Let’s Talk Sleep

Lesley Baradel, MBA, MS, RDN, LD

THE THREE PILLARS OF HEALTH

NUTRITION

SLEEP

EXERCISE

Sleep is a basic human need and is crucial to our overall health and well-being.

AGENDA

- Discuss sleep statistics
- Investigate theories of why we sleep
- Learn about the physiology of sleep
- Learn about the sleep regulation cycle
- Discuss common sleep disorders
- Learn how to change sleep disturbing activities

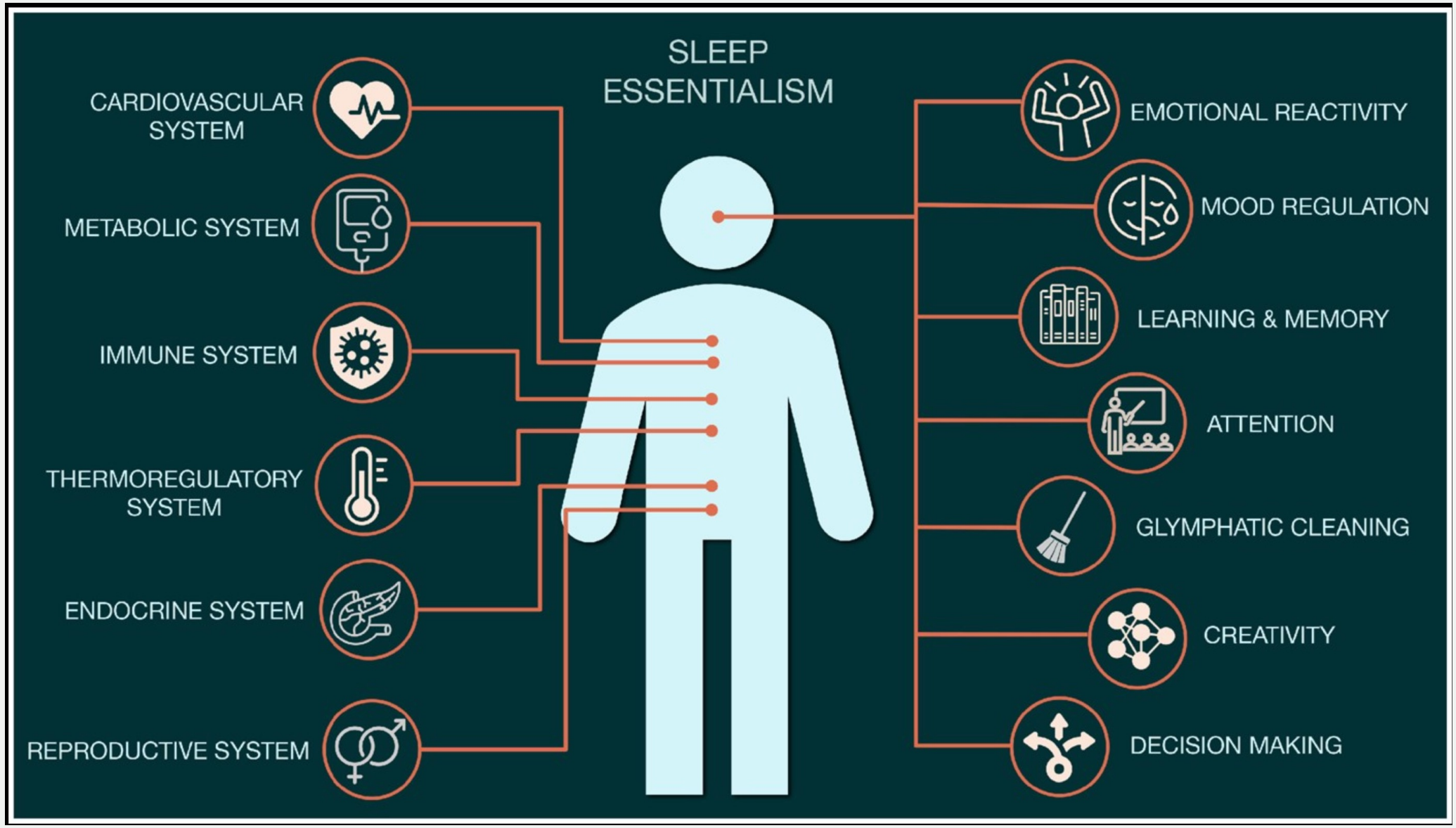
Video 1

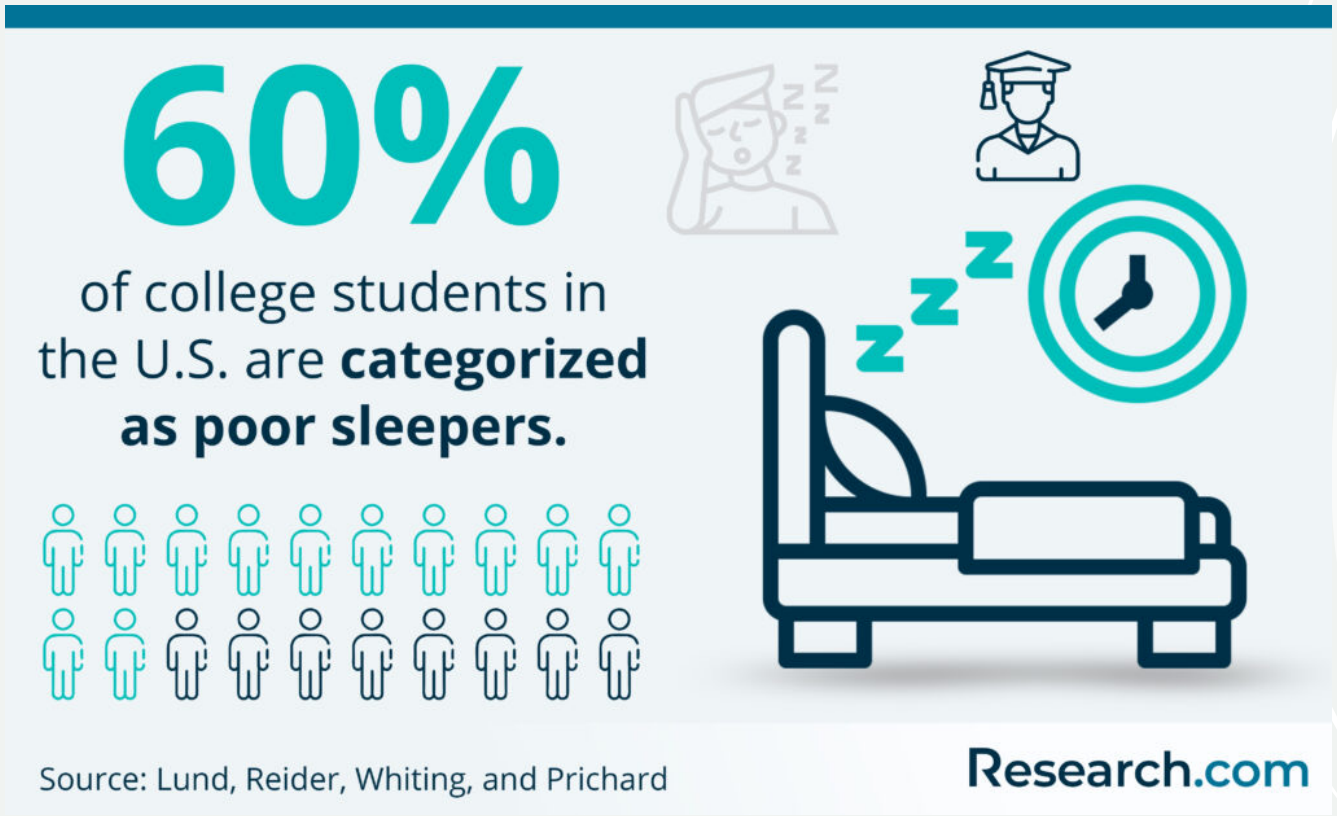
Video 2

On average, how many hours of sleep do you get per night?

Things We Know About Sleep

- Sleep is a universal need of all higher life forms.
- Humans spend about 1/3 of their lives sleeping.
- Sleep’s function is not be fully understood.
- Absence of sleep has serious physiological consequences.


SLEEP
ESSENTIALISM
CARDIOVASCULAR SYSTEM
METABOLIC SYSTEM
IMMUNE SYSTEM
THERMOREGULATORY SYSTEM
ENDOCRINE SYSTEM
REPRODUCTIVE SYSTEM
EMOTIONAL REACTIVITY
MOOD REGULATION
LEARNING & MEMORY
ATTENTION
GLYMPHATIC CLEANING
CREATIVITY
DECISION MAKING



- Poor sleep hygiene
- Alcohol
- Caffeine and other stimulants
- Technology
- Sleep disorders

Why is Sleep Important for A College Student?

Vital to academic success and mental functioning

- “Content-Relevant Sleep”
  - Getting enough sleep at the time you learn the content is more important than getting the same kind of sleep the night before a quiz or assessment.

Source: **Sleep and Academic Performance Statistics & Sleep Tips for College Students** Access at: https://research.com/education/sleep-and-academic-performance-statistics. Accessed on Nov 1, 2021.

Sleep Quantity and Academic Performance

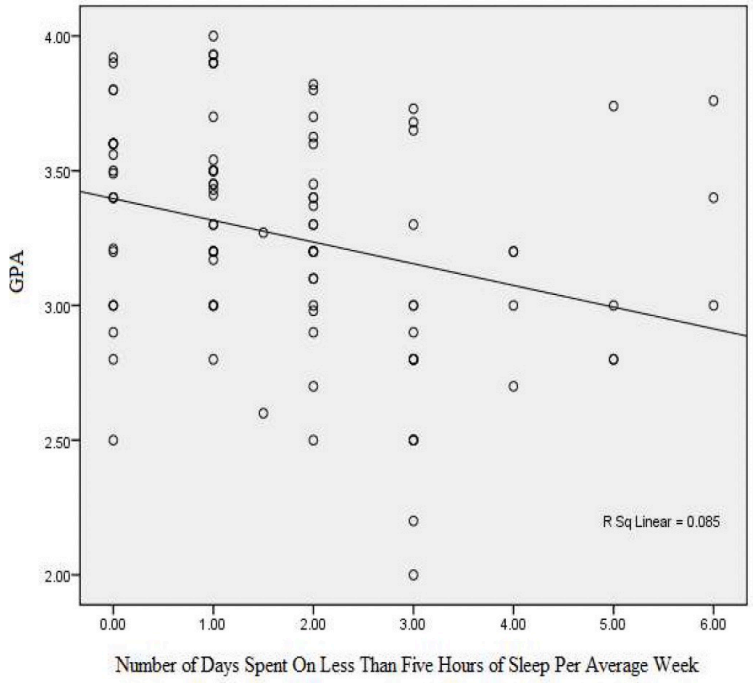


FIGURE 1. Scatter plot of GPA by average number of nights per week the students get less than five hours of sleep. Line of best fit included.

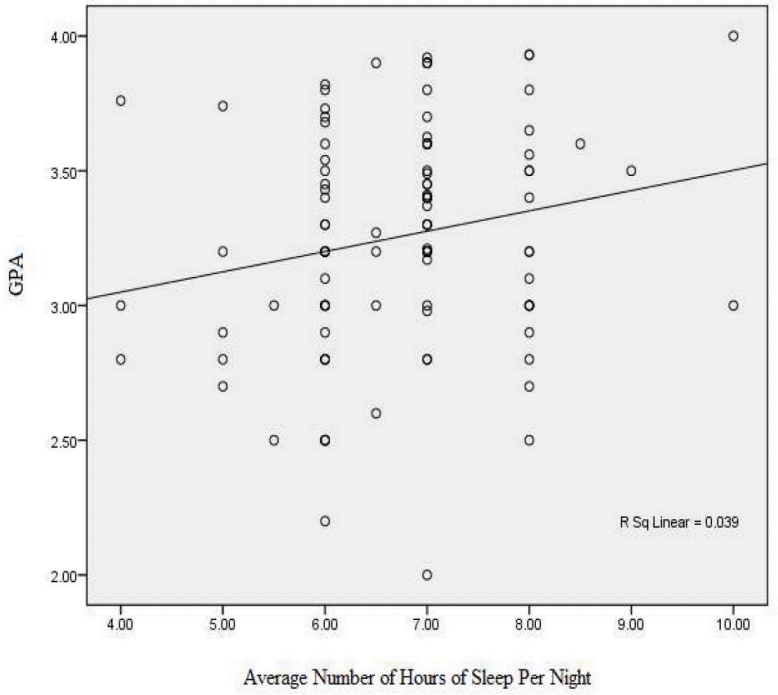
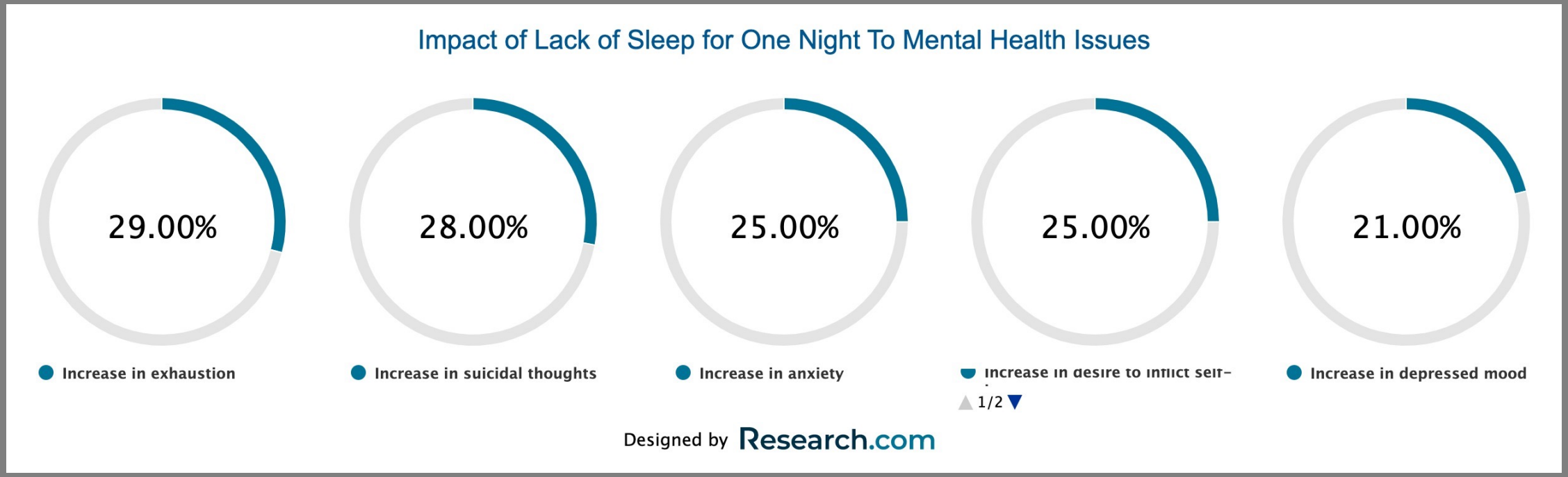


FIGURE 2. Scatter plot of GPA by number of hours slept by the student in an average night. Line of best fit included.

Source: To, Mo Kainin. The Link Between Sleep Quantity and Academic Performance for the College Student. VOLUME 3 – SPRING 2010 - https://drive.google.com/file/d/1VuOWSjYFh5rvdN3h0dEhmkqTCNMW8qdc/view. Accessed on June 26, 2023.

Why is Sleep Important for A College Student?

Plays an important role in mental health



Source: **Sleep and Academic Performance Statistics & Sleep Tips for College Students** Access at: https://research.com/education/sleep-and-academic-performance-statistics. Accessed on Nov 1, 2021.

Why is Sleep Important for A College Student?

Restores you physically and maintains your immune function

Contributes to neurological functioning

Source: **Sleep and Academic Performance Statistics & Sleep Tips for College Students** Access at: https://research.com/education/sleep-and-academic-performance-statistics. Accessed on Nov 1, 2021.

AGENDA

- Discuss sleep statistics
- Investigate theories of why we sleep
- Learn about the sleep physiology of sleep
- Learn about the sleep regulation cycle
- Discuss common sleep disorders
- Learn how to change sleep disturbing activities

Why Do We Sleep?

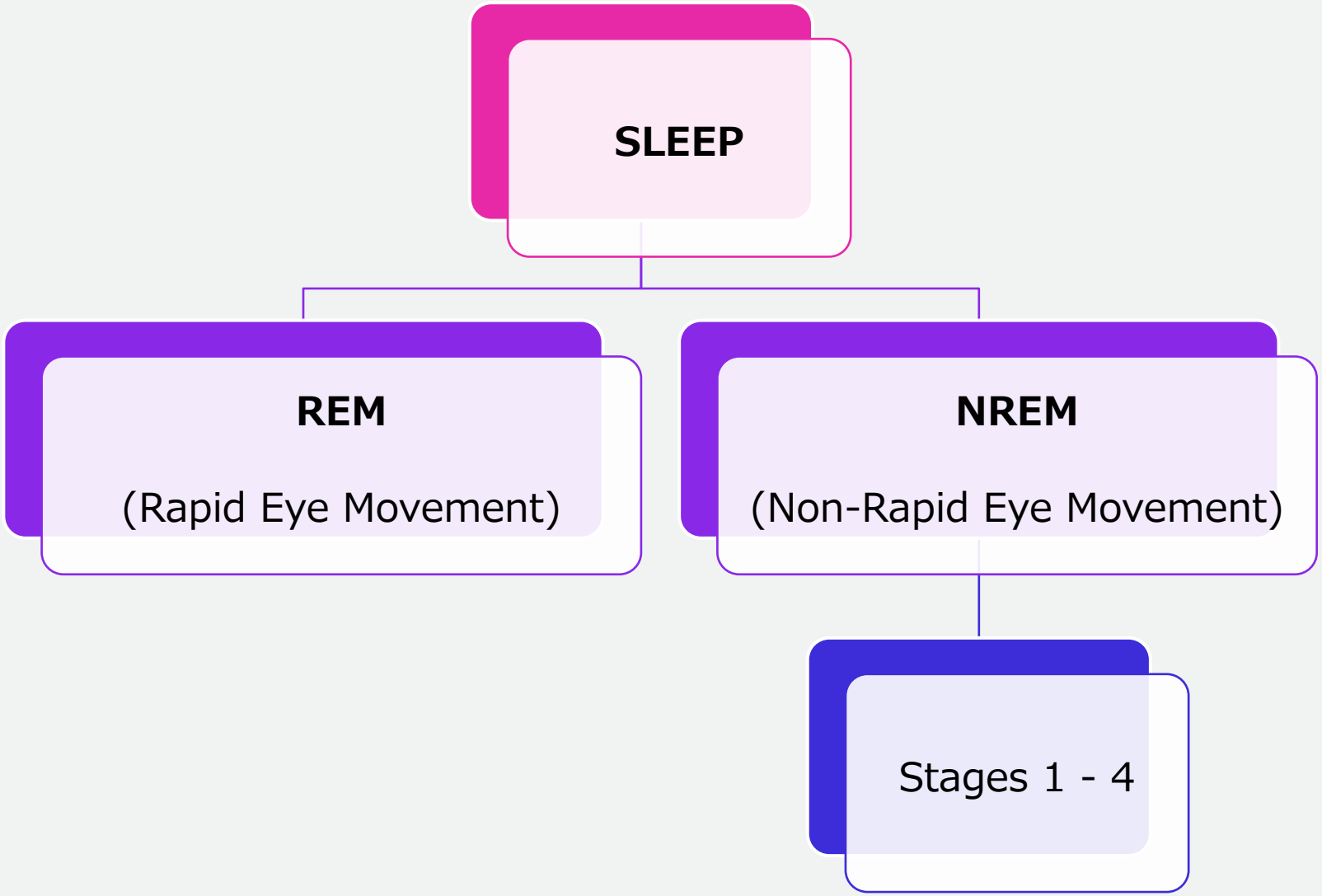
Inactivity Theory	• Concept of evolutionary pressure where creatures inactive at night were less likely to die from the predation occurring in the dark, thus creating an evolutionary and reproductive benefit to being inactive at night.
Energy Conservation Theory	• Reduces a person's energy demand during part of the day and night when it is least efficient to hunt for food. This theory is supported by the fact that the body has decreased metabolism by up to 10% during sleep.
Restorative Theory	• Sleep allows for the body to repair and replete cellular components necessary for biological functions that become depleted throughout an awake day.
Brain Plasticity Theory	• Sleep is necessary for neural reorganization and growth of the brain’s structure and function.

Source: Brinkman JE, Reddy V, Sharma S. Physiology of Sleep. [Updated 2021 Sep 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482512/

AGENDA

- Discuss sleep statistics
- Investigate theories of why we sleep
- Learn about the sleep physiology of sleep 
- Learn about the sleep regulation cycle
- Discuss common sleep disorders
- Learn how to change sleep disturbing activities

Sleep Cycle Structure



Sleep Cycle

NREM:
75-80% of sleep

NREM

Stage 3

Moderate Sleep

Lasts 10-20 min.

NREM

Stage 2

Light Sleep

Lasts 20 min.

NREM

Stage 1

Drowsy

First 5-10 min.

NREM

Stage 4

Deep Sleep

Lasts 30 min.

Stage 5

REM

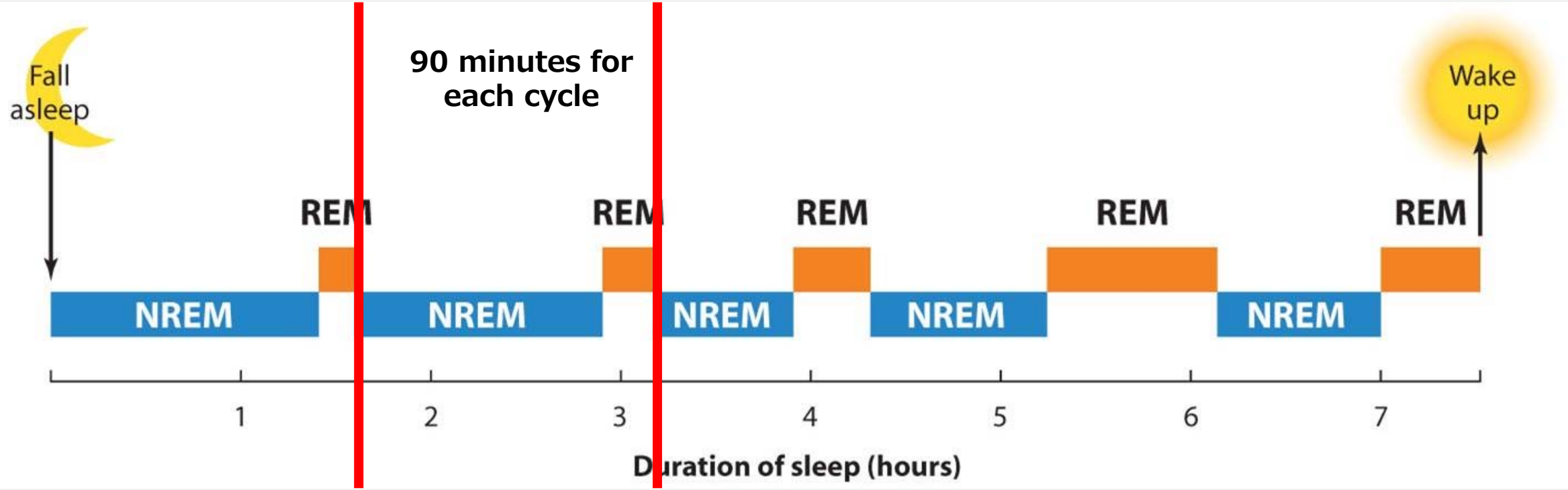
Rapid Eye Movement

REM:
20-25% of sleep

- **Dreaming**
- **Memory consolidation**

Length of Each Sleep Cycle

As the number of hours you sleep increases, your brain spends more and more time in REM sleep. Sleeping for too few hours could mean you're depriving yourself primarily of essential **"content-relevant" sleep**.



Physiological Changes During Sleep

Physiology	NREM	REM
Brain Activity	• Decreases from wakefulness • Dreamless	• Increases in some motor and sensory areas • Dreams occur • **Consolidates and processes information from the day & stores in long-term memory**
Energy	• **Restful and restorative** • **Body temperature and energy use drop** • **Growth hormone released and the body repairs worn tissues** • **Boosts immune function** • **Builds up energy for the next day**	Energized
Heart Rate	Slows from wakefulness	Increases compared to NREM
Blood Pressure	Decreases from wakefulness	Increases

Physiological Changes During Sleep

Physiology	NREM	REM
Sympathetic Nervous System	Decreases from wakefulness	Increases significantly from wakefulness
Muscles activity	Similar to wakefulness	**Muscles paralyzed except for respiratory muscles and eye muscles**
Blood flow to brain	Decreases from wakefulness	Increases from NREM, depending on brain region
Respiration	Decreases from wakefulness	Increases from NREM, but may show brief stoppages
Body temperature	**Lower set point than wakefulness**	Temperature drifts toward that of the local environment

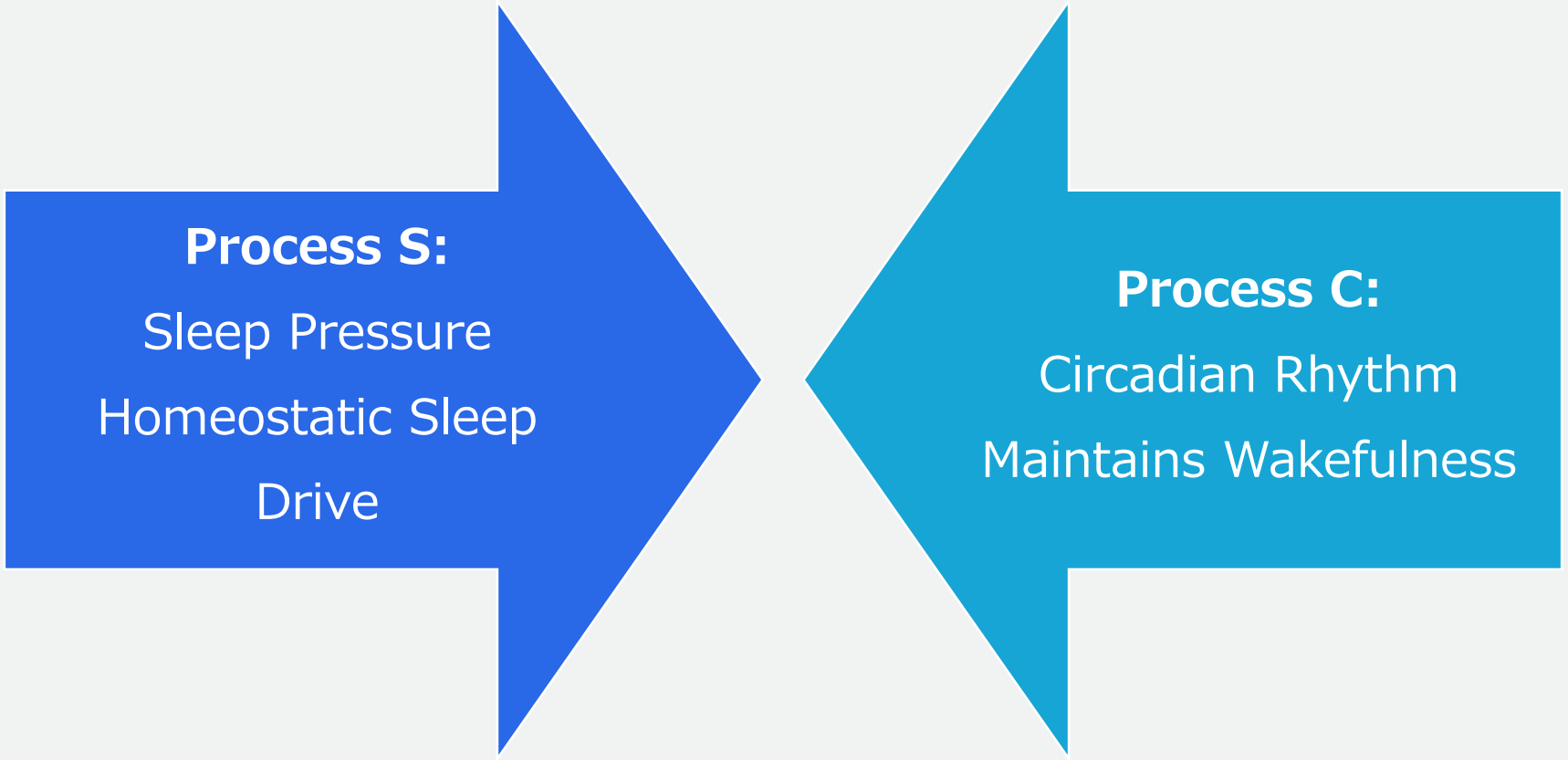

End of Video 1

AGENDA

- Discuss sleep statistics 
- Investigate theories of why we sleep 
- Learn about the sleep physiology of sleep 
- Learn about the sleep regulation cycle 
- Discuss common sleep disorders
- Learn how to change sleep disturbing activities

SLEEP-WAKE REGULATION:

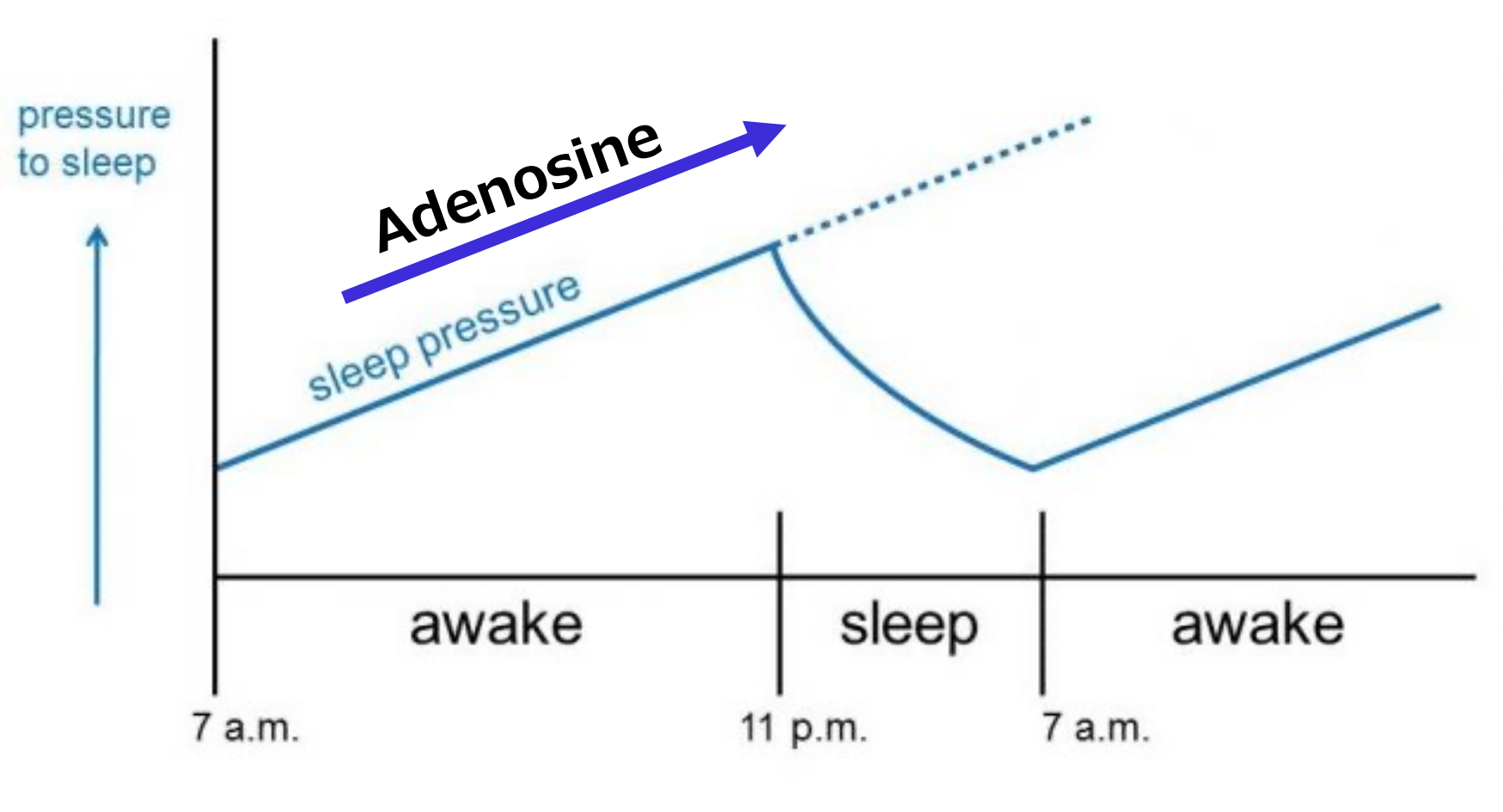
Interplay of Two Concurrent Processes



Source: https://www.cdc.gov/niosh/work-hour-training-for-nurses/longhours/mod2/10.html. Accessed on 7.5.22

SLEEP REGULATION:

Process S: Sleep Pressure: Homeostatic Sleep Drive



An increase in adenosine (from ATP) increases a person's need for sleep

Source: https://www.cdc.gov/niosh/work-hour-training-for-nurses/longhours/mod2/10.html. Accessed on 7.5.22; Adenosine and Sleep Accessed at: https://www.sleepfoundation.org/how-sleep-works/adenosine-and-sleep#:~:text=An%20increase%20in%20adenosine%20increases,stronger%20their%20sleep%20drive%20becomes. Accessed on Sept 14, 2022.

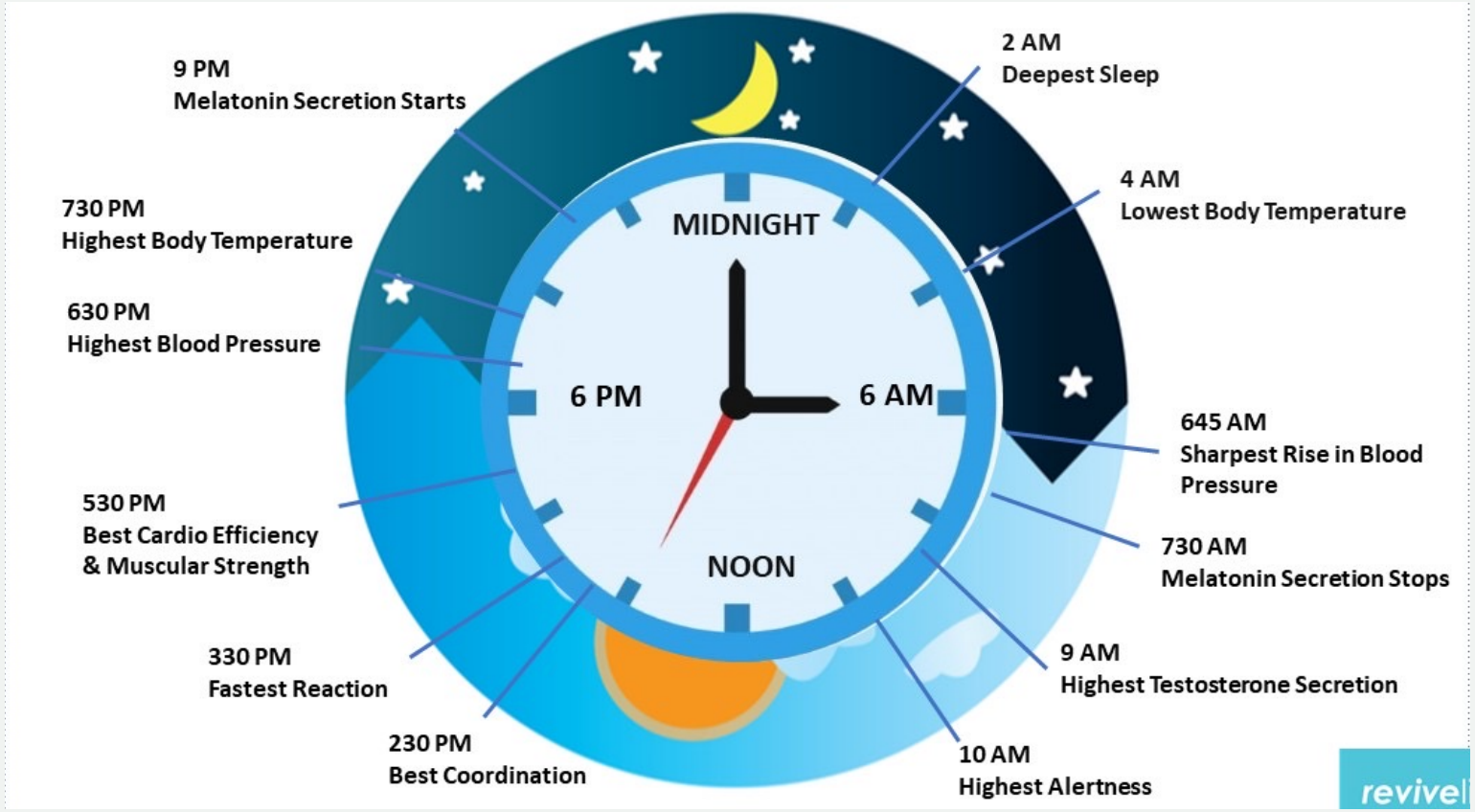
WAKE REGULATION:

Process C: Circadian Rhythm

<u>24-hour sleep/wake cycle</u>

Controls the daily rhythms in physiology and behavior of the body:

- physical activity
- food consumption
- body temperature
- hormonal secretion



WAKE REGULATION:

Process C: Circadian Rhythm

Circadian Rhythm

24-hour sleep/wake cycle

External regulator:

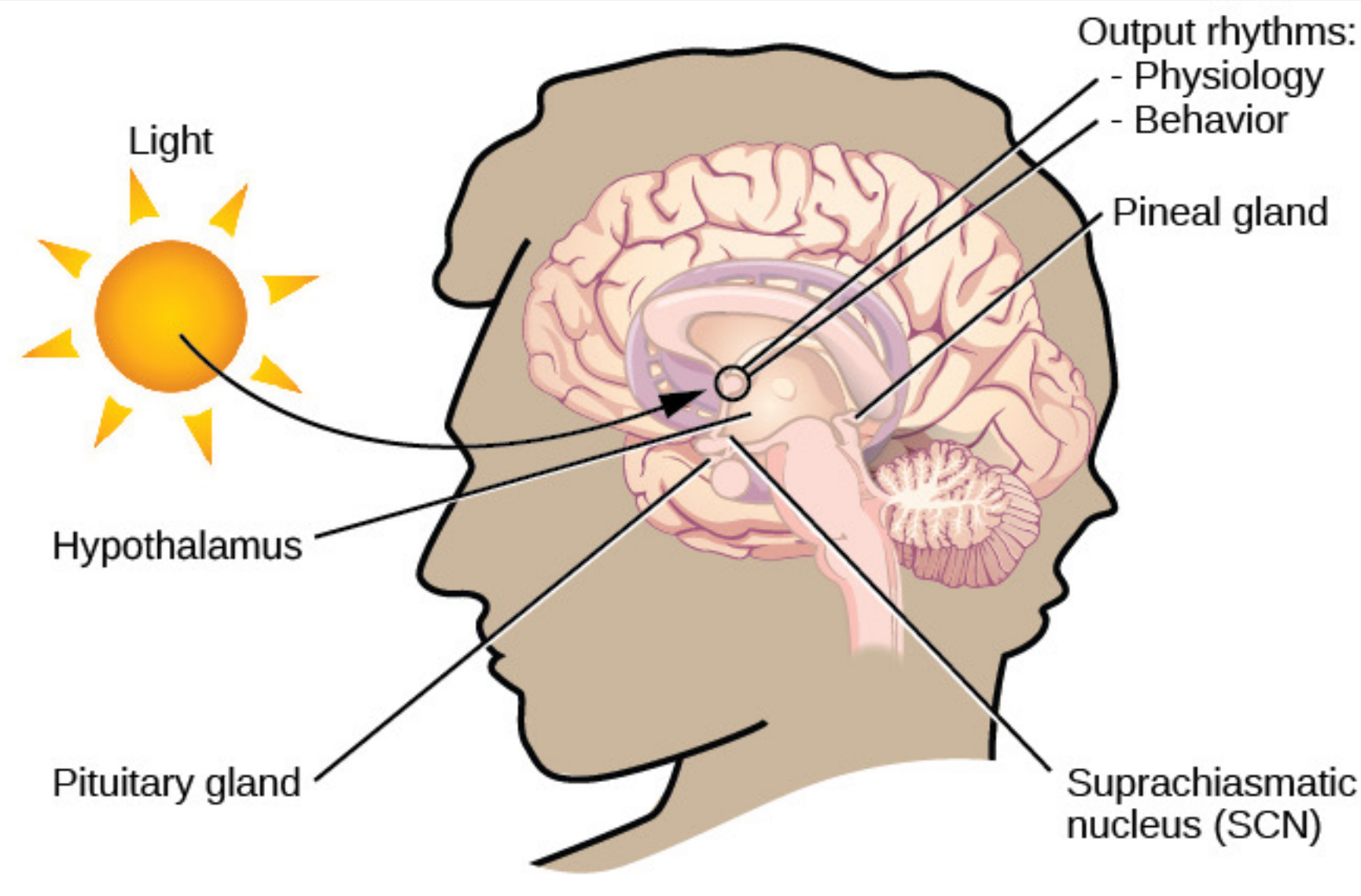
Lightness and darkness

Internal regulator:

Hypothalamus

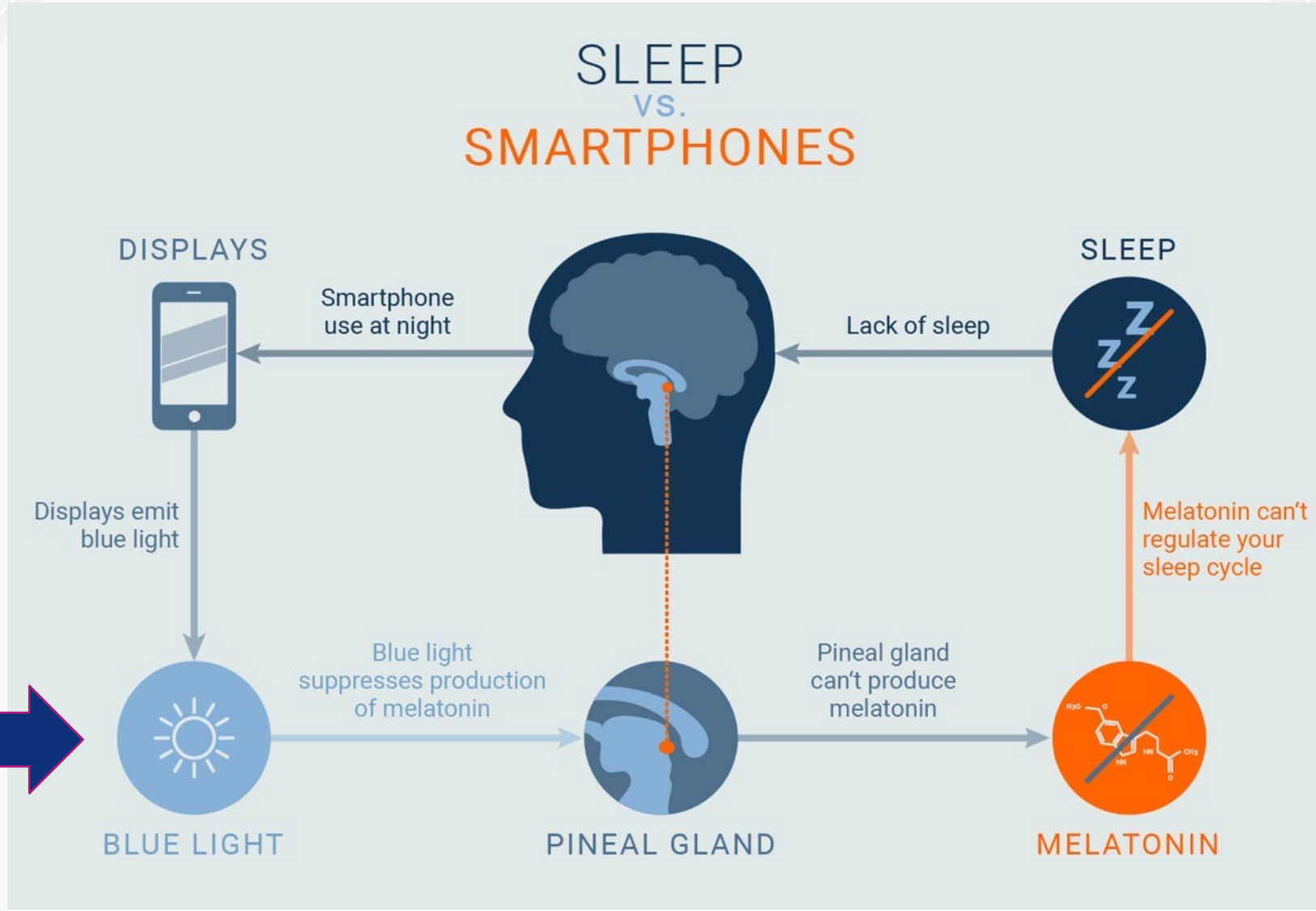
(Suprachiasmatic Nucleus)

Internal/External Regulation



- **Retina**
  - Regulates light/dark inputs
- **Hypothalamus**
  - **Suprachiasmatic Nucleus**
    - *Neuron clusters in the hypothalamus that receive visual information from the retina via the optic nerve and that regulate the body's circadian rhythms.*
  - **Pineal Gland**
  - Releases Melatonin

Source: https://www.cdc.gov/niosh/work-hour-training-for-nurses/longhours/mod2/25.html. Accessed on 7.5.22



Blue Light is the most impactful

The Color of the Light Affects Circadian Rhythms

Facts on Light and Sleep

- Light will even pass-through closed eyelids during sleep and signal the circadian pacemaker.
- Bright evening light causes a phase delay (getting sleepy later and waking up later).
- Bright morning light causes a phase advance (getting sleepy earlier in the evening and waking up earlier in the morning).

Other things we think about on the sleep topic…

- Your Chronotype
- Caffeine
- Alcohol
- Naps

What is your chronotype?

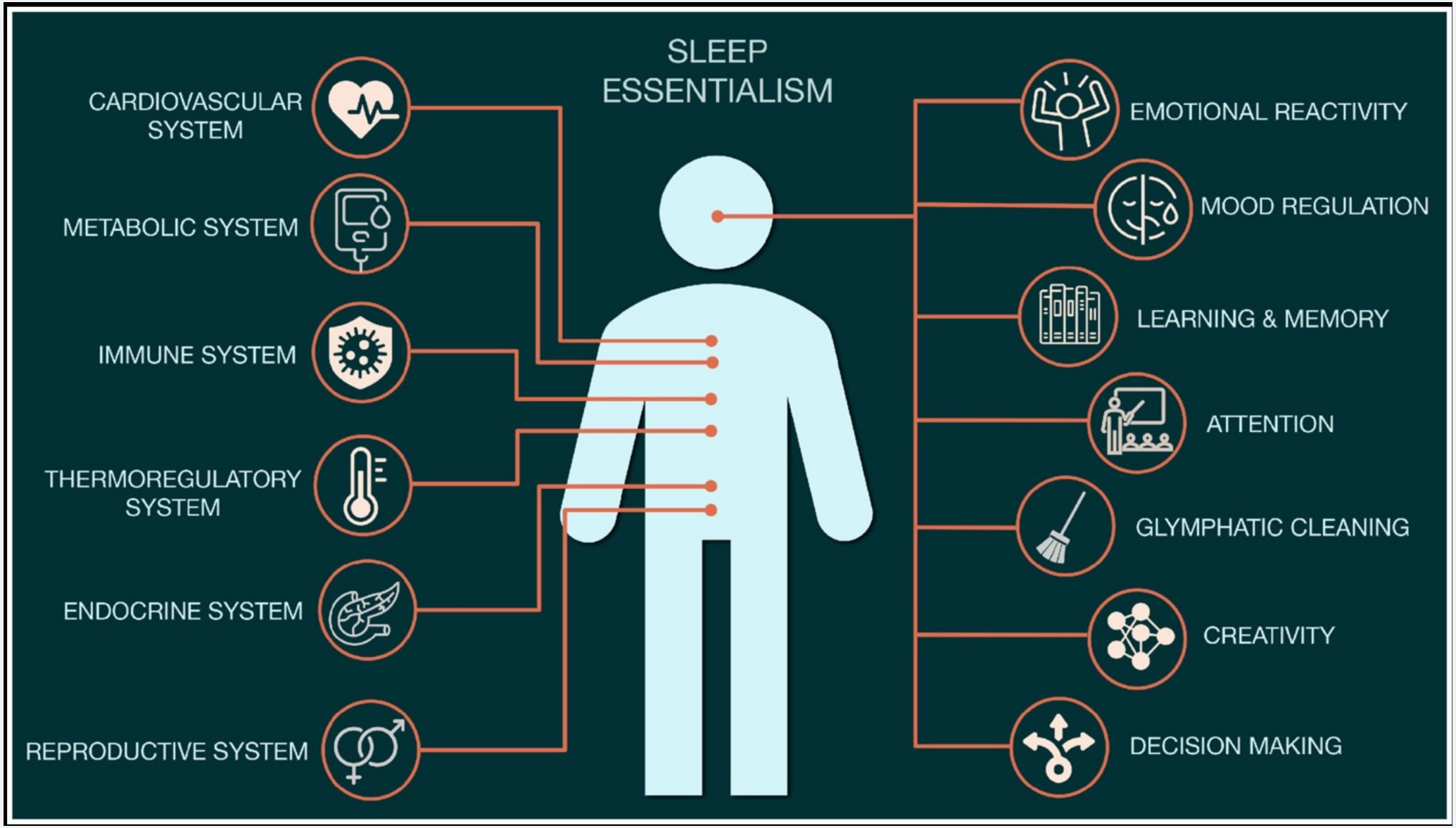
Or Are You Somewhere In Between?

Sources: Montaruli, A.; Castelli, L.; Mulè, A.; Scurati, R.; Esposito, F.; Galasso, L.; Roveda, E. Biological Rhythm and Chronotype: New Perspectives in Health. Biomolecules 2021, 11, 487. https://doi.org/10.3390/biom11040487; Sleep Foundation. Accessed at: https://www.sleepfoundation.org/how-sleep-works/chronotypes#types-of-chronotypes. Accessed on June 26, 2023.

“Morningness-Eveningness” Questionnaire

Website: https://chronotype-self-test.info/index.php?sid=61524&newtest=Y

Your Chronotype Can Impact Your Health



Source: Montaruli, A.; Castelli, L.; Mulè, A.; Scurati, R.; Esposito, F.; Galasso, L.; Roveda, E. Biological Rhythm and Chronotype: New Perspectives in Health. Biomolecules 2021, 11, 487. https://doi.org/ 10.3390/biom11040487

Why Do Caffeinated Beverages Keep Us Awake?

- Caffeine promotes alertness by **blocking adenosine.**
- Affects caffeine can last 6-8 hours
- Excess consumption of caffeine disrupts circadian cycles

Source: Adenosine and Sleep. Accessed at: https://www.sleepfoundation.org/how-sleep-works/adenosine-and-sleep#:~:text=An%20increase%20in%20adenosine%20increases,stronger%20their%20sleep%20drive%20becomes.. Accessed on Sept 14, 2022.

Three Concerns of Alcohol

1. **Acts as a sedative**

   stops brain cell firing, which counteracts the need for important electrical signaling in the brain

2. **Fragments your sleep**

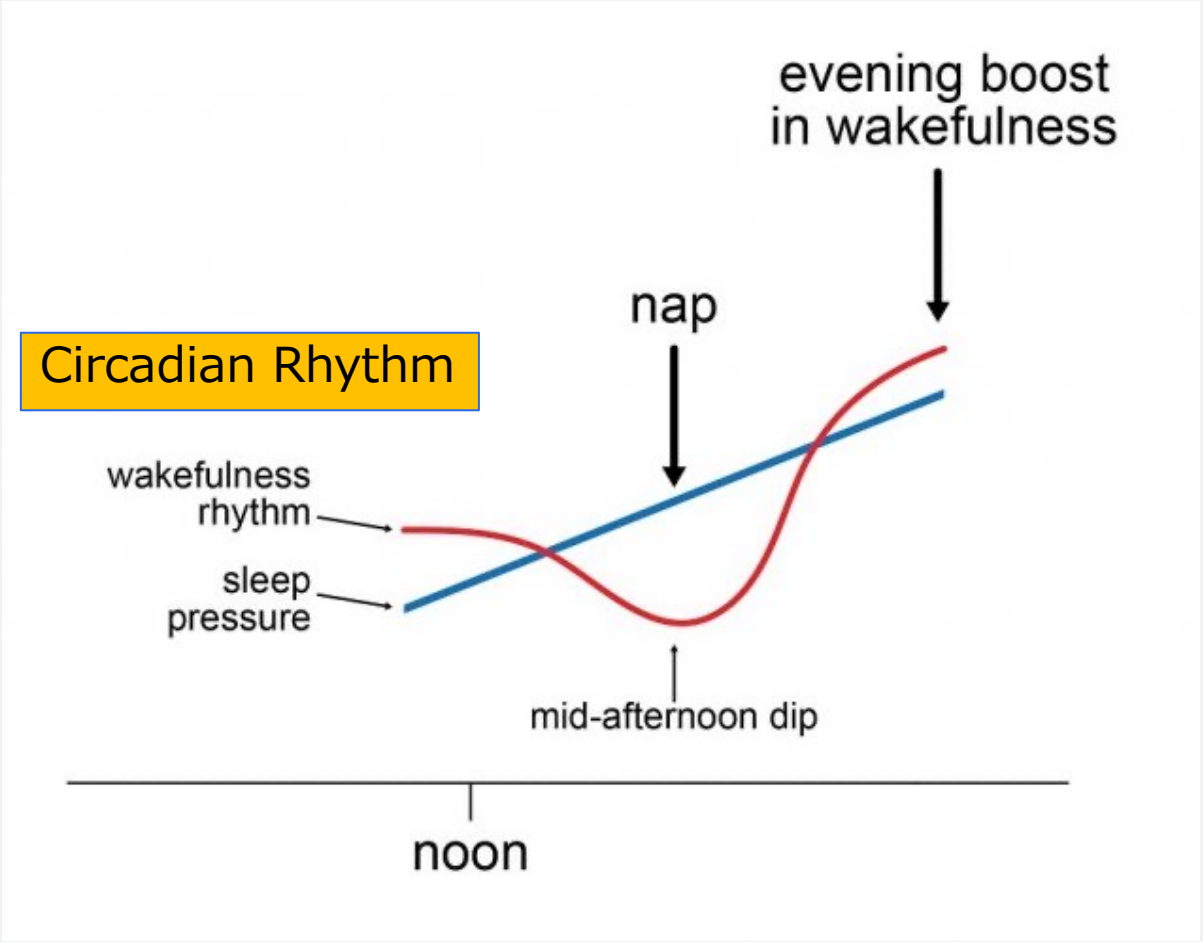
   especially in 2nd half of the night

3. **Blocks REM sleep**

   dream and memory consolidation sleep

Source: Dr. Matt Walker Podcast, Episodes 1 &2 on Sleep and Alcohol

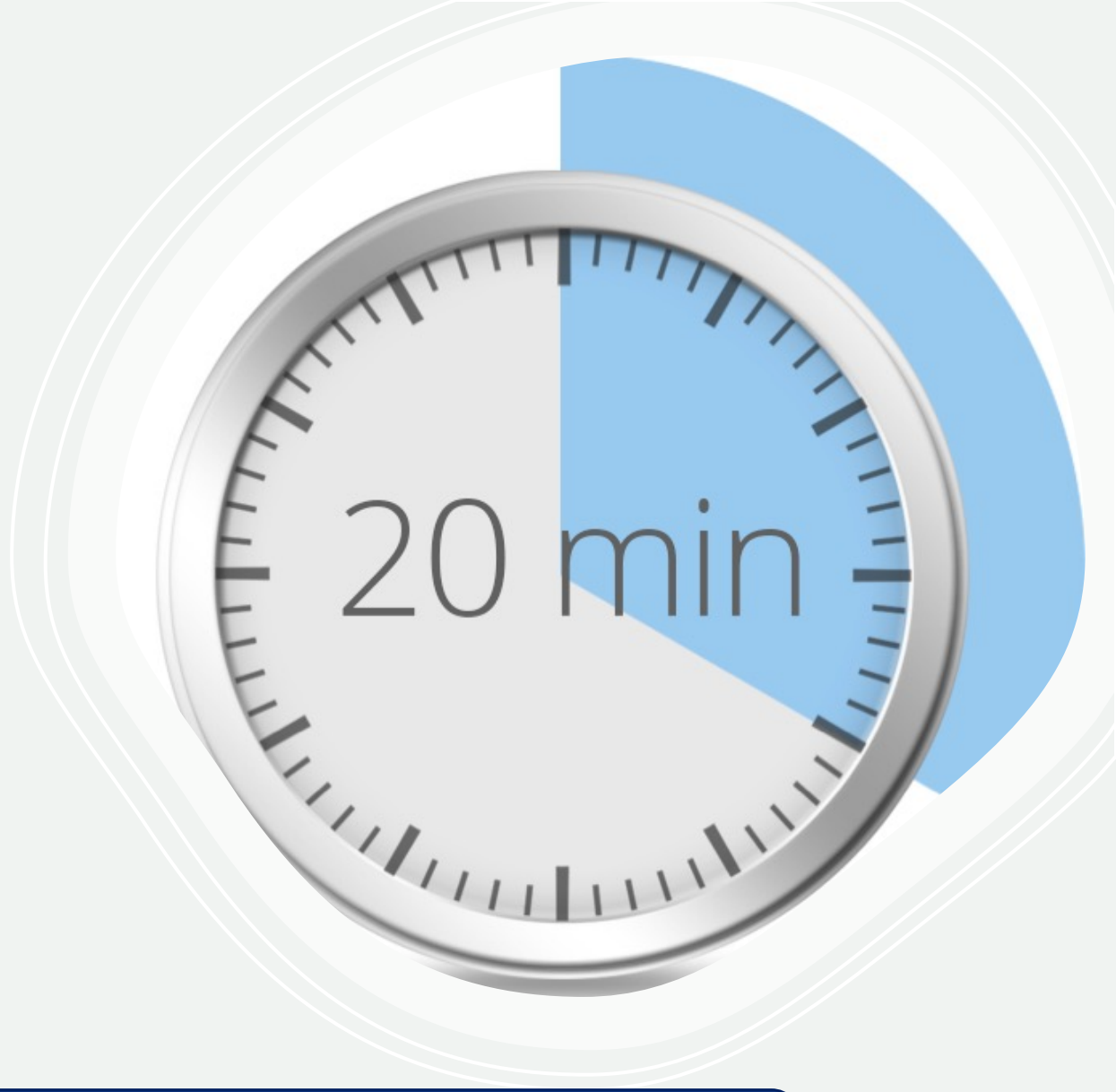
Afternoon Dip in Wakefulness = Naptime!



Source: https://www.cdc.gov/niosh/work-hour-training-for-nurses/longhours/mod2/25.html. Accessed on 7.5.22

THE POWER NAP STRATEGY

- **Why**: Improved alertness, enhanced performance, and a better mood
- **How much:** 20 minutes
  - 30-60 min = deep stages of sleep
  - 90 min = full sleep cycle
- **When:** Mid-afternoon
- **How**: Same time every day



Can’t fall asleep at night···skip the nap!

Dangers of Sleepiness and Fatigue

Sleep deprivation increases pressure for the brain to fall asleep.

The transition from wakefulness to sleep is *abrupt and rapid* and occurs in an on/off-type switch in the brain stem.

Warning signs that the brain is close to falling asleep

- Difficulty focusing
- Frequent blinking
- Heavy eyelids
- Daydreaming/Wandering
- Disconnected thoughts
- Yawning repeatedly
- Rubbing eyes
- Difficulty keeping head up
- Feeling restless and irritable

Car Crash Analysis
Key Findings

- An estimated 16.5% of fatal crashes and 13.1% of crashes resulting in hospitalization
- **Younger drivers aged 16-24 were nearly twice as likely to be involved in a drowsy driving crash as drivers aged 40-59.**
- Two out of three drivers involved in a drowsy driving crash were men.
- Vehicles in which the driver was accompanied by a passenger were nearly 50% less likely to be involved in a drowsy driving related crash.
- About 57%of drowsy driving crashes involved the driver drifting into other lanes or even off the road.

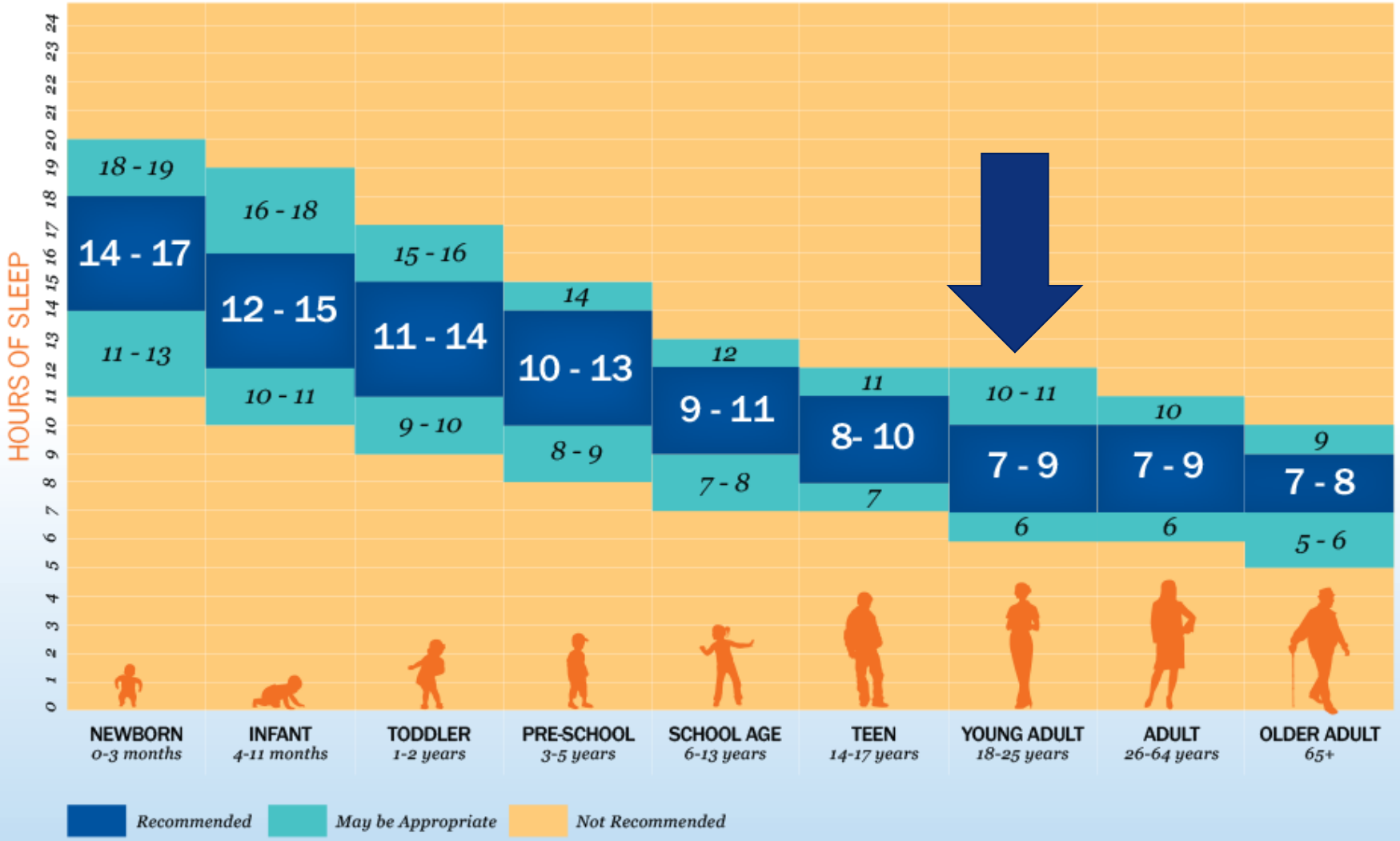
Source: Tefft, B.C. (2010). *The Prevalence and Impact of Drowsy Driving* (Technical Report). Washington, D.C.: AAA Foundation for Traffic Safety.

To remain alert and avoid drowsiness

- Get at least six hours of sleep the night before a long trip
- Travel at times when you are normally awake, and staying overnight rather than driving straight through
- Schedule a break every two hours or every 100 miles
- Stop driving if you become sleepy
- Do not plan to work/study all day and then drive all night
- Drink a caffeinated beverage. Since it takes about 30 minutes for caffeine to enter the bloodstream, find a safe place to take a 20–30-minute nap while you're waiting for the caffeine to take effect
- Avoid sleepy times of day. Take a mid-afternoon nap and find a place to sleep between midnight and 6 a.m.
- Travel with an awake passenger.

NATIONAL SLEEP FOUNDATION

SLEEP DURATION RECOMMENDATIONS



Key Factors that Promote Fatigue

Time of day (circadian effect)

Time awake and amount of sleep

Time on task

AGENDA

- Discuss sleep statistics
- Investigate theories of why we sleep
- Learn about the sleep physiology of sleep
- Learn about the sleep regulation cycle
- Discuss common sleep disorders 
- Learn how to change sleep disturbing activities

Sleep Disorders

INSOMNIA

SLEEP APNEA

Chronic Insomnia Disorder

- Most common sleep disorder
- More common among women than men
- Prevalence increases with age
- Lasts 3 months or more
- Characterized by one of the following sleep difficulties:
  - **Sleep Onset Insomnia** - Falling asleep
  - **Sleep Maintenance Insomnia** - Staying asleep
  - **Non-Restorative Sleep Insomnia** – not feeling rested

Chronic Insomnia Disorder

- At least one associated problem when awake
  - Daytime fatigue and sleepiness
  - Attention, concentration or memory impairment
  - Impaired social, family, occupational or academic performance
  - Mood disturbance/irritability
  - Reduced motivation or energy
  - Prone to errors or accidents
- Treatments
  - Cognitive behavioral therapy
  - Hypnotic or sedative medications
  - Relaxation techniques

“30/30/3” Rule of Thumb

30 At least 30 minutes to fall asleep

30 30 minutes go fall back to sleep after waking during the night

3
- Happening consistently at least 3 nights a week.
- Having these issues for three straight months

Why do we get Insomnia?
3 P's Model

Predisposing factors	Precipitating factors	Perpetuating factors
Genes that play a role in your risk of developing insomnia	A trigger that pushes you into insomnia	Continue the condition and make it even more permanent

Sleep Disorders

INSOMNIA

SLEEP APNEA

SLEEP APNEA

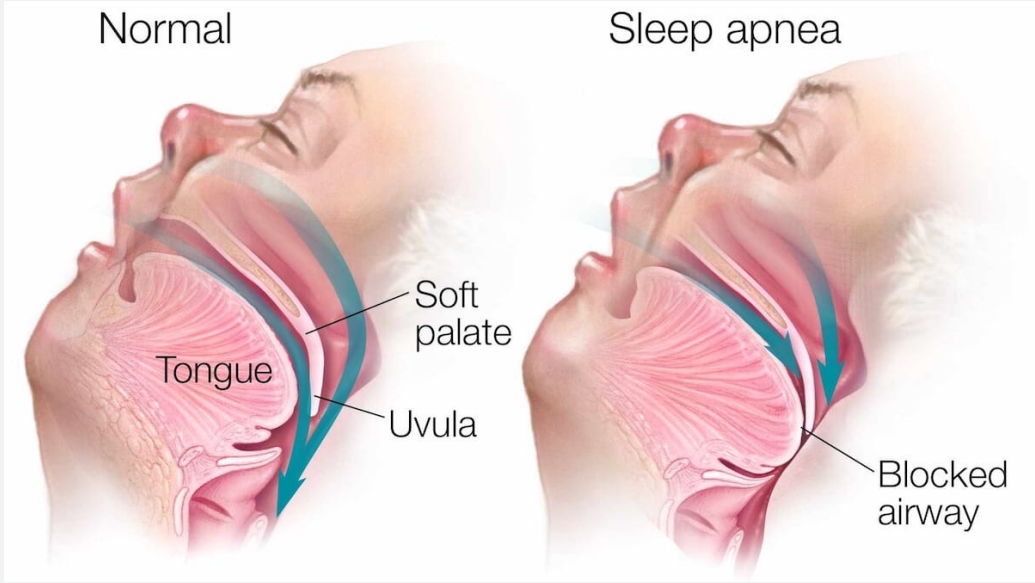
- 1 in every 15 people (>18 million people)
- Breathing is briefly and repeatedly interrupted during sleep

Central Sleep Apnea

- Brain fails to tell the respiratory muscles to initiate breathing
- Contributors: alcohol, illegal drug usage, certain medications

Obstructive Sleep Apnea

- Air cannot move in and out of a person's nose or mouth, even though the body tries to breathe
- Contributors: overweight/obese



AGENDA

- Discuss sleep statistics
- Investigate theories of why we sleep
- Learn about the sleep physiology of sleep
- Learn about the sleep regulation cycle
- Discuss common sleep disorders
- Learn how to change sleep disturbing activities

Examples of Changing Sleep-Disturbing Activities

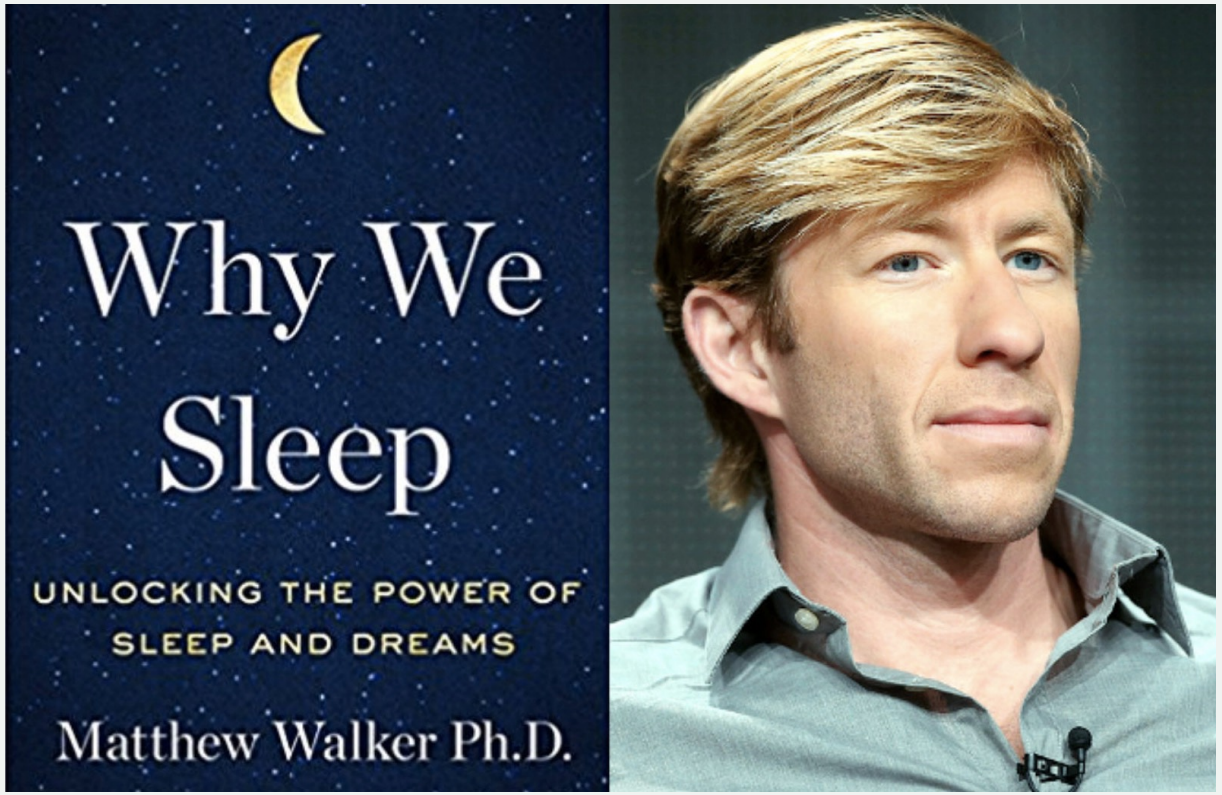
Sleep-disturbing activities	Samples of Corrective Actions
Sleeping in an unrestful environment	• Work with my partner or roommates to make your housing quiet and cool at night. • Reduce thermostat at night • Ensure that sources of light (windows, doorways) coming into your room are covered.
Exercising vigorously within one hour of bedtime	• Change my routine to exercise in the morning or after work/school.
Ate a large meal before bedtime	• Arrange to finish dinner by 7:30 PM, 8 at the latest. • Try to have larger meals for breakfast and lunch while keeping dinner meals smaller.
Indulged in a midnight snack	• If I get hungry overnight, plan light snack and perhaps warm milk at least an hour before bedtime.
Varying your bedtime by more than an hour across the week	• Cut out the weekend binge-watching of your favorite shows until 3 am. • Set a consistent bedtime and wake schedule. Vary it no more than 1 hour across the week.
Taking a nap that is longer than 20 minutes	• Allow myself naps to get through the day only if needed but use cellphone timer to limit to 20 minutes.
Taking a nap after dinner or with less than 3 hours before bedtime	• Schedule early afternoon naps. • If find myself really craving a nap after dinner, try taking a nap before preparing dinner and maybe moving dinner back 30 minutes.

Examples of Changing Sleep-Disturbing Activities

Sleep-disturbing activities	Corrective Actions
Working/Studying until bedtime	• Quit working/studying one hour before bedtime. • Set a warning alarm 30 minutes before you need to stop working/studying.
Consuming alcohol within 2 hours of bedtime	• Have wine with dinner and then no alcohol after that. • Before bed, have some warm decaffeinated tea or milk instead of alcohol.
Doing other activities (e.g., work, eating, watched TV) in bedroom	• Move TV to another location in home. • Restrict all non-sleep activities outside of the bedroom. • Store laptop and phone in another room.
Using screens in bed and immediately before bedtime	• Renew subscription to magazines to have hard copies to read in bed. • Buy hard copies of books or get a blue light filter Kindle
Staying in bed and worrying	• If can't return to sleep within 20-30 minutes, get up, go to another room, and read relaxing material for at least 30 minutes – ***No TV or phone!!!!*** • Get out of bed and/or the bedroom, write down all the topics worrying you on a pad of paper, perhaps note plans for dealing with them, set aside, and return to bed. • Make a plan before bedtime for nagging problems will help keep your mind from turning them over and over while you are wanting to sleep.
Drinking caffeinated drinks late in the day	• Limit caffeine intake to 6-8 hours before bedtime.

Four Key Tips for Optimizing Your Sleep

1. Have the same bedtime & wake up time.
2. Have a bedtime routine.
3. Create a ”sleep cave”!
4. Abstain from caffeine after noon.



Why We Sleep

Matt Walker, PhD

(19 minutes)

VIDEO FOUND IN THE SLEEP MODULE