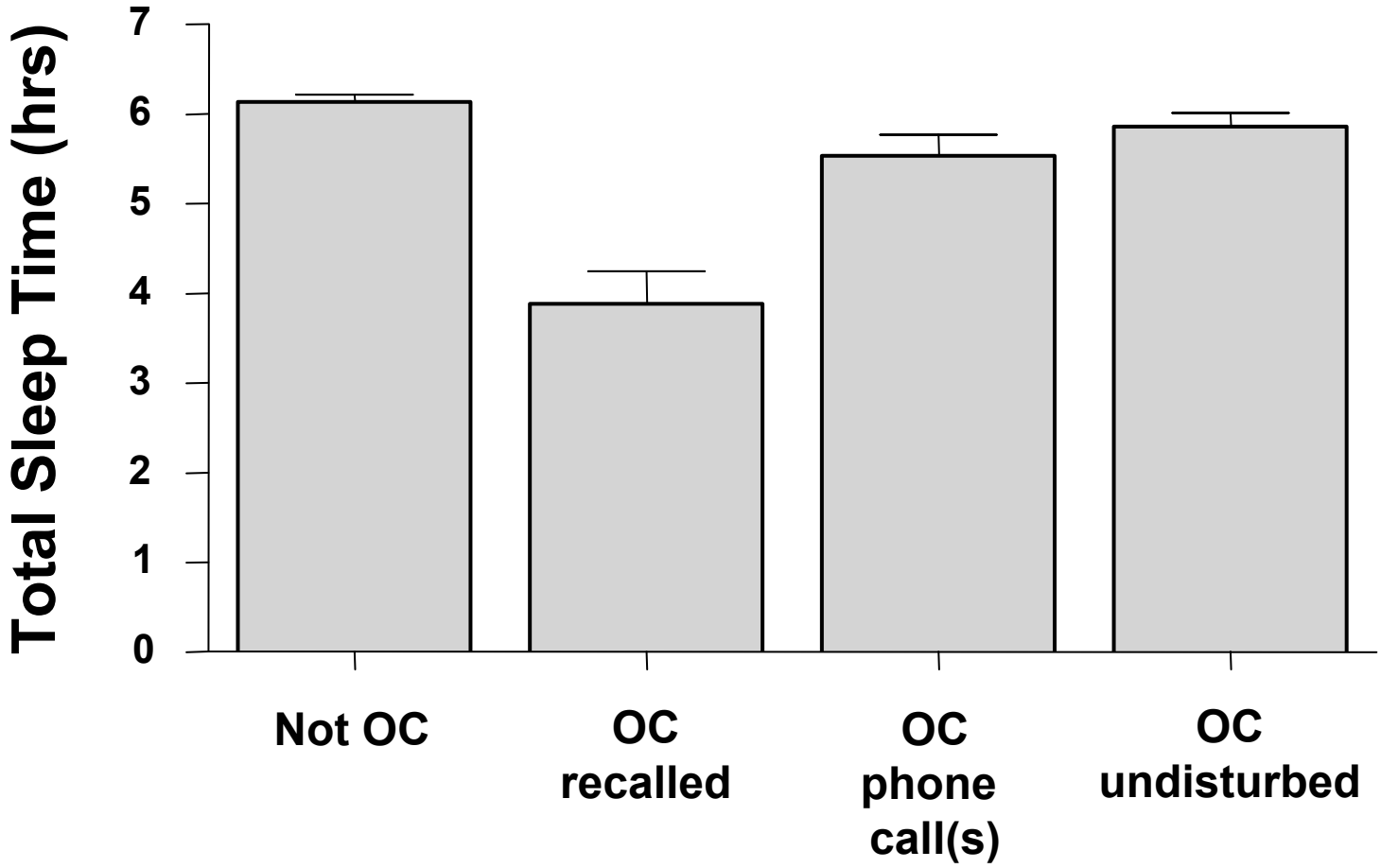
Sleep Debt – Cargo Pilots



Sleep and on-call

- Sleeping can be disturbed even when sleeping at night
- On-call presents a unique set of issues when it comes to fatigue management and rostering

Sleep when On Call



Managing shift work and Fatigue

Managing shift work

- Shift work has been identified as an occupational hazard *(Health and Safety in Employment Act)*
- i.e. has the potential to cause harm in the same way as operating heavy machinery or working with chemicals.
- employers must ensure that rosters take account of the impacts of work patterns, give workers adequate time to recover between shifts and between rosters/schedules.
- employees must report fit for work and behave safely in the workplace

Fatigue Management

- In any 24h operation, fatigue will be an issue
- fatigue cannot be prevented but can be managed
- managing this risk can happen on a number of levels and needs both a commitment from management and individuals

Risk Factors for workplace Incidents

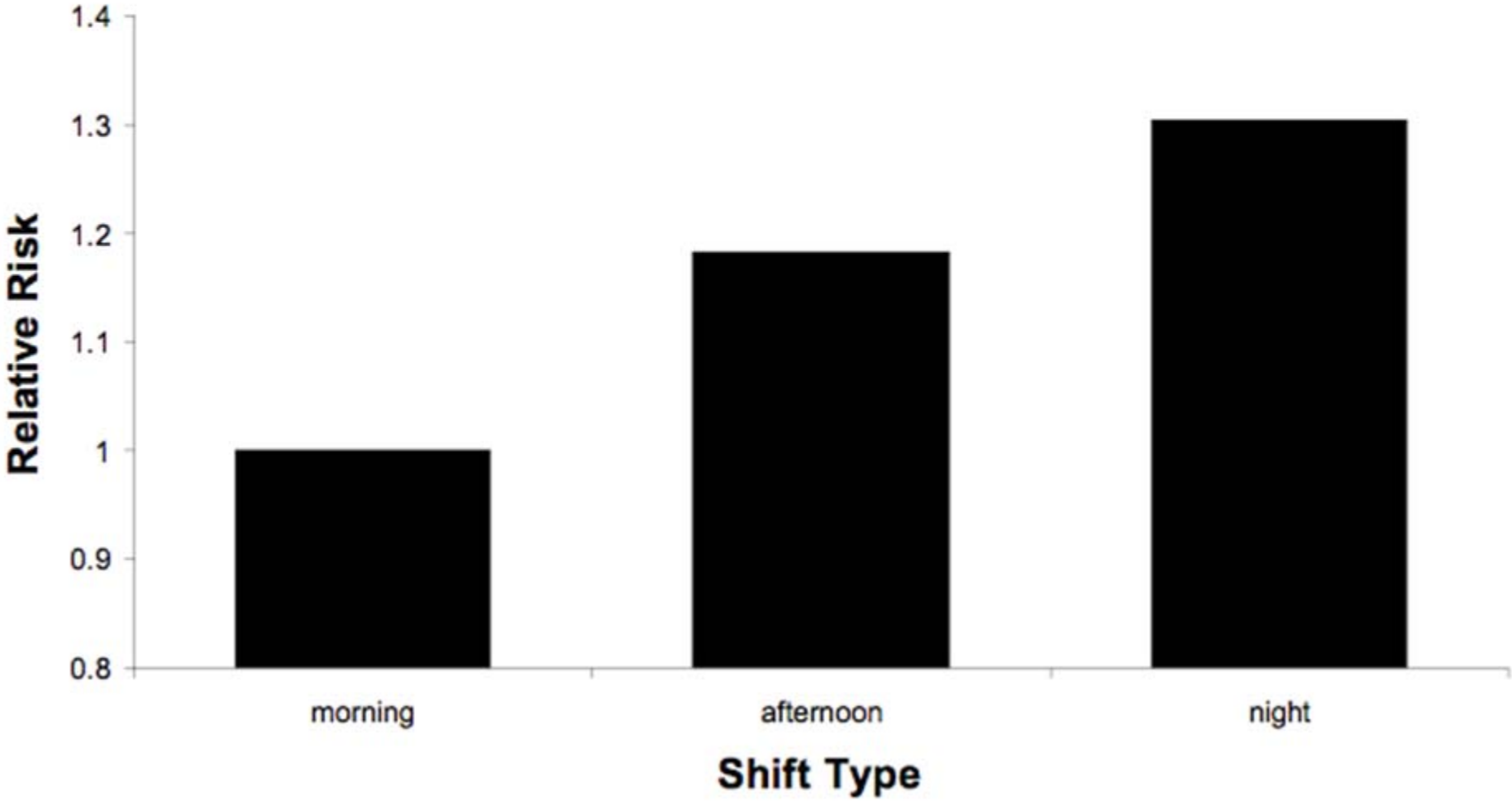
What shift characteristics are associated with increased risk of accidents and injuries?

- **Shift Type**
- **Successive Shifts**
- **Hours of Duty**
- **Time Since Last Break**

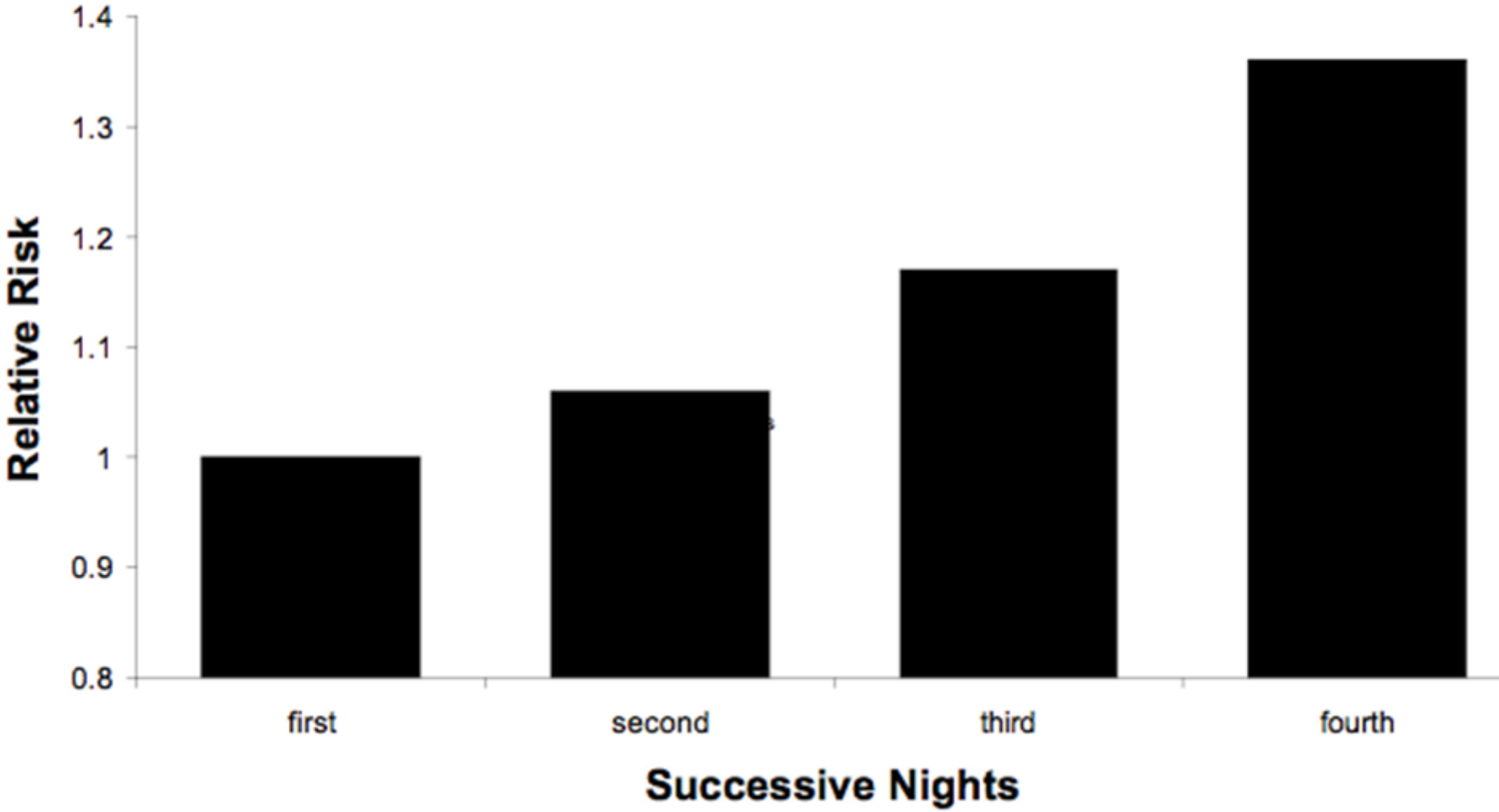
Rosters need to consider all these things

Folkard & Tucker (2003)

Relative Risk
Shift Type



Relative Risk
Successive Night Shifts



Relative Risk
Hours on Shift

- Keeping track of your sleep
- Keeping track of how long you've been awake
- Utilising given sleep opportunities
- Recognising signs and symptoms of fatigue in yourself and colleagues
- Fatigue countermeasures

Self Management Strategies

Monitoring your sleep

- How much sleep did you get last night?
- How much the night before?
- How much on your last day off?
- What affects your sleep?

- Sleep environment
  - dark room
    - use mask or heavy curtains
  - quiet room
    - turn off the phone
    - use ear plugs
  - comfortable temperature
  - comfortable surface

- Very important for night-workers sleeping during the day

Sleep Environment

Drugs and Sleep

- Alcohol
  - can help you fall asleep BUT…
  - blocks REM sleep early in the night
  - withdrawal later in the night - dreams, disturbed sleep
- Sleeping pills
  - most don’t give normal sleep structure (non-REM / REM)
  - effects can last too long and make you sleepy at work
  - can have side effects, interact with alcohol
- Prescription medications
  - can disturb sleep
  - beta blockers, theophylline, Prozac

Strategic use of Caffeine

- Usual dose 50-200 mg
  - **Peak blood levels 30-60 minutes later**
  - **Half-life 3-5 hours**

- Effects on sleep
  - **Postpones sleep onset**
  - **Reduces amount of stage 3 and 4 sleep**
  - **Decreases sleep efficiency**

Napping

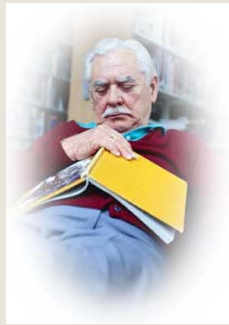
- A short nap can improve alertness for a few hours
- Timing is important as a nap can make it hard to initiate sleep later on
- Sleep inertia - grogginess that lasts about 1/2hr, performance can be impaired

Increasing alertness at work

- Fatigue countermeasures include;
  - Taking a break
  - Working in pairs
  - Having a nap
  - Strategic use of caffeine
  - Task reallocation

Age

- Sleep changes across the lifespan
- Children: sleep more, ↑ Slow Wave Sleep
- About age 50
  - sleep at night becomes lighter, more disturbed, shorter
  - sleepiness during the day increases



Questions?