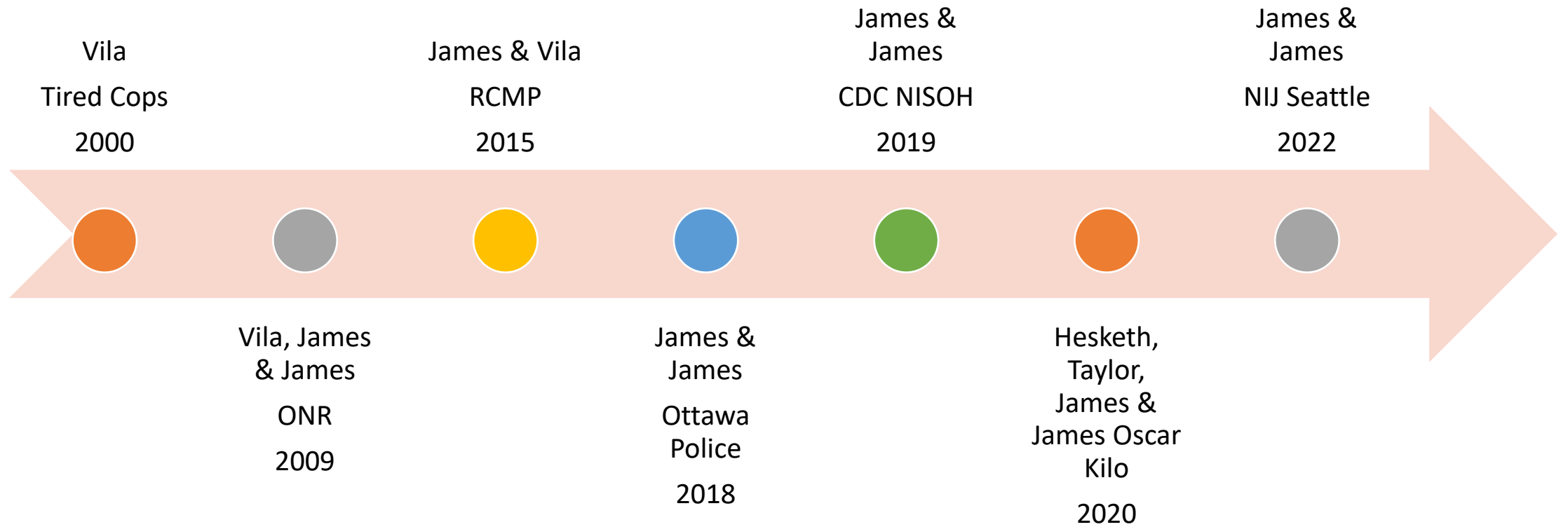


# The Hidden Risks of Fatigue



Stephen James PhD  
Elson S. Floyd College of Medicine





# Simulated Hazardous Operational Tasks Lab



Are you happy with your sleep?

Trust

Job Satisfaction

Education

Training

Leadership

Procedure

Oversight

Policy

Law

IA

EIS

Compstat

Public Satisfaction

Supervision

KPIs

Hiring

Crime Rates

Mentoring

Problem solving  
Judgment  
Planning  
Anticipation  
Speaking  
Self-monitoring  
Emotional expression  
Inhibition of behavior  
Awareness of abilities



Motor planning  
Sexual Behavior  
Personality  
Limitation  
Organization  
Attention  
Concentration  
Mental flexibility  
Initiation





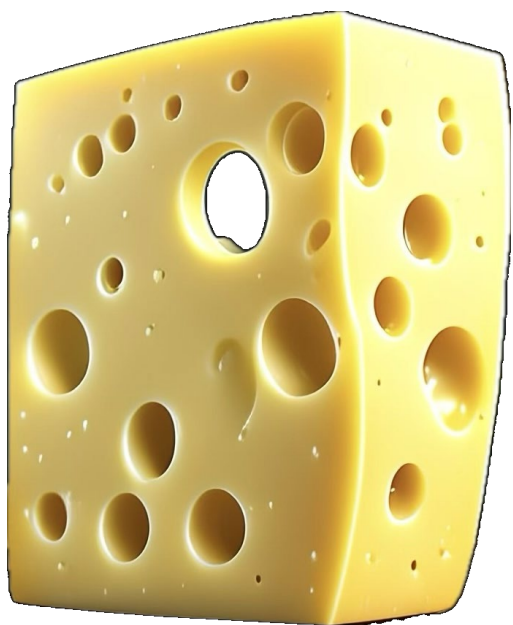


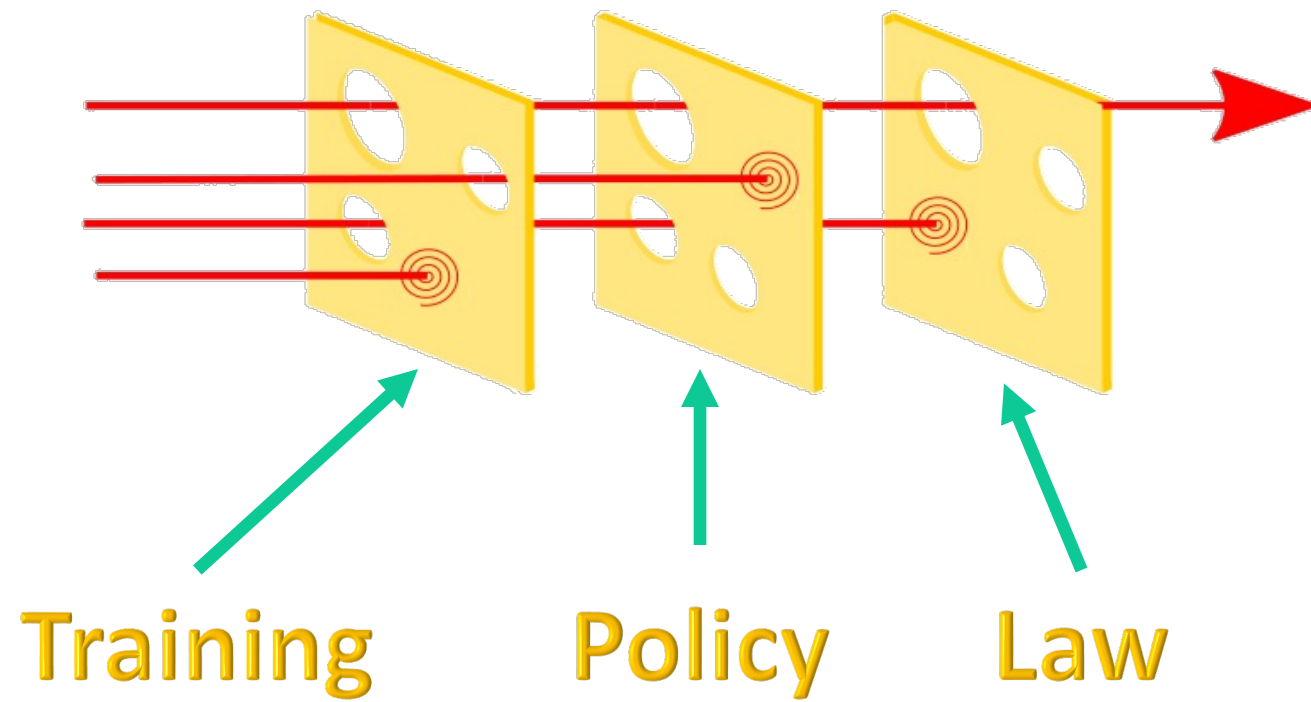
**17 – 24 hours of wakefulness**

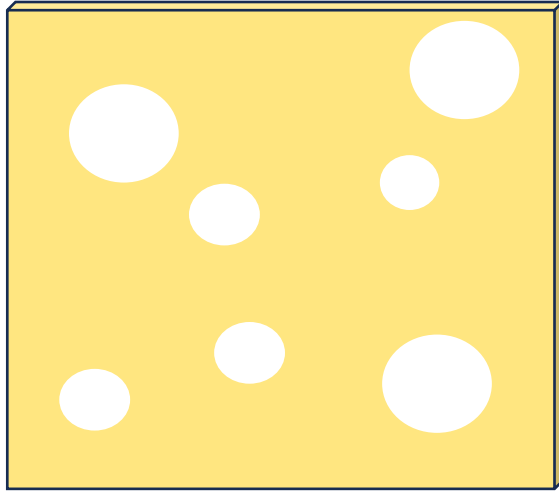
**BAC = 0.10**

# Effects of Fatigue on Skills Needed for Driving

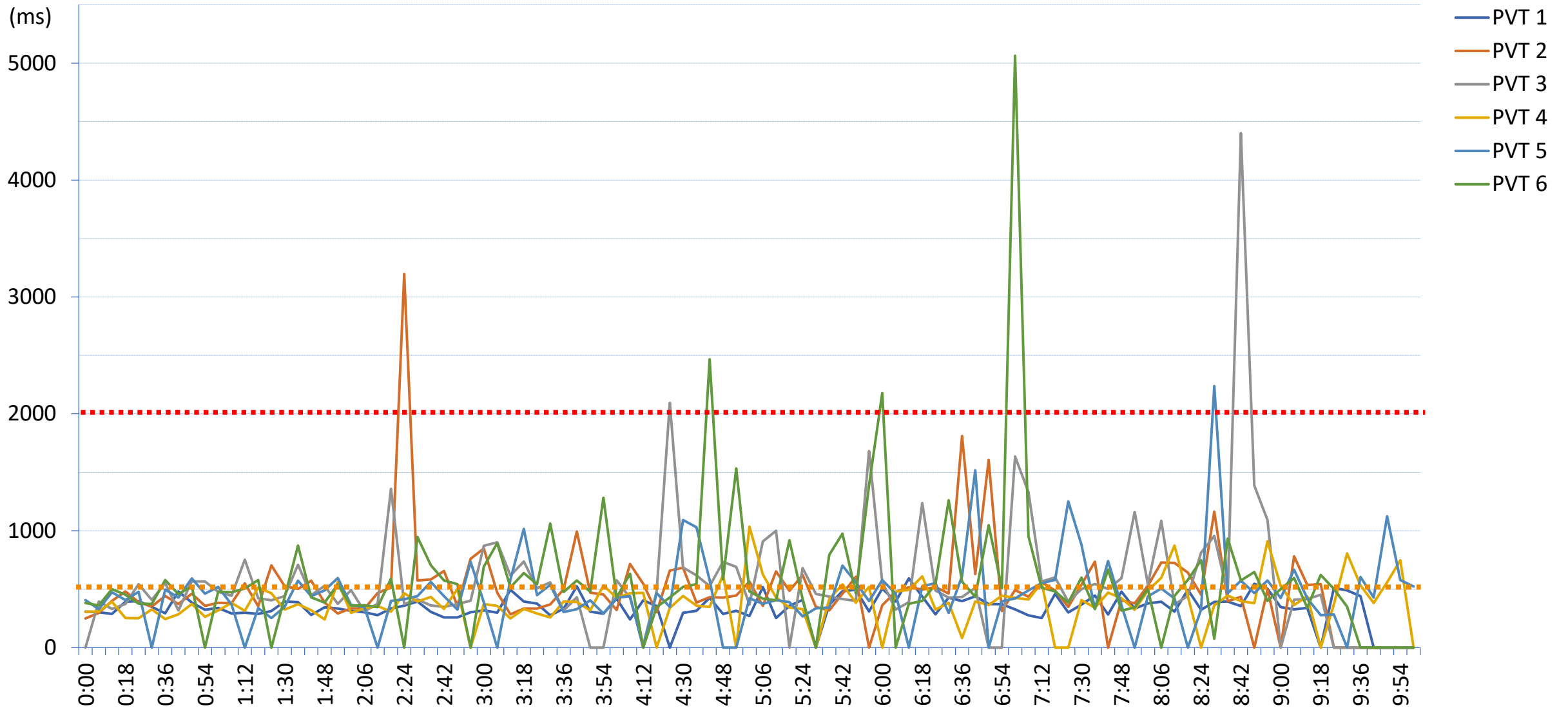
| <b>Fatigue</b>         | <b>17-19 Hours Awake</b> |
|------------------------|--------------------------|
| Reaction Time Speed    | ↓ 9%                     |
| Reaction Time Accuracy | ↓ 225%                   |
| Dual Task Speed        | ↓ 10%                    |
| Hand Eye Coordination  | ↓ 10%                    |
| Object Tracking        | ↓ 7%                     |
| Vigilance Speed        | ↓ 14%                    |
| Vigilance Accuracy     | ↓ 14%                    |
| Vigilance False Alarms | ↑ 55%                    |
| Spatial Memory         | ↓ 13%                    |
| Tiredness              | ↑ 77%                    |
| <b>Alcohol</b>         | <b>0.05 BAC</b>          |



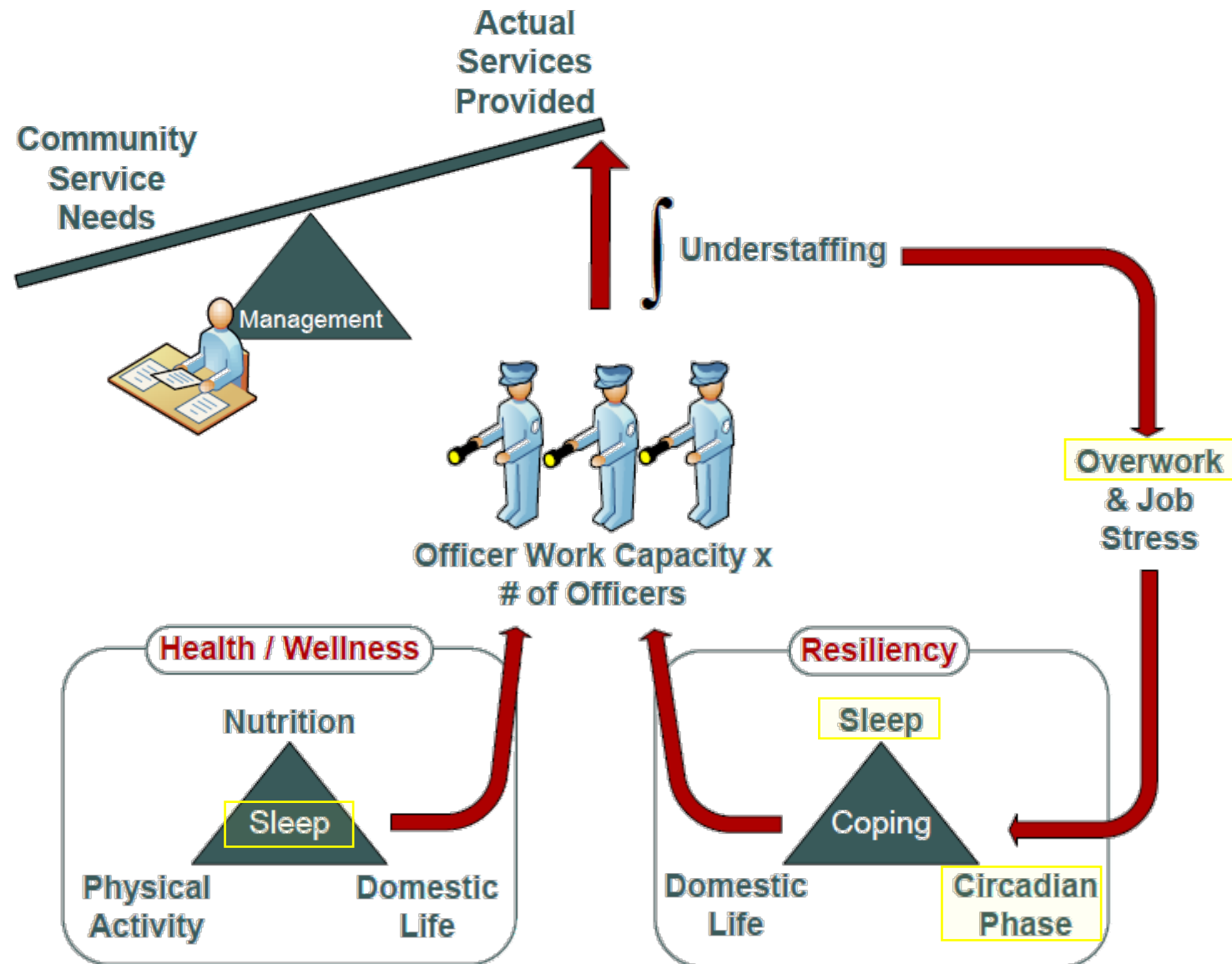




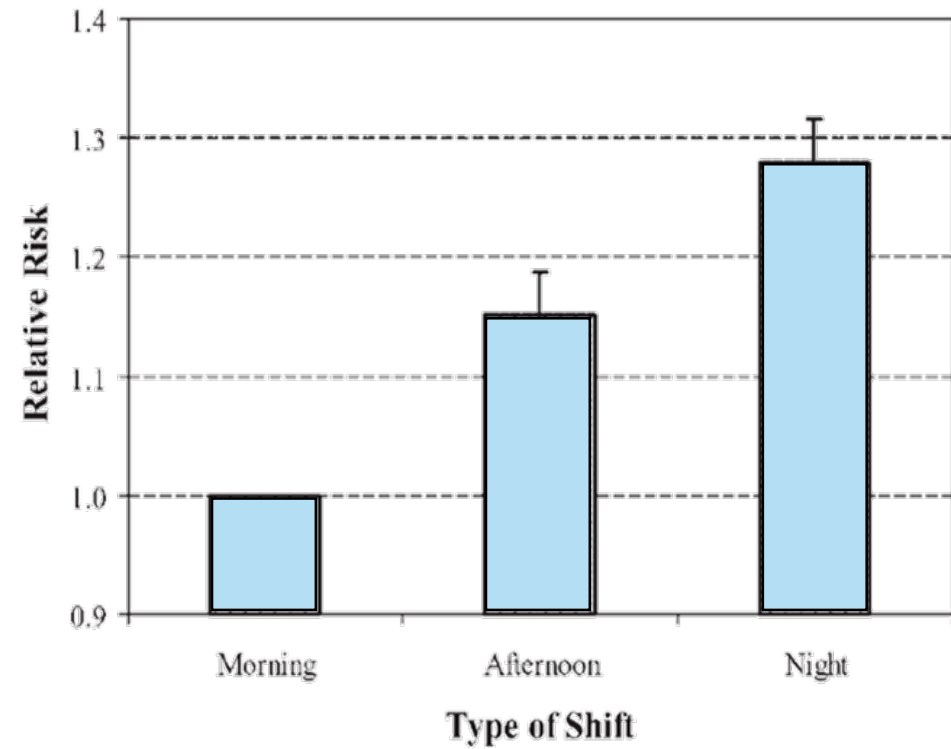
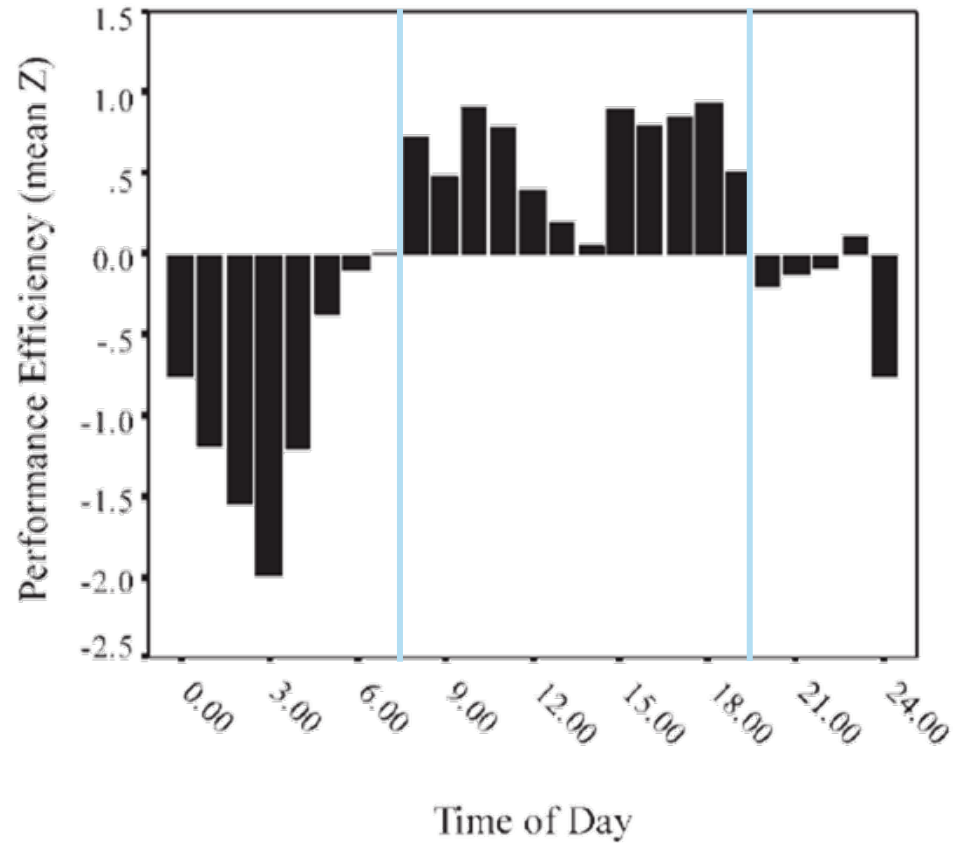
# Vigilance



# Managing Police Fatigue

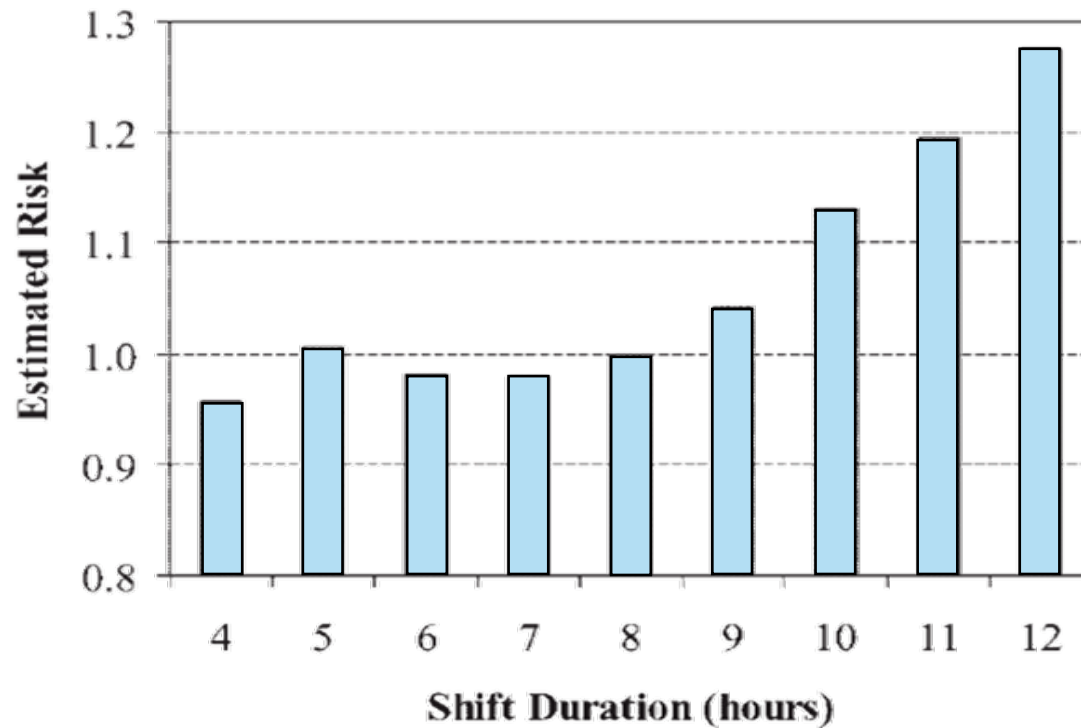


# Risks Associated with Type of Shift

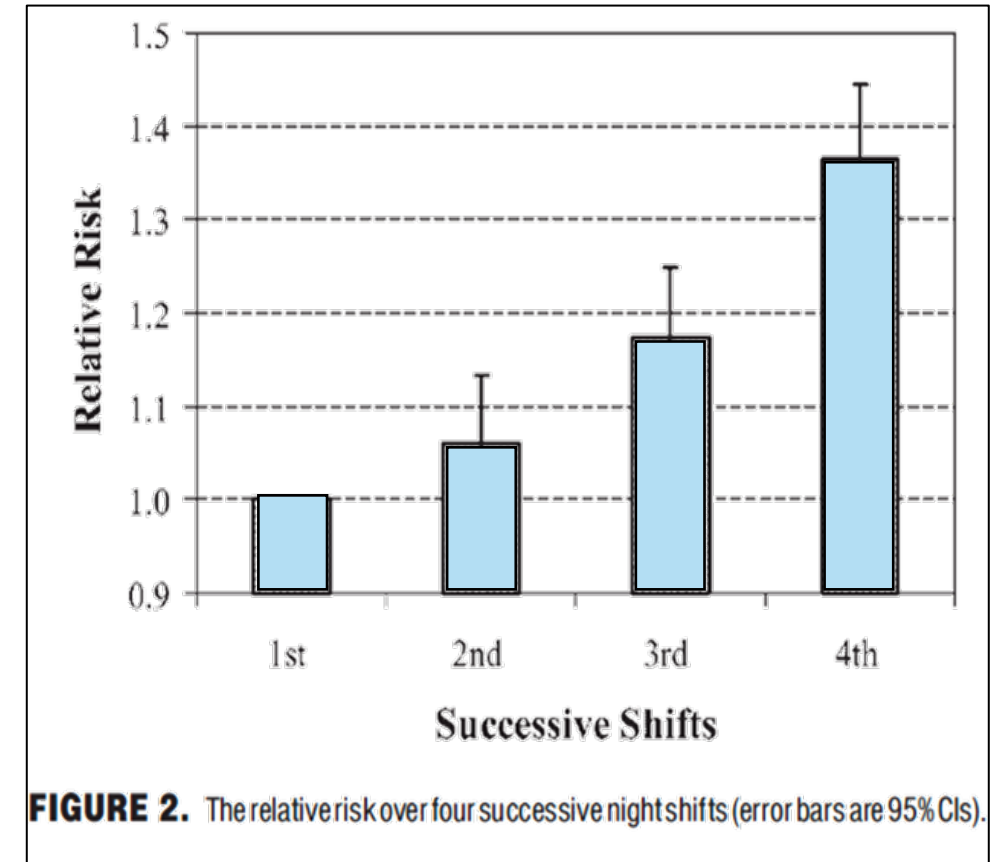


**FIGURE 1.** The relative risk across the three shifts (error bars are 95% CIs).

# Risk Associated with Length of Shift and Consecutive Shifts



**FIGURE 5.** The estimated relative risk on different lengths of shift.

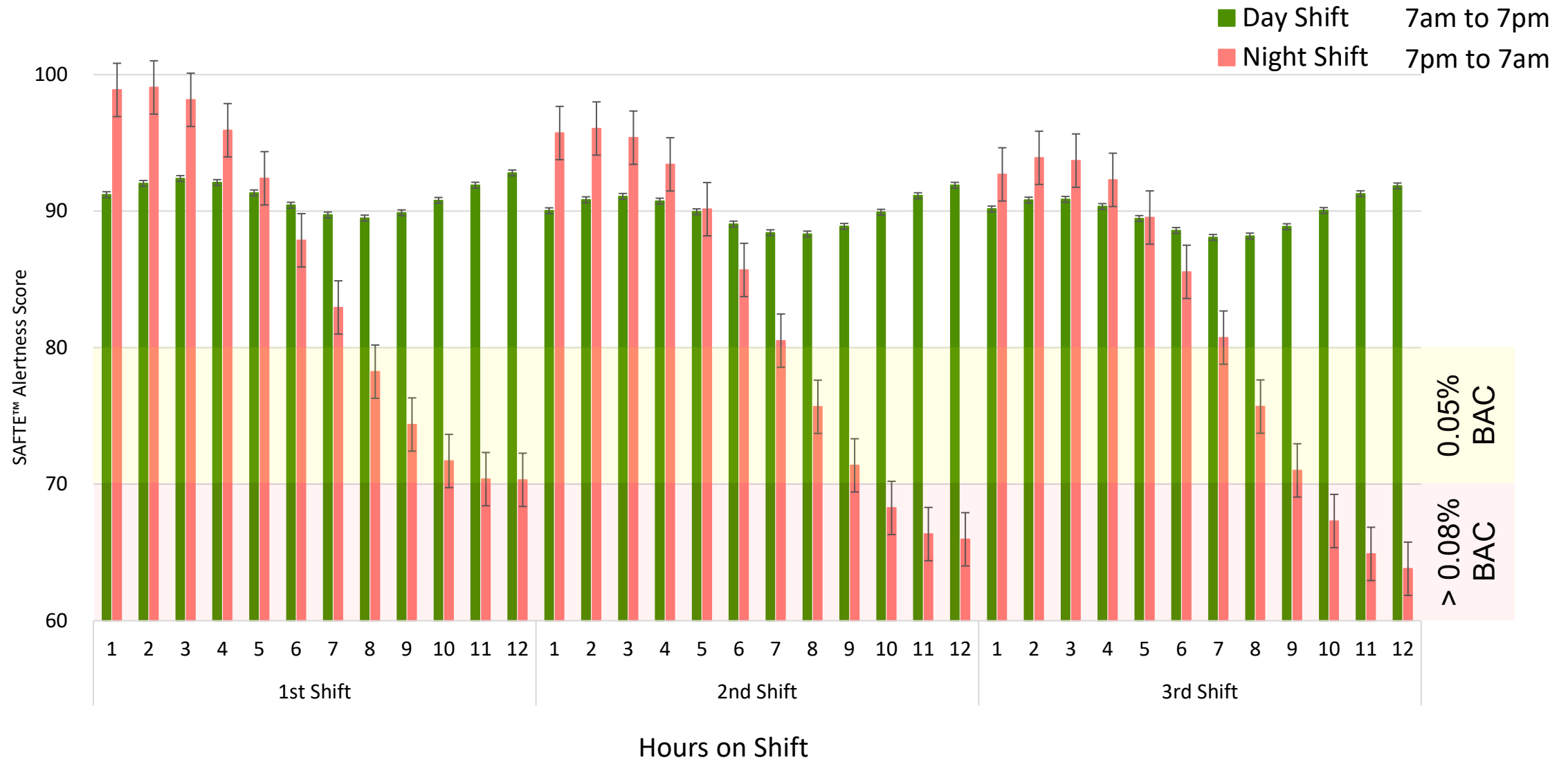


**FIGURE 2.** The relative risk over four successive night shifts (error bars are 95% CIs).

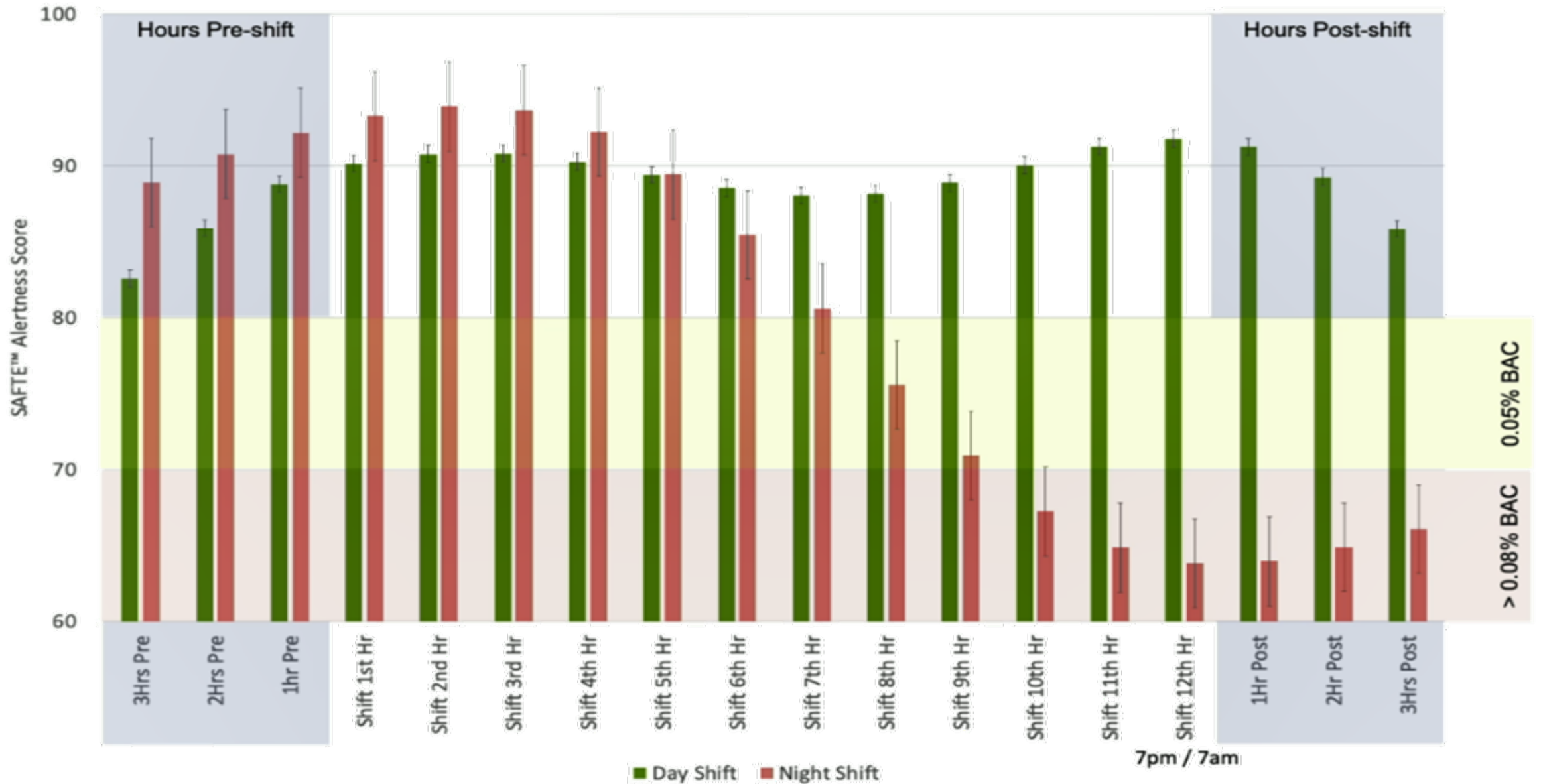
**Take home:**

**It appears that 4 consecutive 10-hour shifts are the best from a risk management perspective**

# Liability - *Predicted Performance*



# Liability - *Predicted Performance*



# Sleep & Health

- Mental Health
- Cardiovascular Health
- Metabolic Health
- Cancer Risks

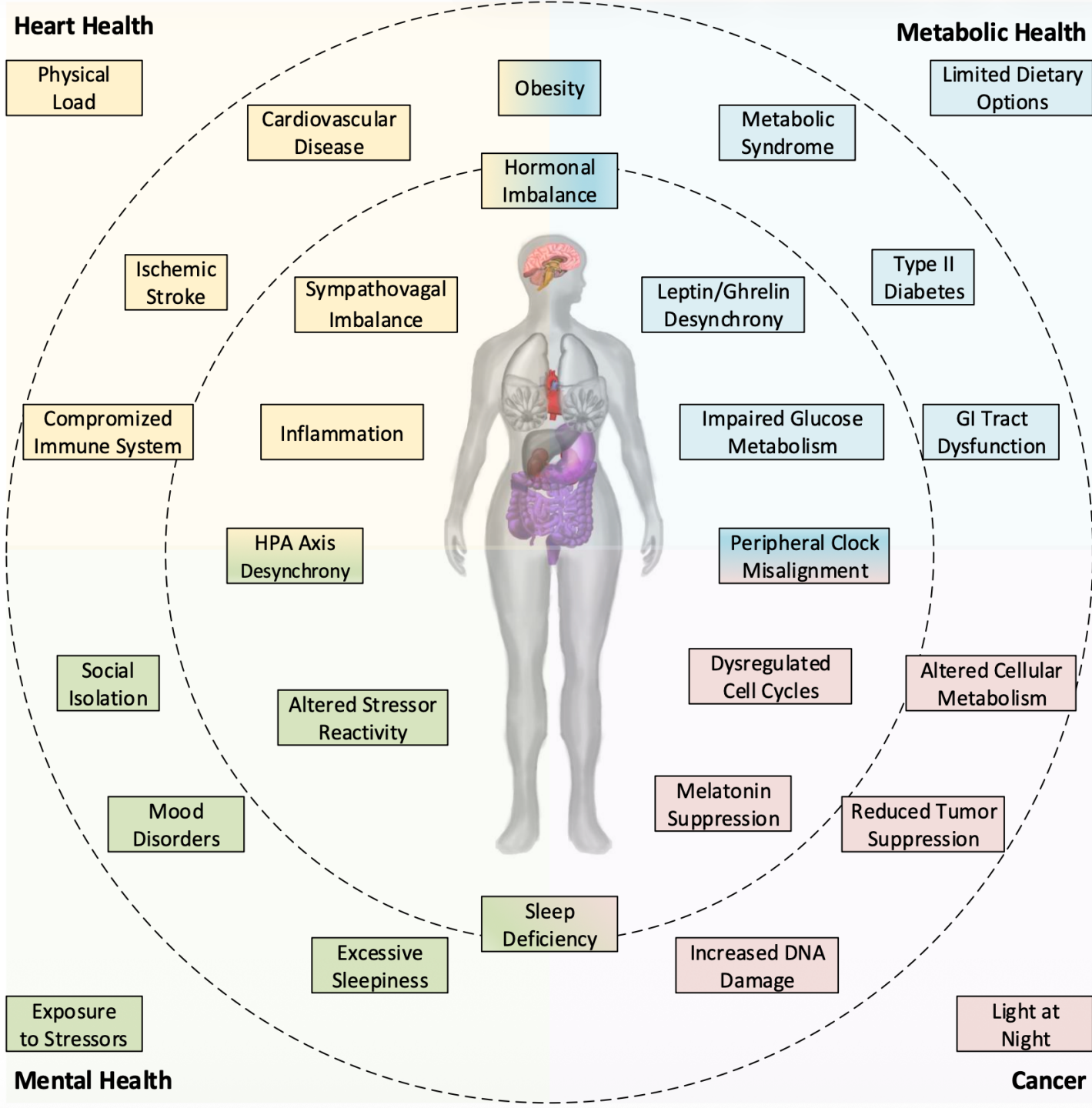
# Mortality

**BCOPS Study:**

**Officers die 10-15 years earlier post-retirement  
than other municipal workers**







## Fatigue Training Can Promote Mental Health

| Improvements to Mental Health (N=61) |              |               |
|--------------------------------------|--------------|---------------|
|                                      | Pre-Training | Post Training |
| Depression                           | 20%          | 17%           |
| Anxiety                              | 26%          | 18%           |
| PTSD                                 | 16%          | 7%            |
| Tiredness                            | 70%          | 60%           |
| Feeling "Hopeless"                   | 32%          | 23%           |
| Feeling "Blue"                       | 55%          | 43%           |
| Feeling "Tense"                      | 63%          | 51%           |
| Temper Outbursts                     | 12%          | 3%            |

- (Data from RCMP Fatigue Training Study)

# Mental Health

- **Effects on Domestic Life**
- Fatigue reduces domestic quality of life:
  - Increased arguments
  - Decreased affection
  - Increased strain & dysfunction





# The Science of Sleep

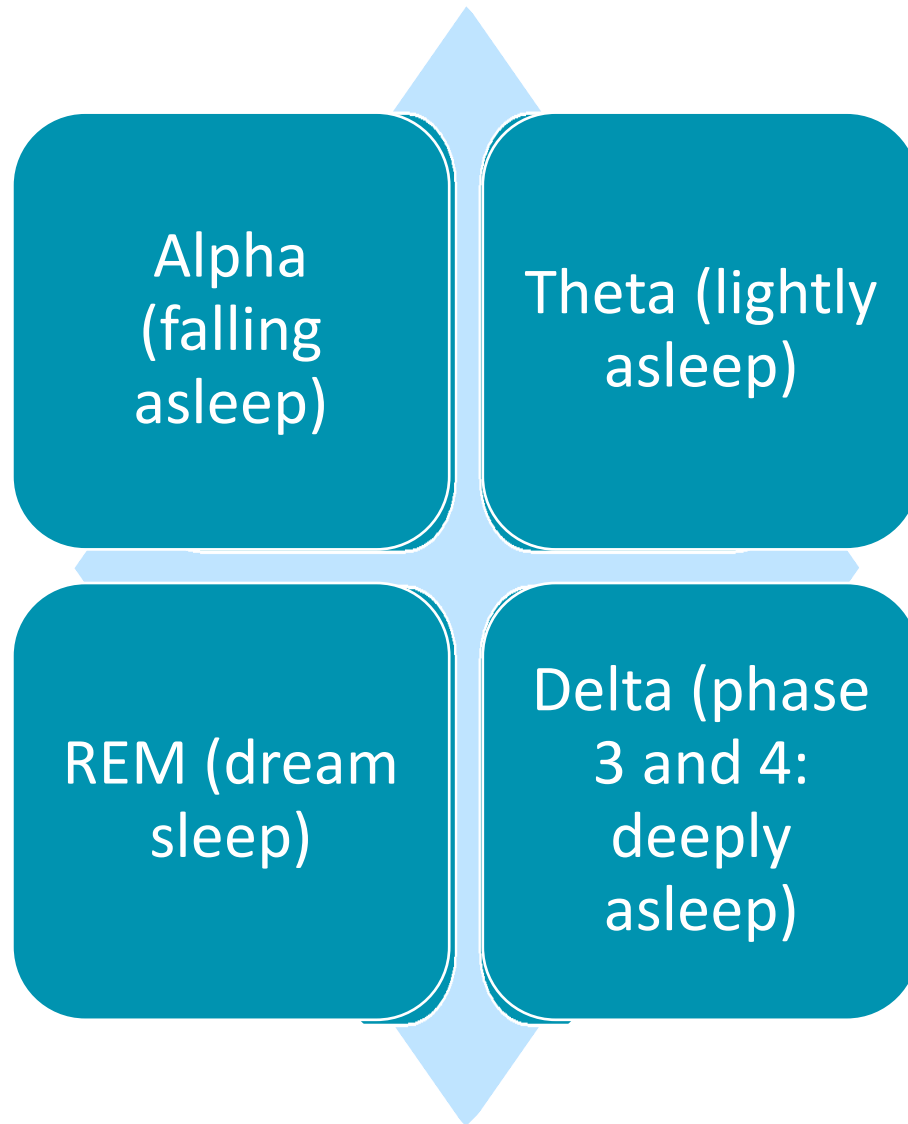
Sleep Cycles

Circadian Rhythms

The Two Process Model

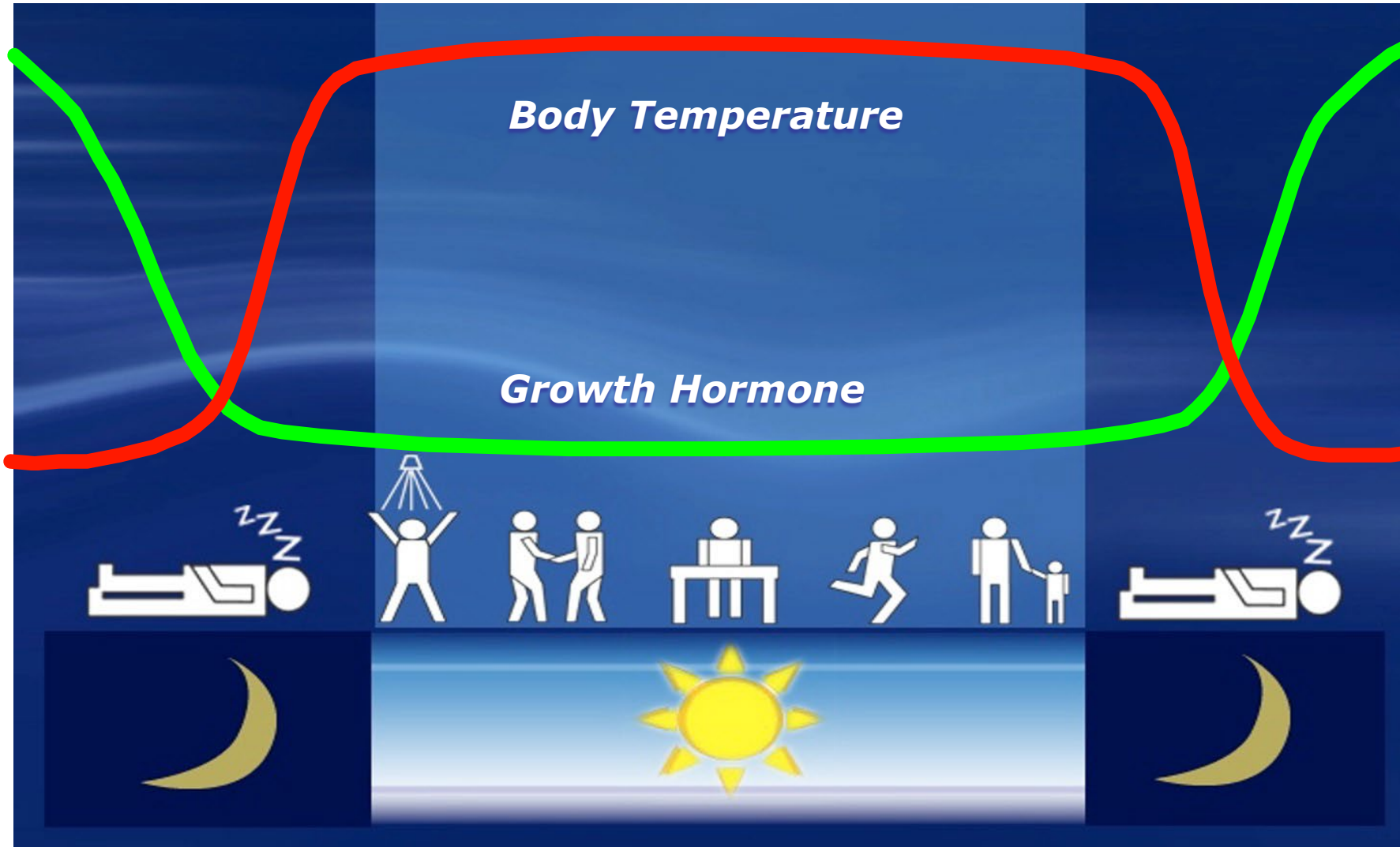
Sleep Dept

# Phases of Sleep

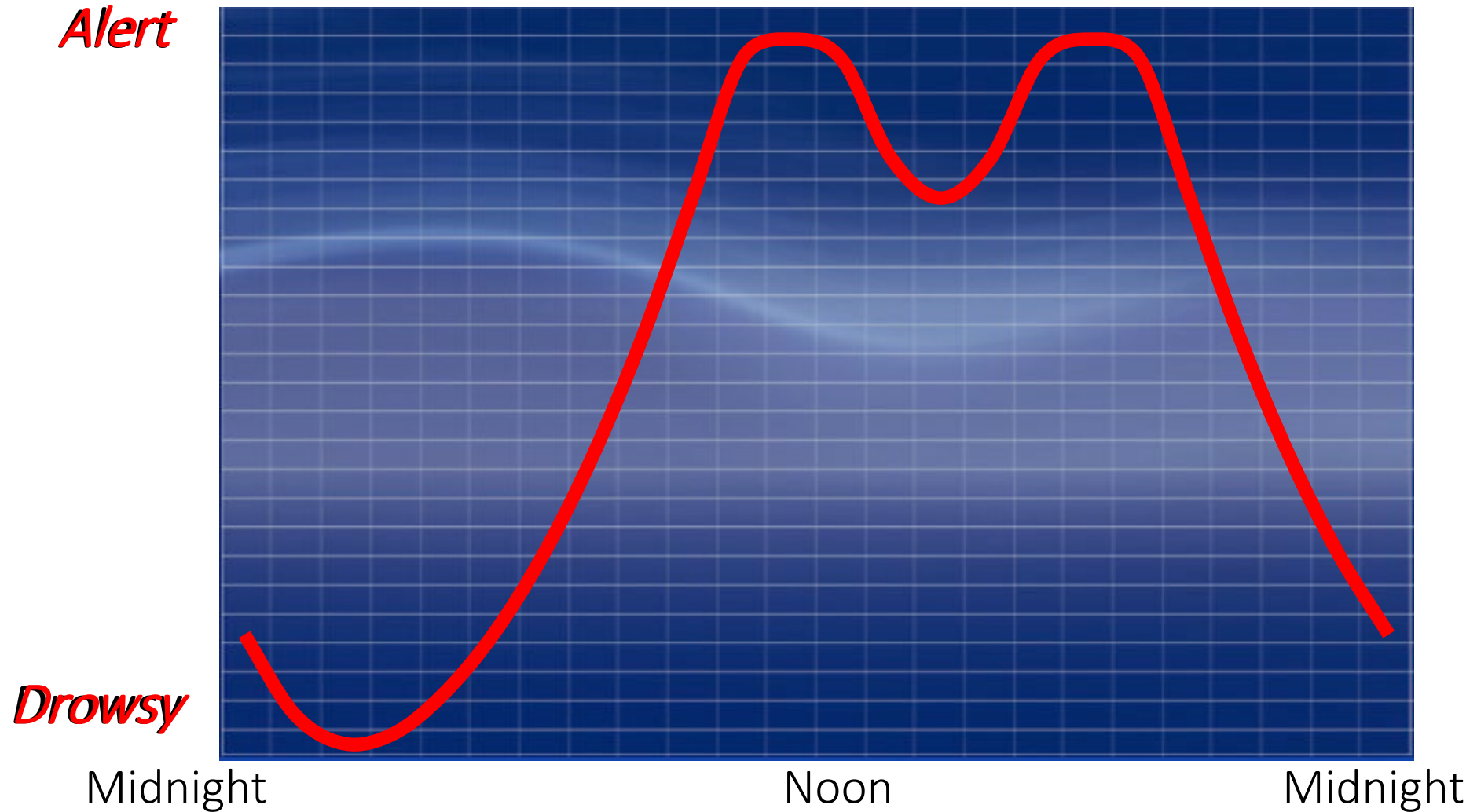


- Sleep cycle ~ 100 minutes
- Typically takes about 20-30 minutes to reach Delta
- Amount of time spent in REM increases as the night goes on and need for deep sleep decreases

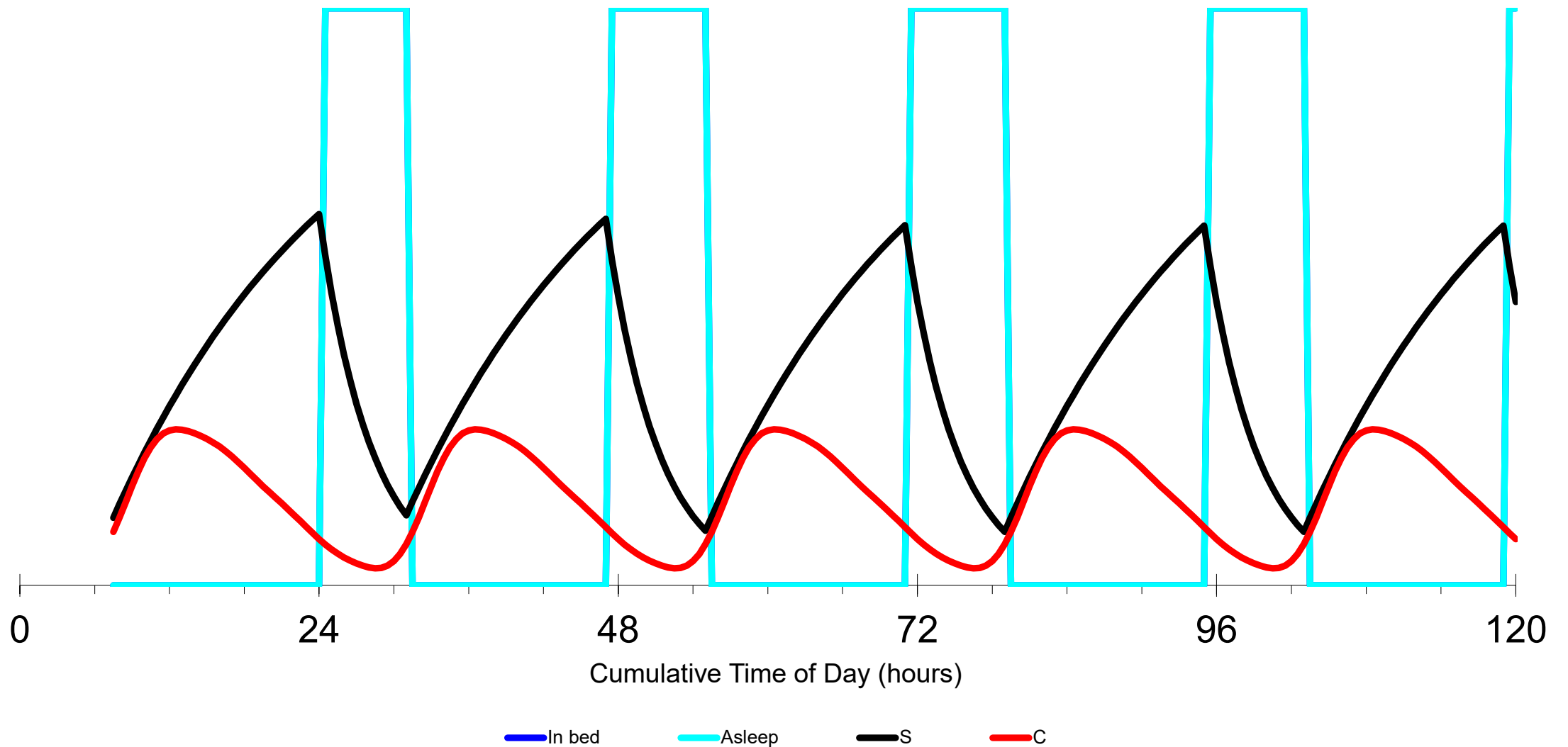
# Circadian Rhythms



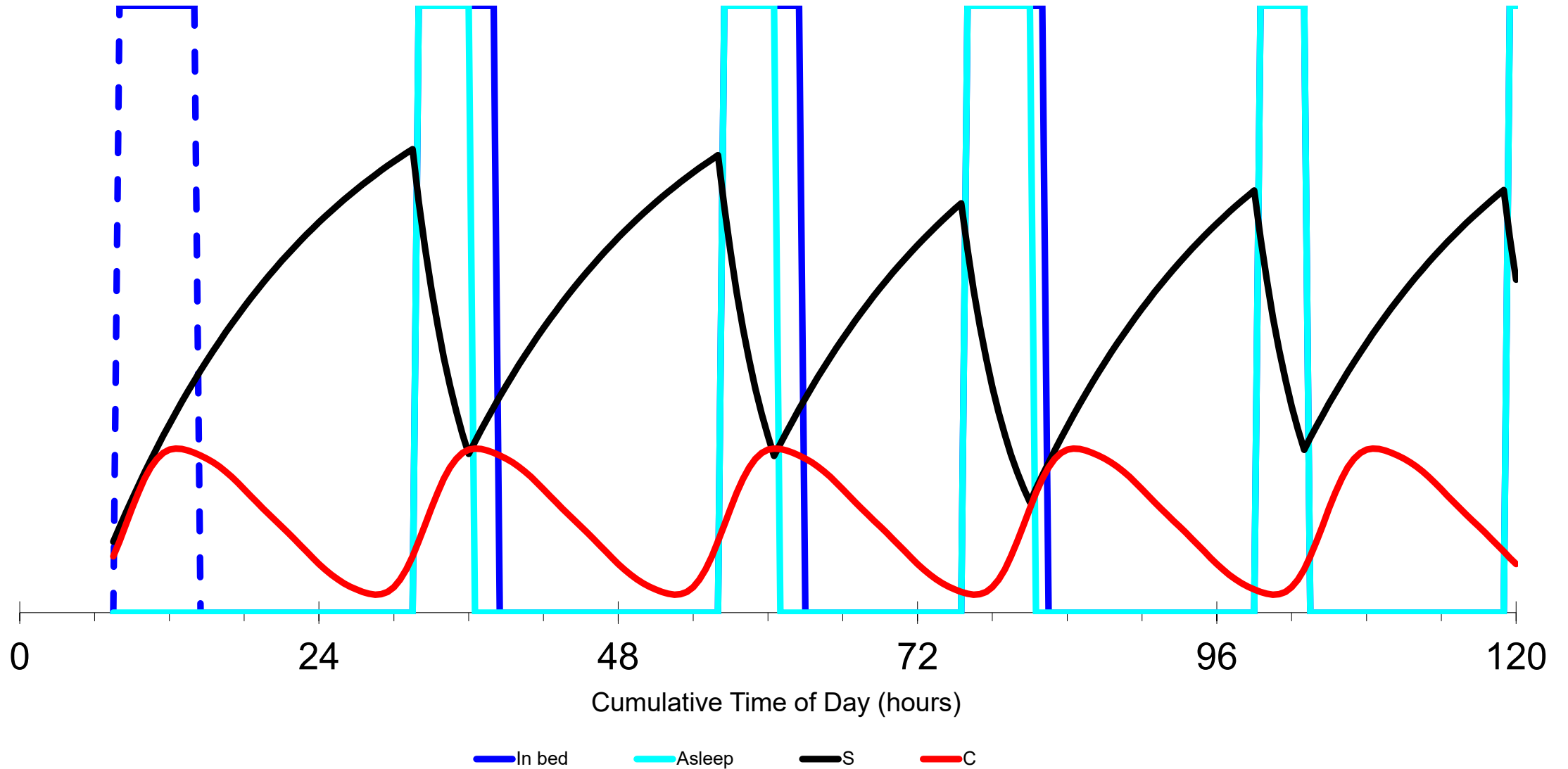
# Alertness Highs and Lows



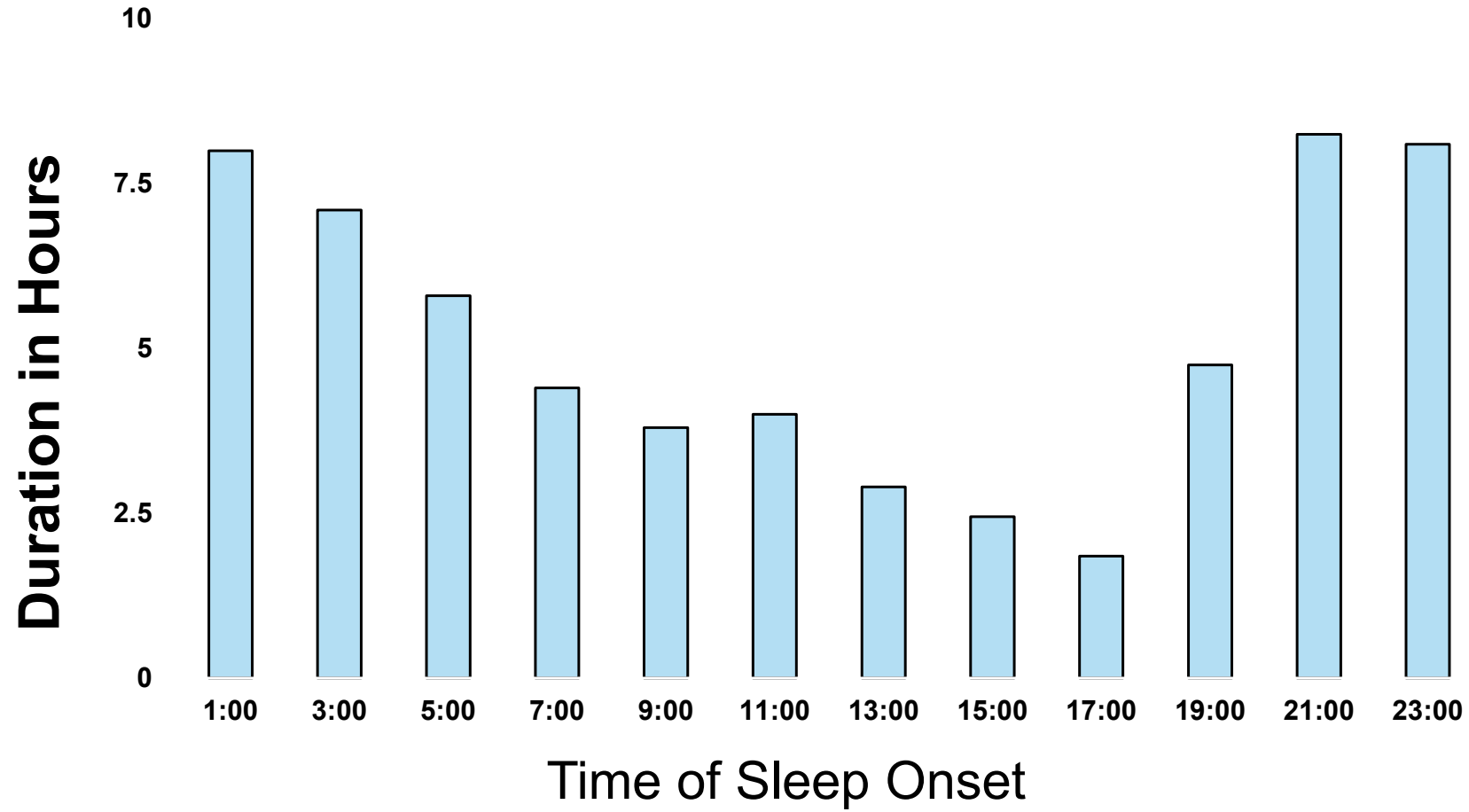
# The Two Process Model – Day Shift



# The Two Process Model – Night Shift



# Sleep Potential Based on Time to Bed





***Do the math...***



**safe**

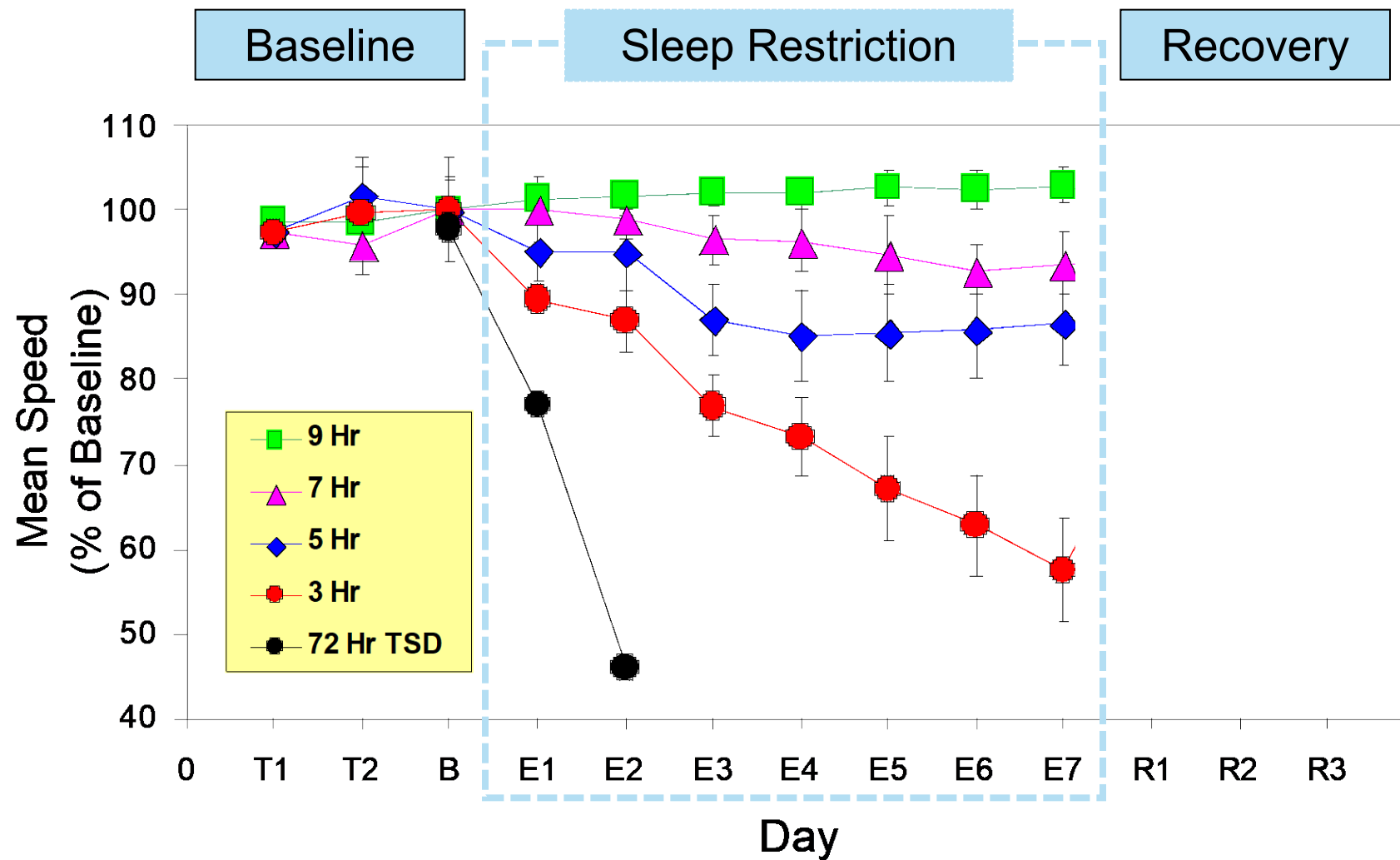
**7 hours**

**+**

**6 hours**

**=**

**13 hours**



The background image is a soft-focus photograph of a stack of three folded white towels. A wooden clothespin is clipped to the bottom towel. In the background, a white bottle and a brown textured object are visible but out of focus.

# Sleep Hygiene

Environment

Light & Light Therapy

Alcohol/Nicotine

# Environment



## Dark

Light proof blinds  
or curtains  
Below 100 lux  
Mask?  
Consider night  
light to rest room,  
etc.



## Quiet

Ear plugs?  
White noise / fan



## Cold

65°  
Fan / moving air



## Establish a routine

When adequate  
sleep quantity is  
not possible, stick  
to a routine



## Monitor “sleep debt” and catch up



## Time to wind down after shift

# Light Therapy



**Light exposure  
for 30 mins  
upon waking**

Consider  
purchasing a SAD  
light therapy box ~  
\$30



**Light  
avoidance for  
30 mins before  
bed**



**Limit  
technology  
before bed**



**No TV, laptop,  
iPad, etc. in  
the bedroom**



**Use the “night  
shift” feature  
to reduce blue  
light before  
sleep**



**Consider  
changing bulbs  
in your house**

# Alcohol/Nicotine

## Limit alcohol before bed, especially hard liquor

- We might think alcohol can help us sleep?
  - At low doses alcohol is a stimulant, at high doses a depressant
  - As we sleep the alcohol dissipates and becomes a stimulant again
  - This forces us to wake early and disrupts our normal sleep cycles

## Limit tobacco before bed

- Nicotine is a stimulant, refraining from nicotine before bed shows reduced sleep latency (time to fall asleep)

# Caffeine Management

## BEVERAGE

## CAFFEINE

8 ounce cup of coffee

95 – 200mg

8 ounce energy drink

70 – 100mg

12 ounce soda

35 – 45mg

8 ounce cup of tea

14 – 60mg

# Caffeine Management

Limit your caffeine consumption to no more than about 300 mg to 400 mg per day

- three to four cups (8-oz) of coffee

If you are pregnant or nursing should consume less caffeine or avoid it altogether

High blood pressure or other heart problems should avoid high levels of caffeine

It is best if you ***avoid caffeine in the late afternoon and in the evening***

The FDA and the American Academy of Sleep Medicine advise consumers to avoid powdered pure caffeine

# Caffeine Management



400 mg of  
caffeine taken 6  
hours before  
sleep



Caffeine reduced  
sleep by more  
than 1 hour



If experienced  
over multiple  
nights, may have  
detrimental  
effects on  
daytime function



[stevejames@wsu.edu](mailto:stevejames@wsu.edu)

# Stephen James, PhD

- Dr. S James received his doctorate in Criminology and Criminal Justice in 2015 from Washington State University with a focus on police performance. Steve is an Associate Professor in the WSU Elson S. Flyod College of Medicine. Steve, as the Principal Investigator, has been awarded \$5.8m of grant funded research and published 50 peer reviewed abstracts, articles, and book chapters. He is a member of the Homeland Security Human Factors Engineering Technical Advisory Group and a member of the advisory board of Lexipol Inc. Steve is also an active consultant for the National Police Institute.
- Steve was a member of the Trinity College Boxing Team; the team won the British & Irish Intervarsity Boxing Tournament all four years of his participation. He also was a member of the Trinity College Rugby Team (3rds).
- Prior to becoming an academic Steve spent 23 years in the British Army as an infantry soldier (10 years enlisted) and officer (13 years commissioned). Steve served in several elite units focusing primarily on counter-terrorism operations. He completed nine combat tours and served in Cyprus, the Former Yugoslavia, Northern Ireland, and Afghanistan.