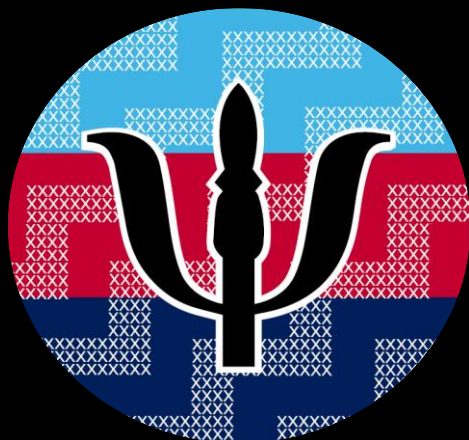




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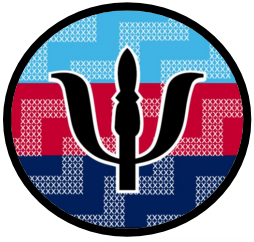


SLEEP LEADERSHIP

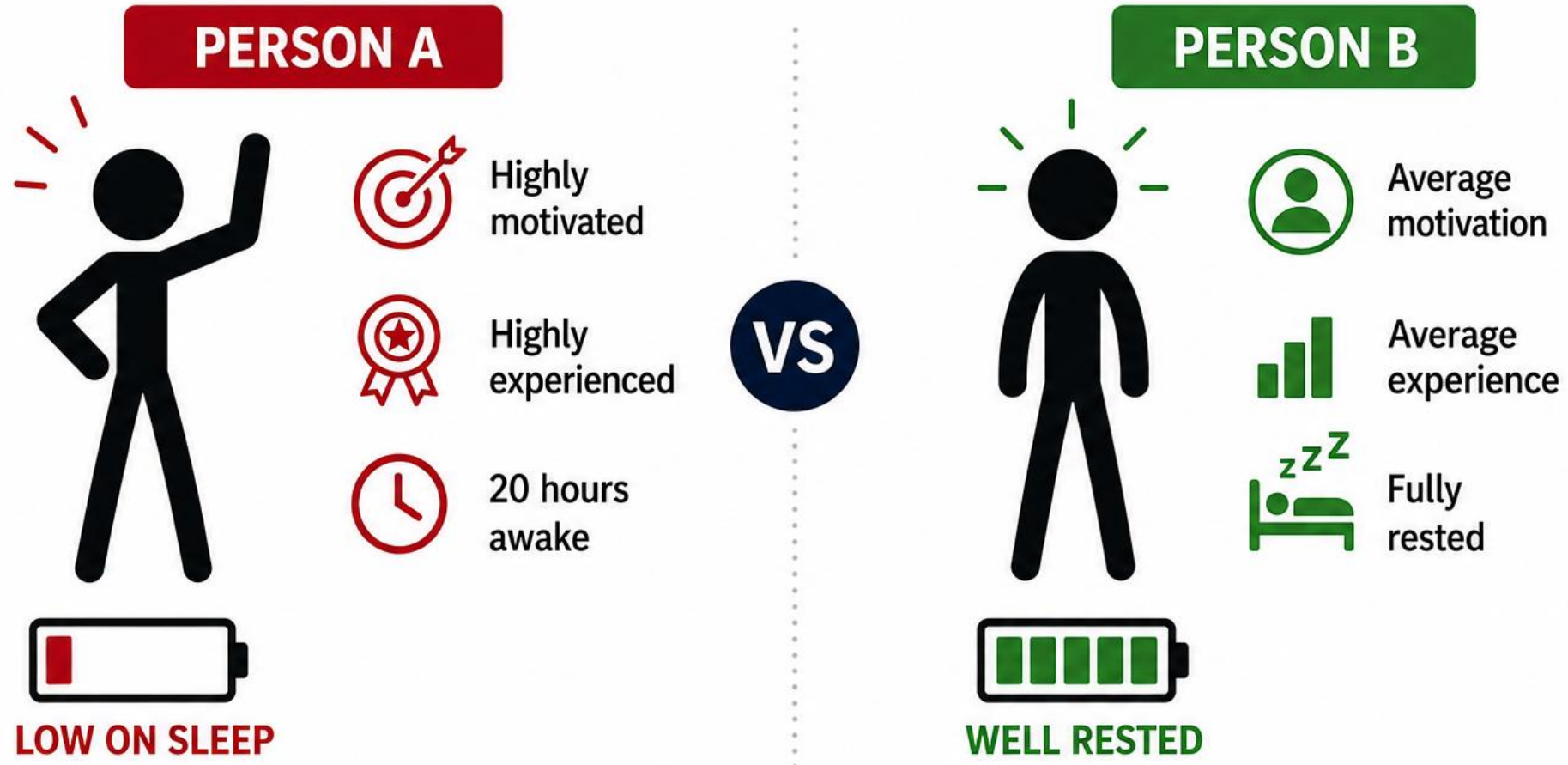
WHY IT MATTERS

FLTLT Amy Davis & FLTLT Campbell 'TEX' Teixeira

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Who would you rather have making the decision?





Contents



Part 1 - The Biology

Can motivation beat biology?



Part 2 - The Evidence

What actually happens to our performance



Part 3 - The Leadership

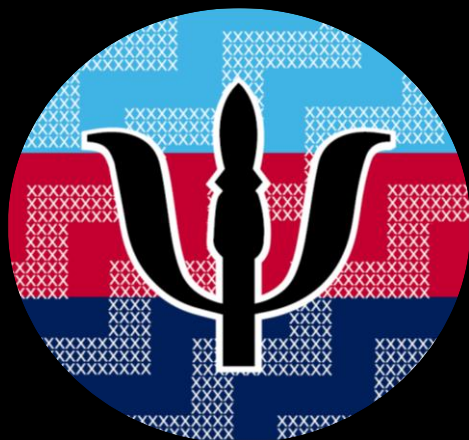
What do we do about it?





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PART ONE

THE BIOLOGY

CAN MOTIVATION BEAT BIOLOGY?



Sleep Pressure - How long have you been awake?



ADENOSINE

Waste builds up while you're awake.



SLEEP PRESSURE

Build-up creates pressure to sleep.

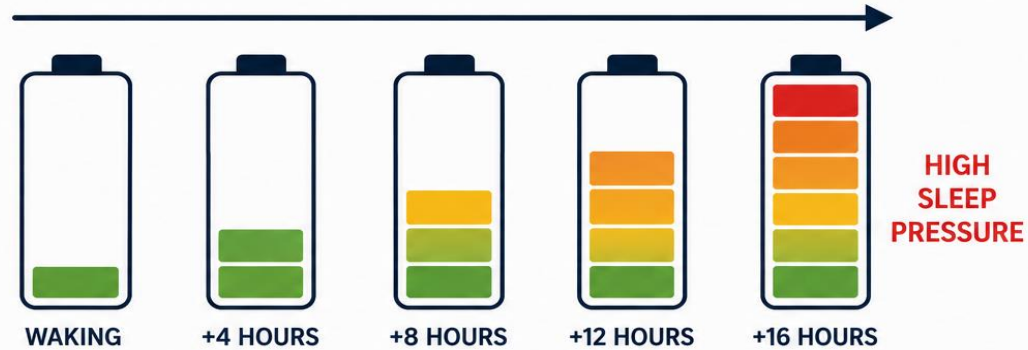


SLEEP

Sleep clears adenosine and restores cognitive reserve.

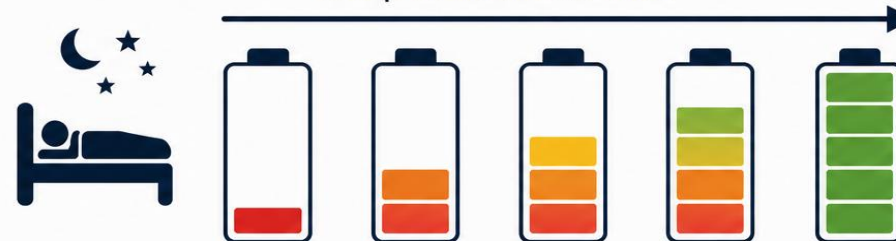
TIME AWAKE

Sleep pressure builds



SLEEP

Sleep clears and restores





Circadian Rhythm – What time does your brain think it is?



MELATONIN

Rises in the evening to prepare the body for sleep. Highest in the early hours.



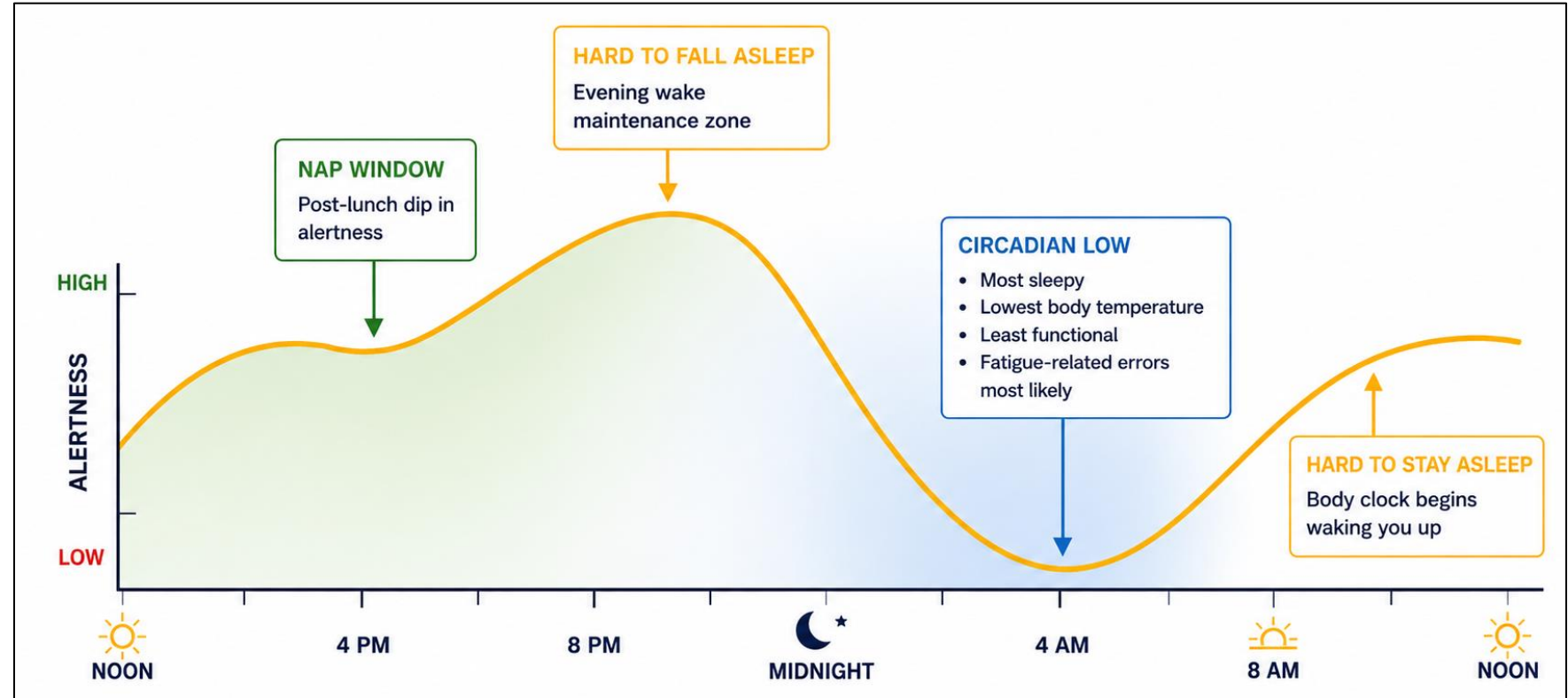
BODY TEMPERATURE

Falls in the evening, lowest around 4 am, then rises again in the morning.



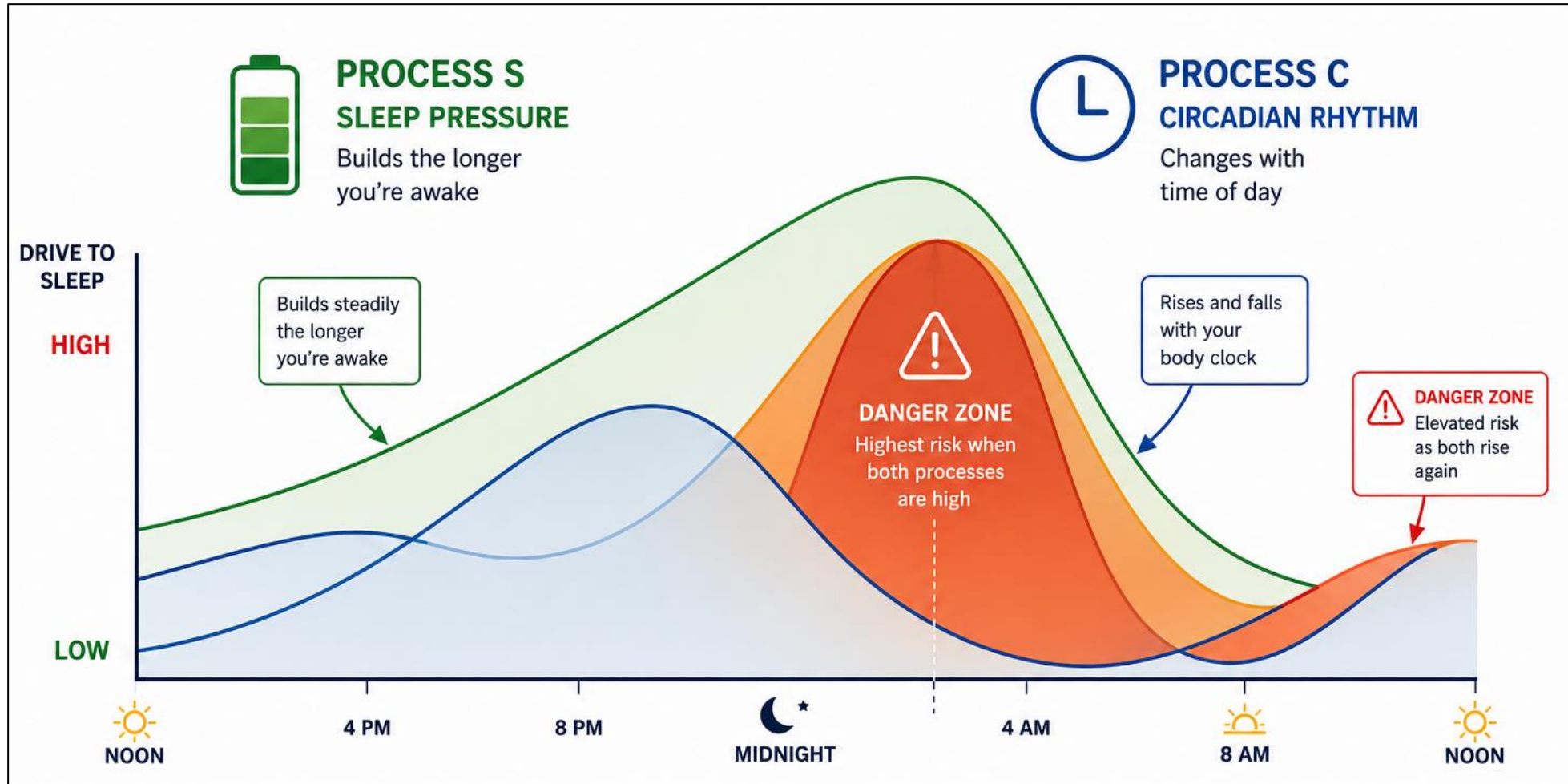
YOUR BODY CLOCK

A 24-hour internal clock that influences alertness, hormones and performance.





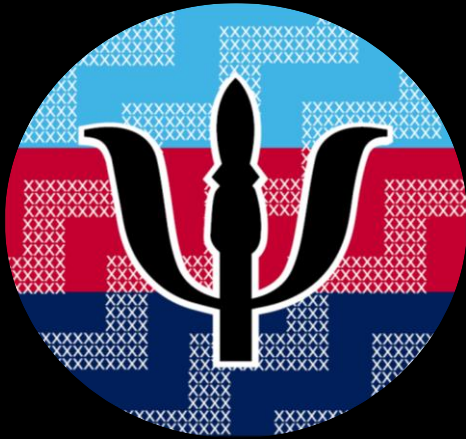
The Biology of Fatigue





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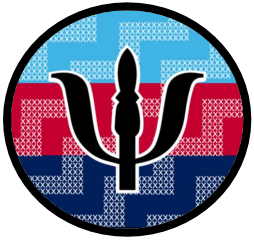
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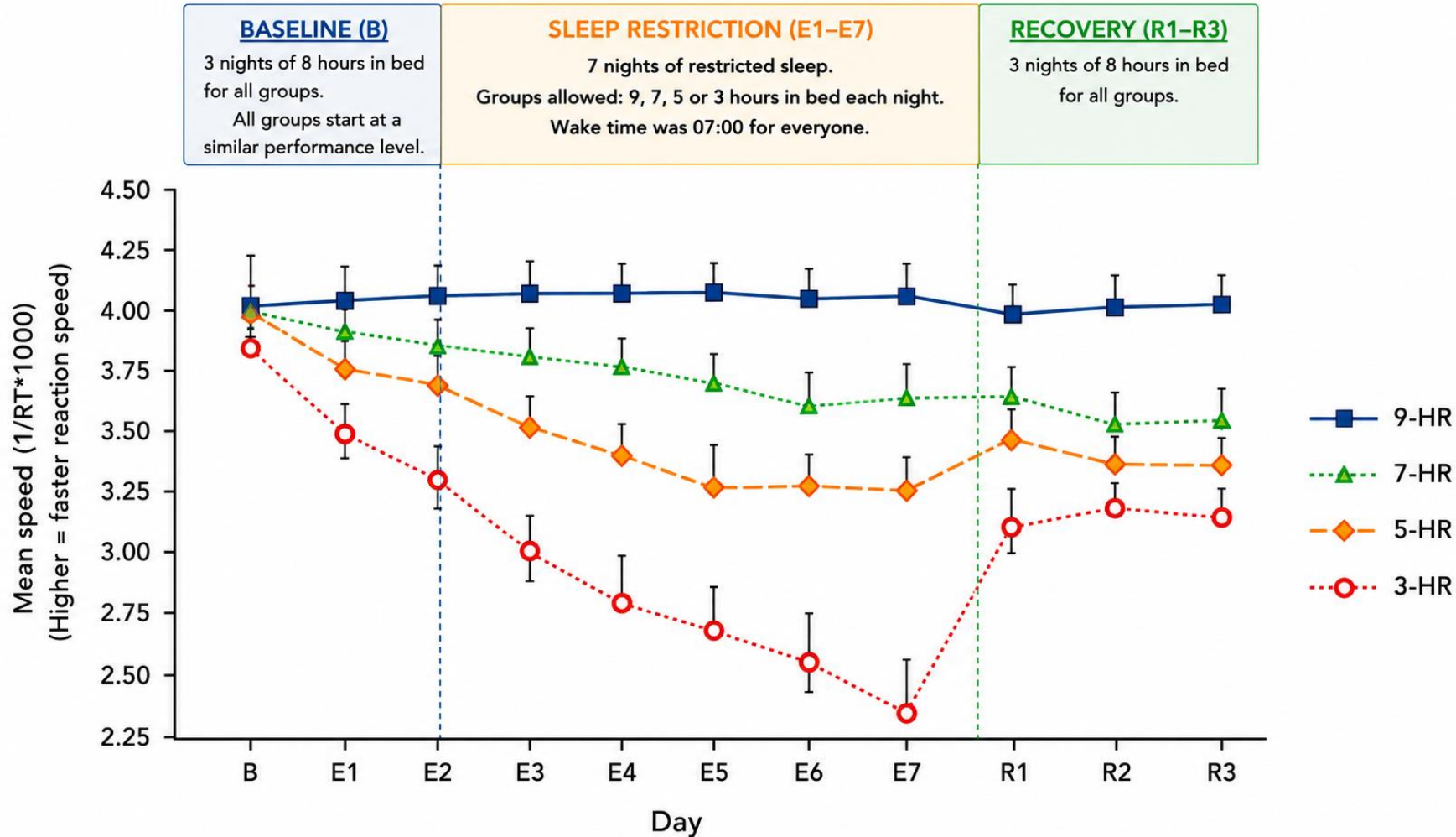
PART TWO

THE EVIDENCE

WHAT ACTUALLY HAPPENS TO OUR PERFORMANCE?



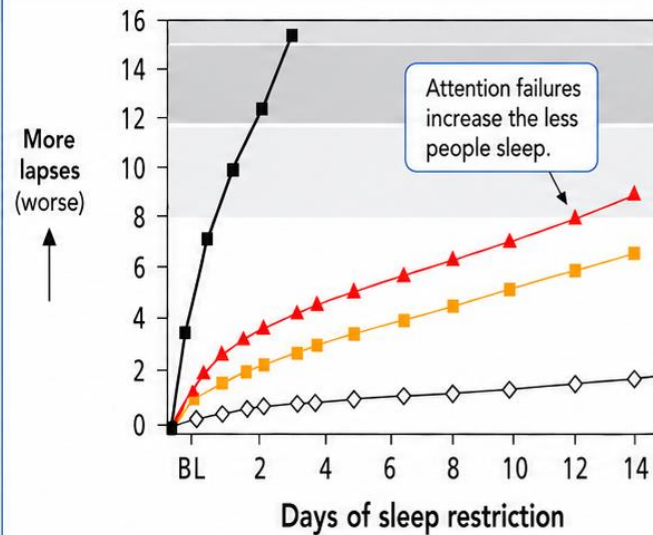
Fatigue Accumulates (Belenky et al., 2003)



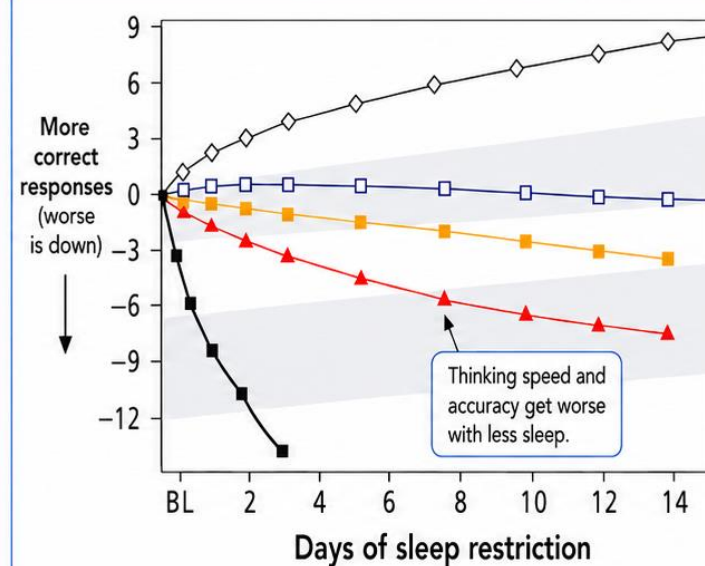


Performance Decreases (Van Dongen et al., 2003)

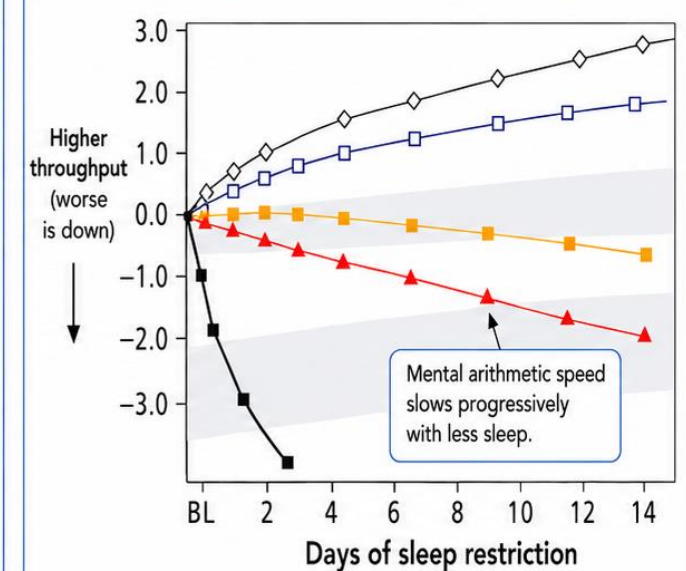
PVT Lapses – Attention failures



DSST Correct responses – Thinking speed / accuracy



SAST Throughput – Mental arithmetic speed



KEY

■ 0 h sleep
(total sleep deprivation)
3 days

▲ 4 h sleep
14 days

■ 6 h sleep
14 days

◇ 8 h sleep
(baseline)
3 days

Range for 1–2 days
of 0 h sleep

Range for 2–3 days
of 0 h sleep

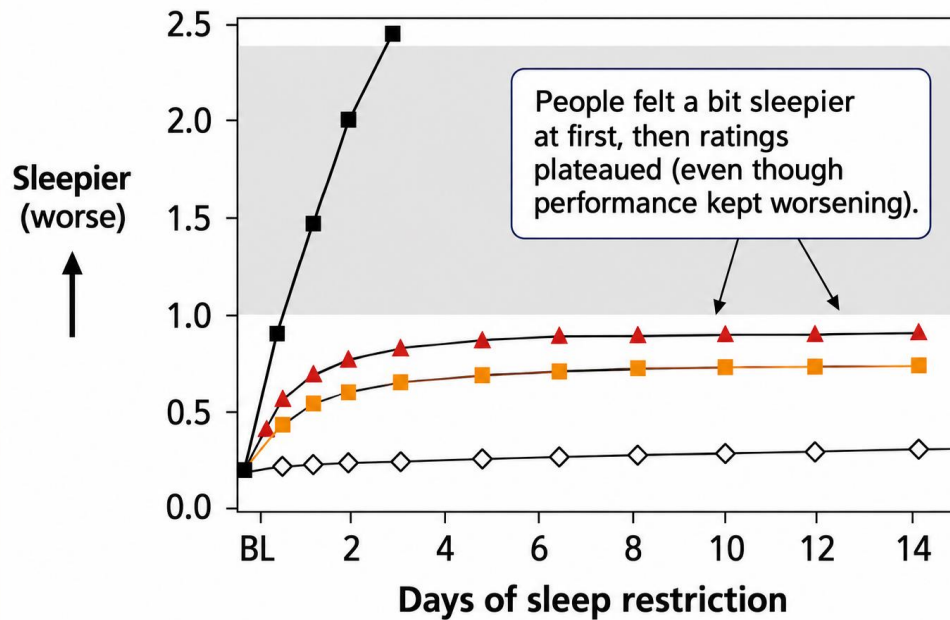
Range for 3–4 days
of 0 h sleep





Self Assessment Becomes Problematic (Van Dongen et al., 2003)

SSS Sleepiness score – *Subjective sleepiness*



SUMMARY OF THE RESEARCH



Performance keeps declining.

With each night of restricted sleep, attention, thinking speed, accuracy and mental arithmetic progressively worsen.



Feeling tired is a poor warning.

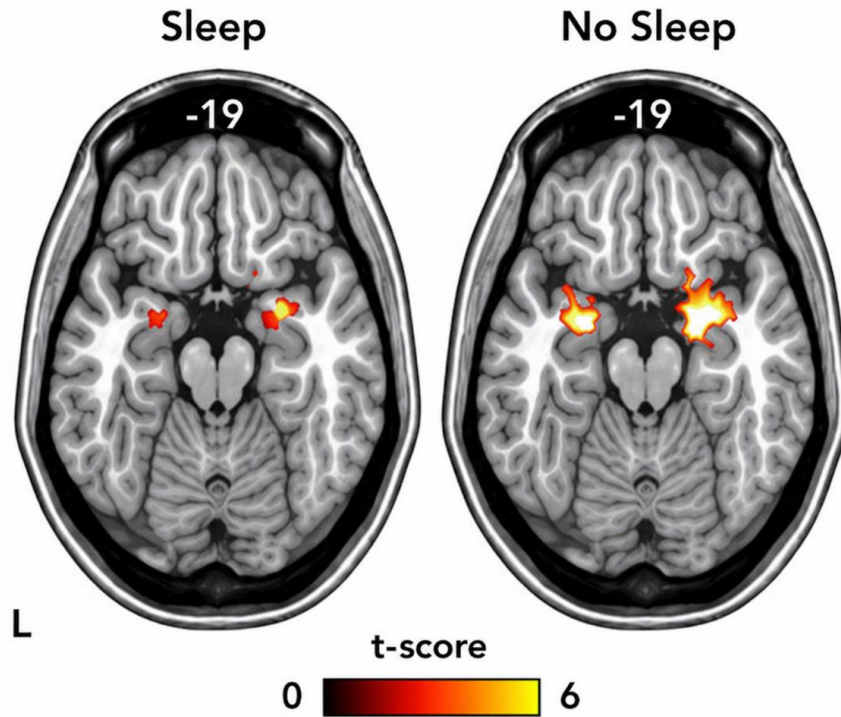
People feel sleepier at first, then their ratings plateau – even while their objective performance keeps getting worse.



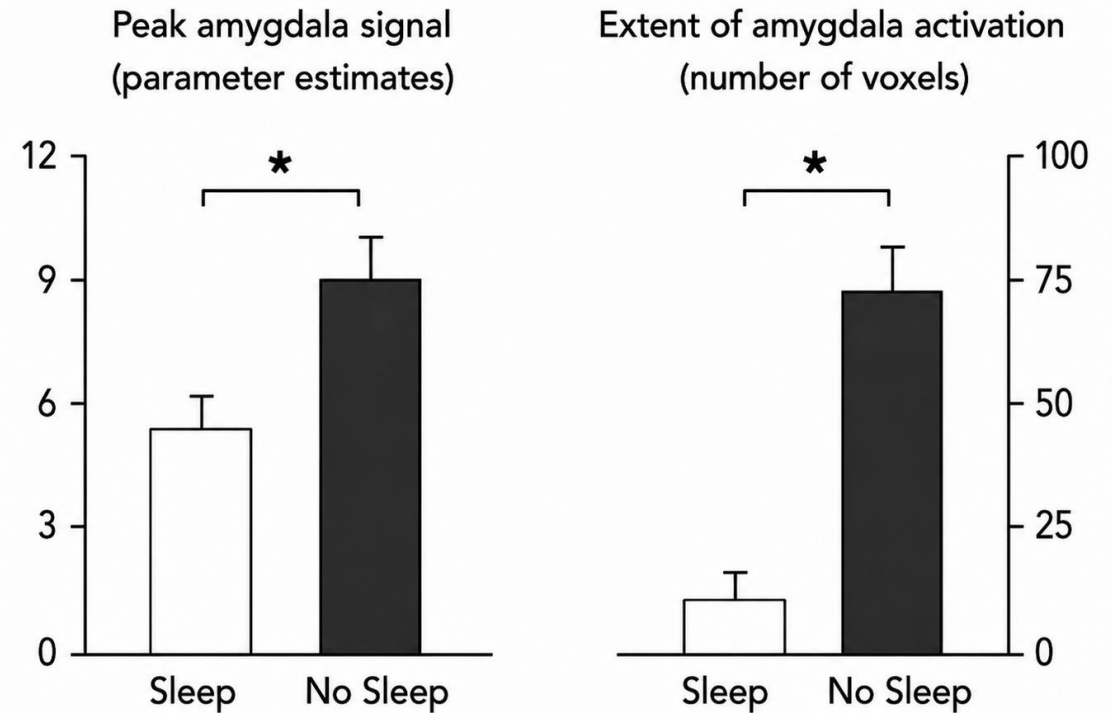


Emotional Regulation (Yoo et al., 2007)

Amygdala Activation (fMRI)



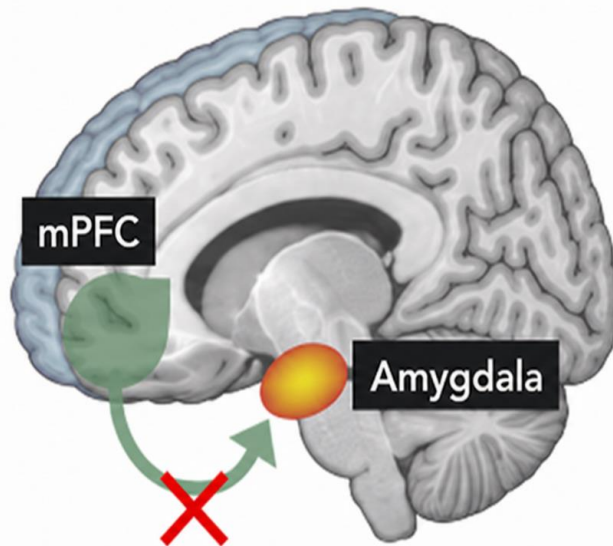
Amygdala Activation: Intensity & Extent





Emotional Regulation (Yoo et al., 2007)

Functional Connectivity Without Sleep



Without sleep, mPFC connection is **decreased**, potentially negating top-down control and resulting in an **overactive amygdala**.

SUMMARY OF THE RESEARCH



Emotional centres respond more strongly.

After one night without sleep, the emotional centres of the brain respond **around 60% more strongly** to negative information.



Emotional regulation has less influence.

At the same time, the part responsible for regulating those emotions **has less influence**.

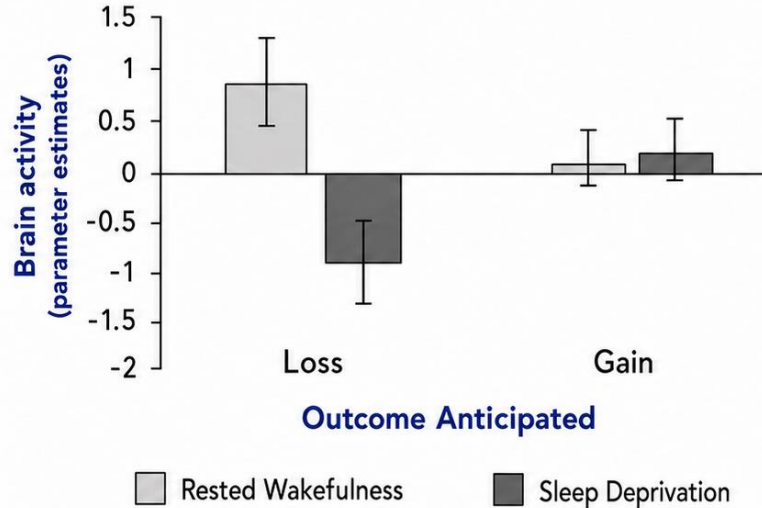




Decision Making (Venkatraman et al., 2007)

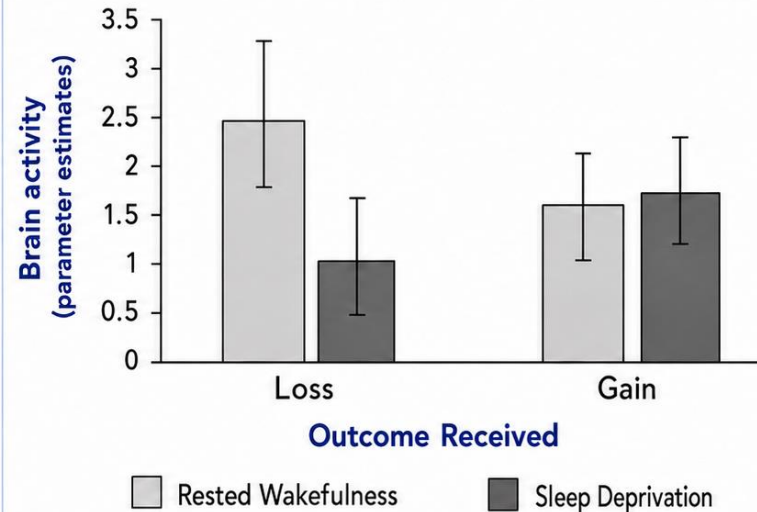
EXPERIMENT 1 – ANTICIPATION OF OUTCOME (EXPECTATION PHASE)

Brain activity in the left anterior insula when participants anticipated a potential **LOSS** or **GAIN** after making a risky decision.



EXPERIMENT 2 – RESPONSE TO OUTCOME (OUTCOME PHASE)

Brain activity in the left anterior insula when participants actually received a **LOSS** or **GAIN**.



SUMMARY OF THE RESEARCH



Losses matter less.

When sleep deprived, the brain's response to potential losses and actual losses is smaller.



Gains look better.

When sleep deprived, the brain shows more activity when expecting rewards.



The balance shifts.

Potential rewards feel more attractive, while potential losses carry less weight.



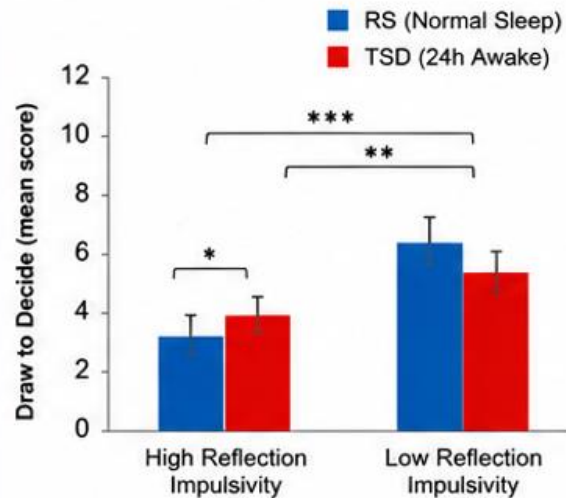


Risk Taking (Salfi et al., 2020)

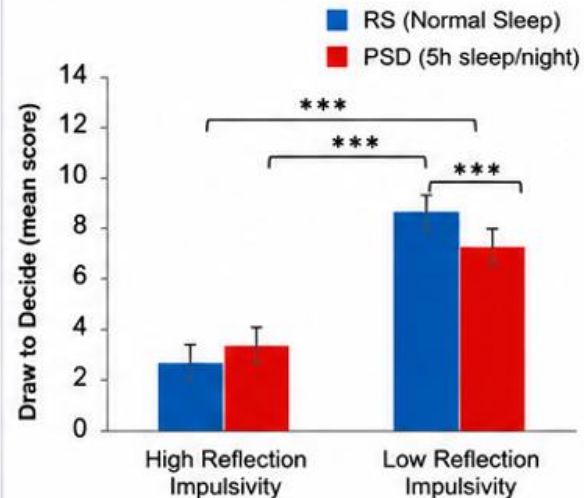
A. REFLECTION IMPULSIVITY (MOSAIC TASK)

Higher scores = decide with less information (more impulsive)

Experiment 1: Total Sleep Deprivation (TSD)



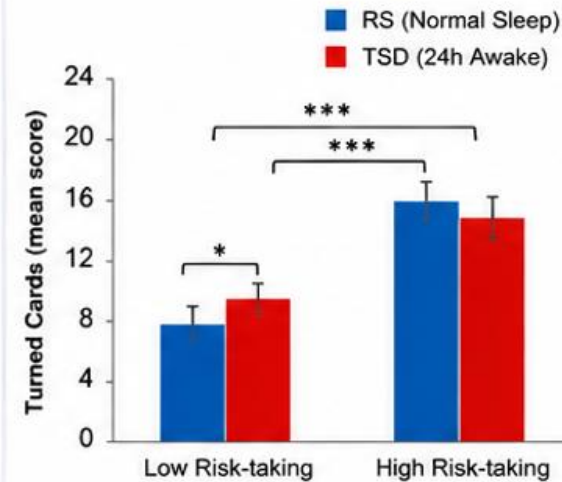
Experiment 2: Partial Sleep Deprivation (PSD)



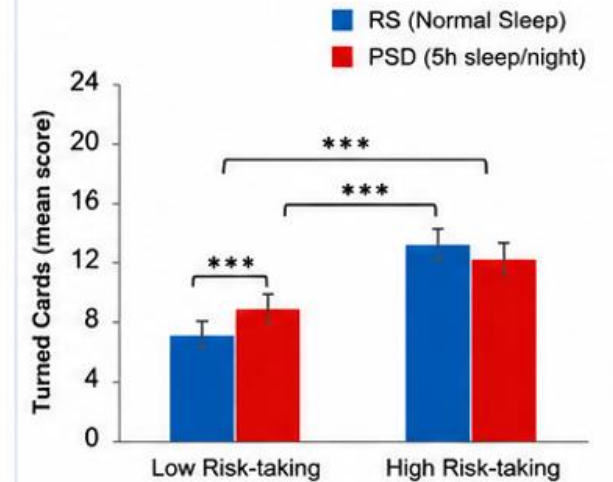
B. RISK-TAKING (COLUMBIA CARD TASK – COLD)

Higher scores = take more risks

Experiment 1: Total Sleep Deprivation (TSD)



Experiment 2: Partial Sleep Deprivation (PSD)





Risk Taking (Salfi et al., 2020)

SUMMARY OF THE RESEARCH



Sleep loss increases impulsivity.

After both total and partial sleep deprivation, people made decisions **with less information.**



Sleep loss increases risk-taking.

After both total and partial sleep deprivation, people **took more risks.**



Reflective people changed the most.

People who were usually more reflective and risk-averse showed the **largest shifts** toward impulsive and riskier behaviour.



Partial sleep deprivation had the strongest impact.

Five nights of restricted sleep led to **larger increases** in impulsivity and risk-taking than 24 hours awake.

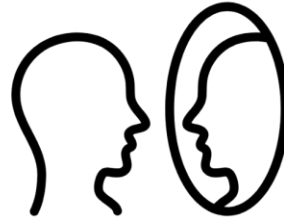




Take Home Messages from the Research



Fatigue accumulates



People may not reliably recognise fatigue



Fatigue can influence emotional regulation



Fatigue can influence behaviour and decision making



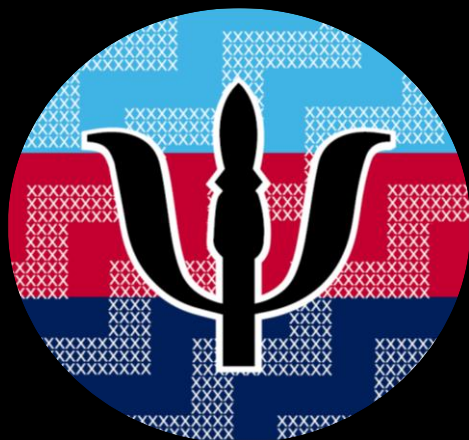
Fatigue can affect judgement and risk perception.





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PART THREE

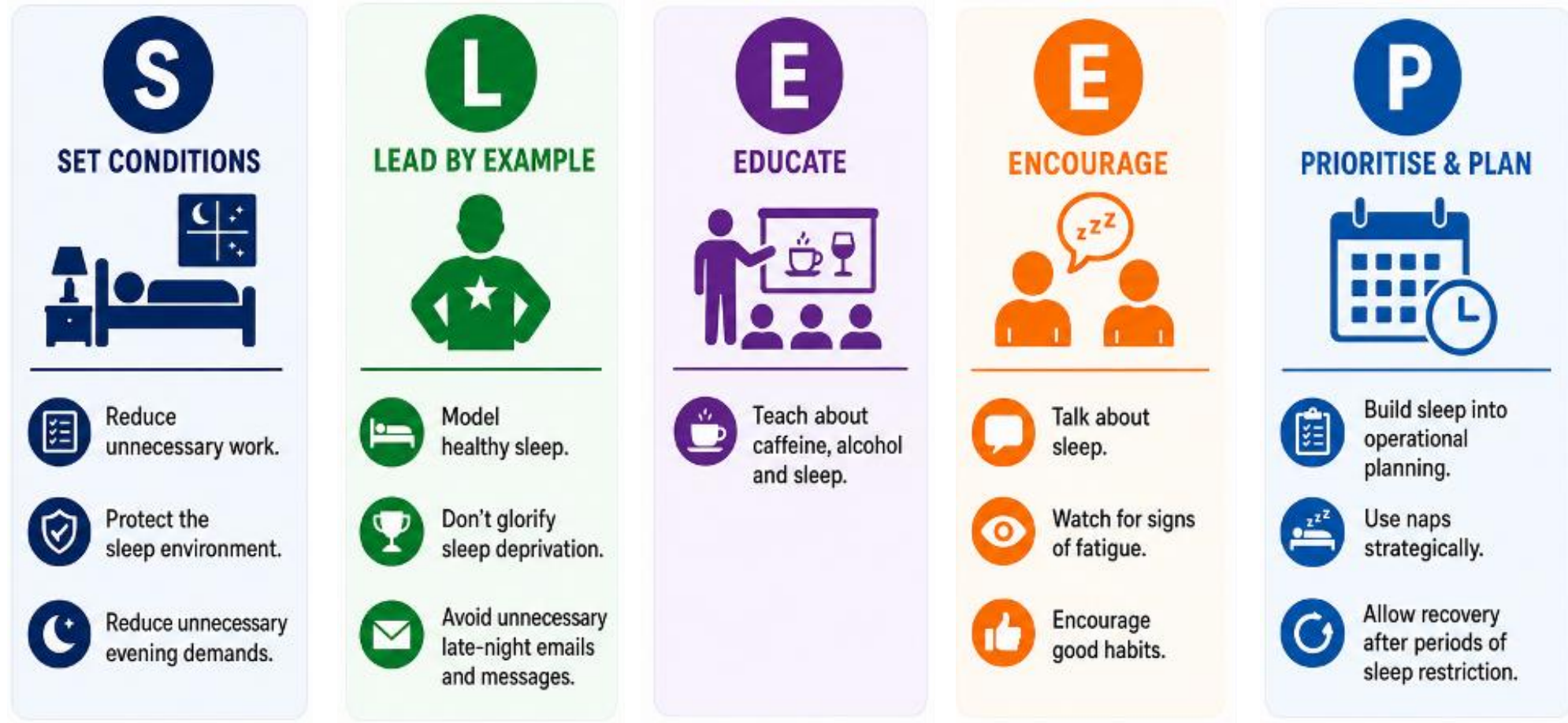
THE LEADERSHIP

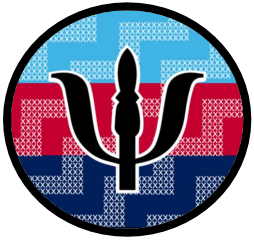
WHAT DO WE DO ABOUT IT?

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WRAIR Sleep Leadership Model

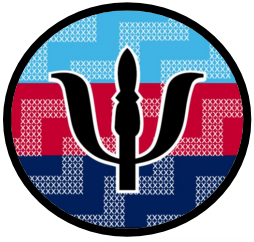




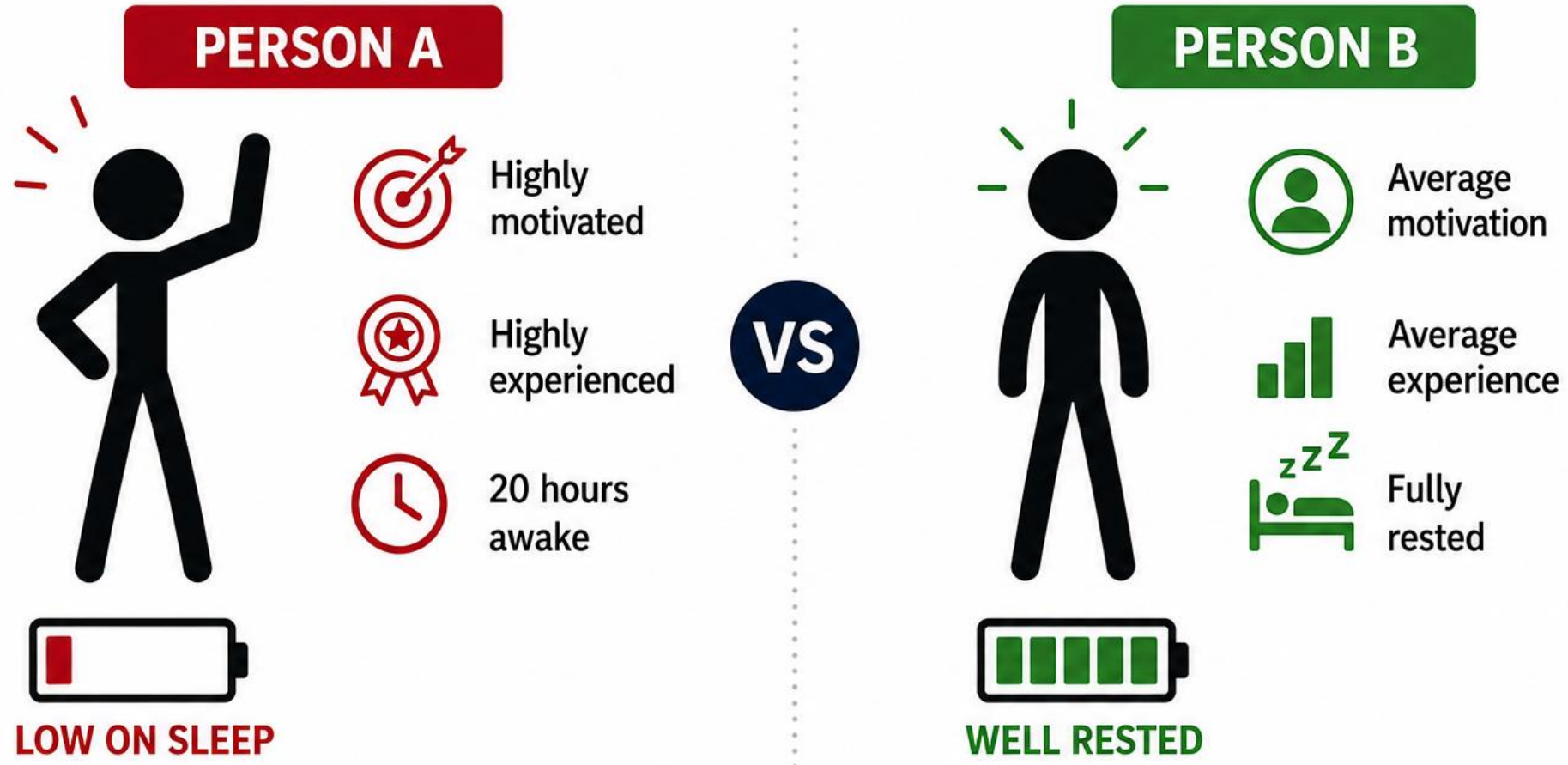
“The first night of an operation shouldn’t be the fourth night of sleep restriction”

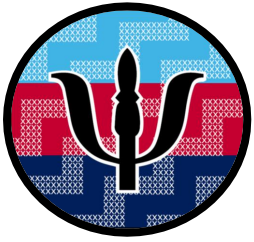
DR. Amy B. ADLER, PHD, Clinical research psychologist and senior scientist,
Walter Reed Army Institute of Research (WRAIR)





Who would you rather have making the decision?





ADDITIONAL NOTE TO PRESENTATION

The Sleep Paradox

One final thought...

For a small number of people, learning about sleep can actually make sleep harder.

This is a well-recognised paradox. Worrying about not getting enough sleep, or about the consequences of poor sleep, can become the very thing that keeps you awake.

If this becomes a regular pattern for you, please reach out. There are effective, evidence based treatments that can help.

A great place to start is the Just a Thought app, or speak with your Medical Officer or healthcare provider.

Thanks again, Amy & Tex.





HEI MANA MŌ AOTEAROA
A FORCE FOR NEW ZEALAND