Don't Sleep on Sleep

How Sleep Can Impact Brain Functioning

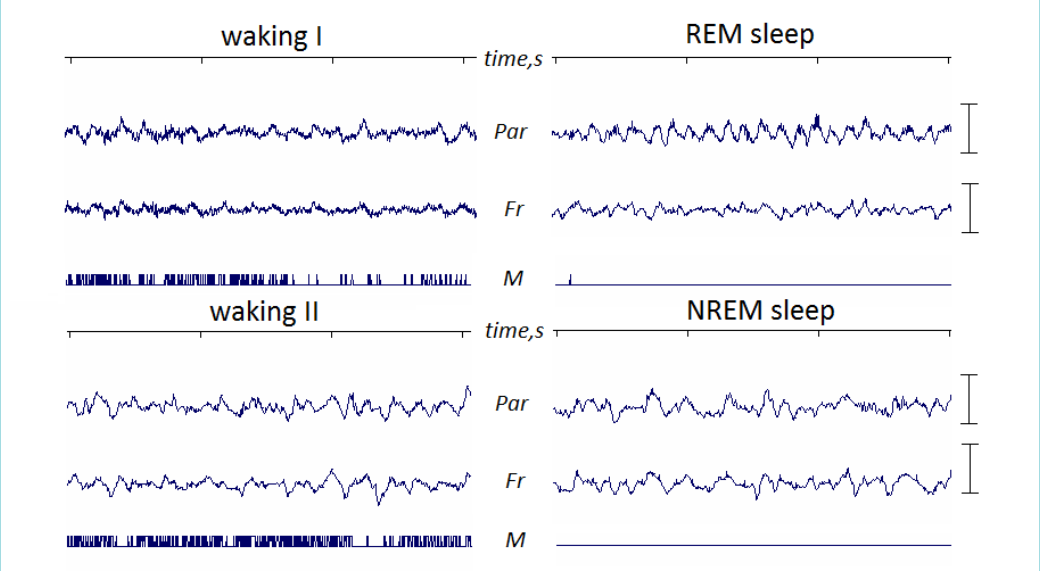
Corinne Cannavale, BS

How do you feel after a poor night’s sleep?

Put your answers in the chat!

What is sleep?

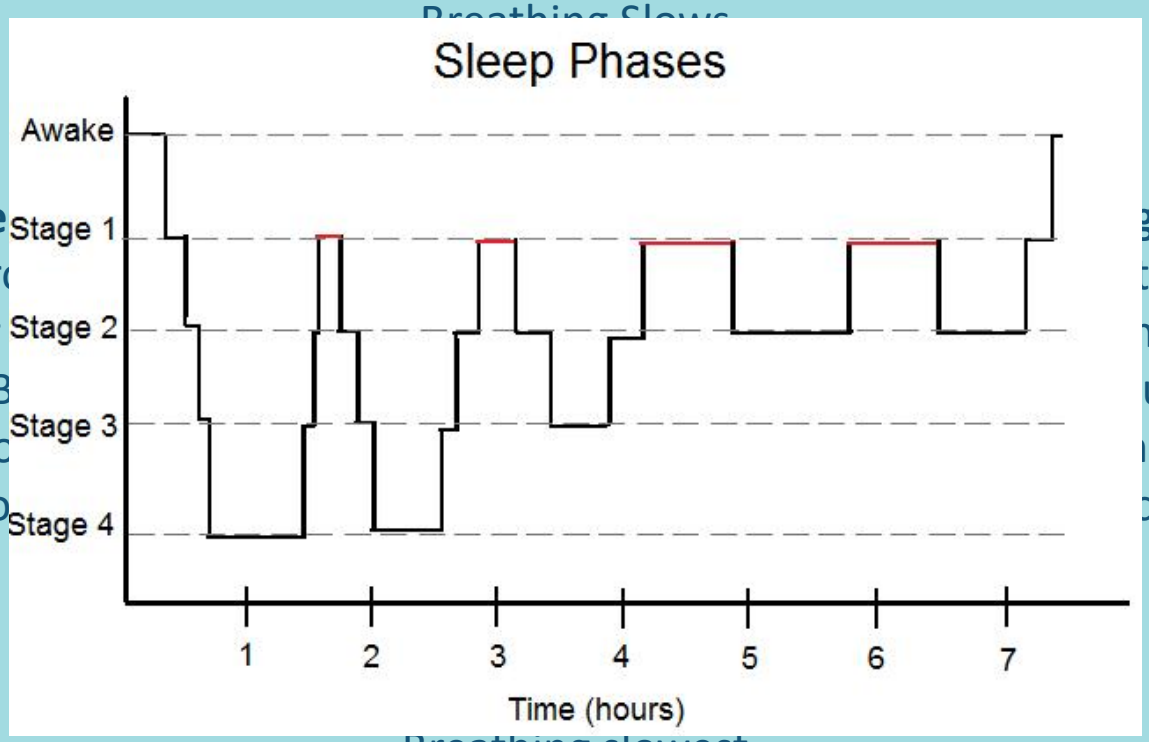
- Sleeping is an essential process which we spend approximately 1/3 of our life doing
- We don’t fully understand why we sleep, however, there are a variety of cognitive, metabolic, and immune benefits of sleeping
- While you sleep, your brain is still active and undergoing various processes



Sleep Stages

Z
Z
Z

Stage 1
Light sleep
Heart Rate Slows
Breathing Slows



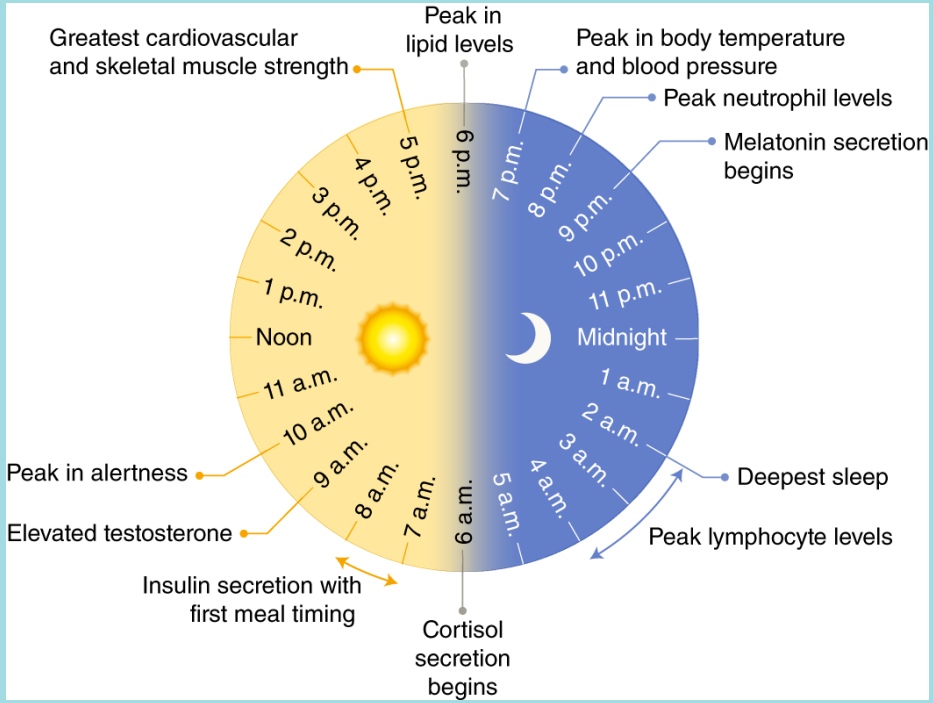
REM sle
Eyes move rapidly fr
Faster irregular
Heart rate and B
Dreaming c
Arms and legs tempo

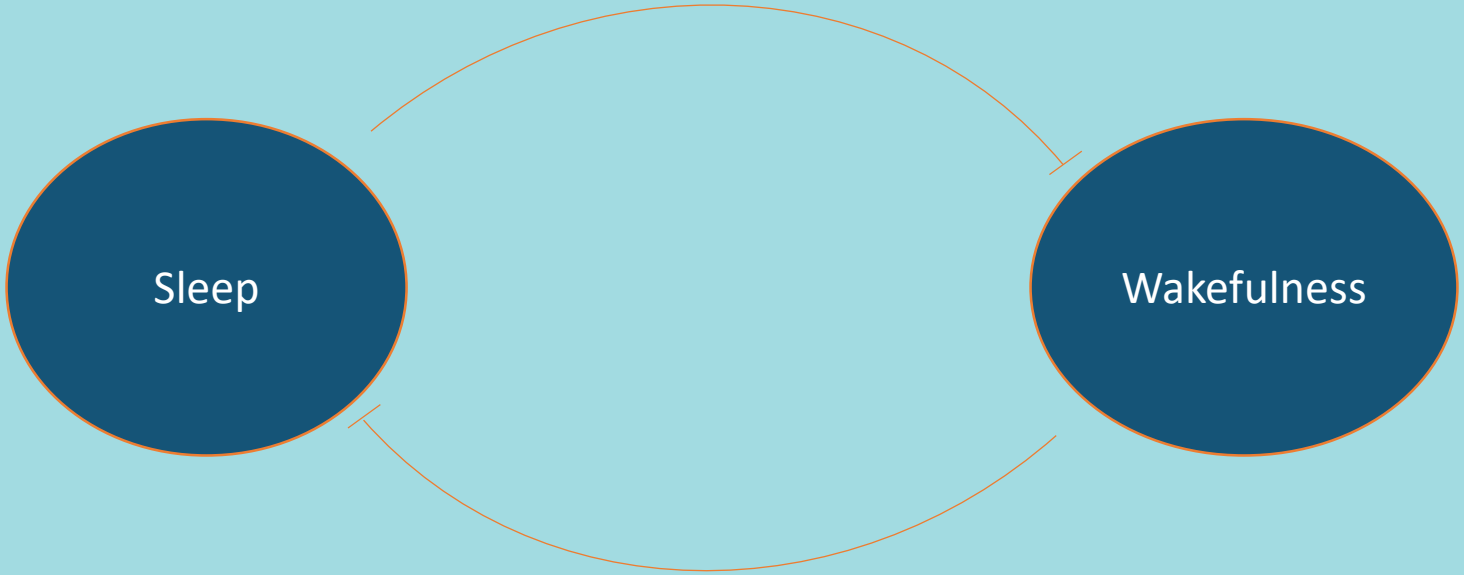
ge 2
t rate slowing
ng slows
ure drops
ovement
cle relaxation

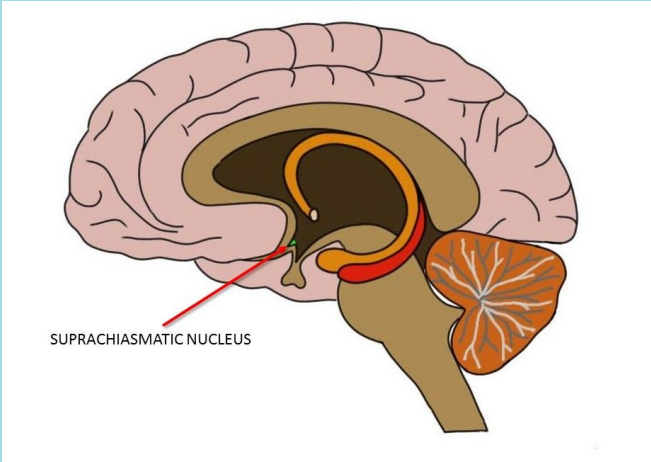
Breathing slowest
Muscles very relaxed
Difficult to wake

Circadian Rhythms

- Our bodies work on ~24 hour clock where signals of sleep and wakefulness are dependent on time and light cycles







Masri & Sassone-Corsi, 2018

How does sleep impact us?

Learning and Memory

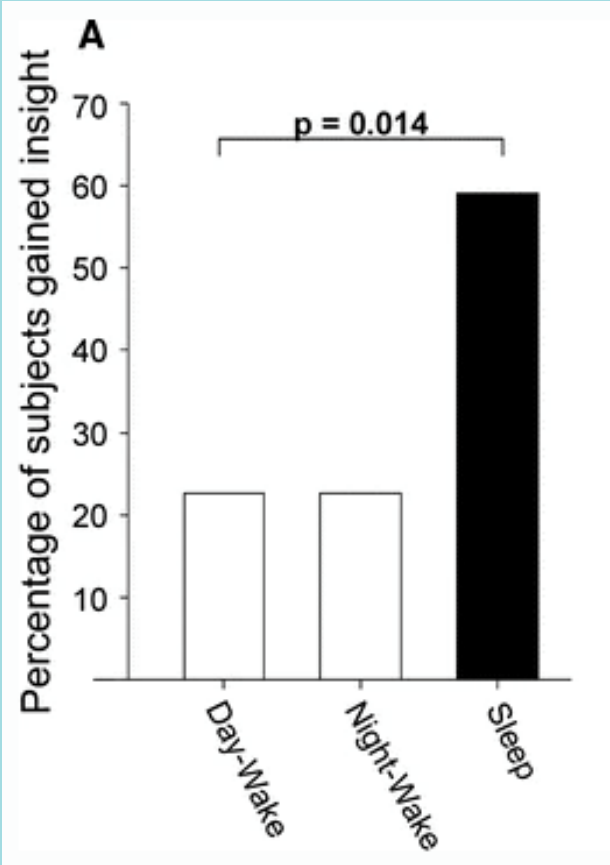
Metabolism

Emotional Regulation

Immune System Function

Memory & Learning

- Many studies have shown that participants who sleep after learning a rule set or information perform significantly better than those who do not sleep after learning
- It is thought that memory is consolidated during sleep, which allows our brains to better retain information previously learned



Born & Wilhelm, 2011

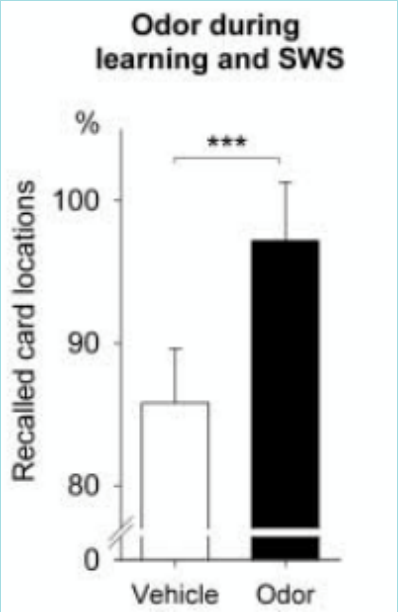
How do we know that memory consolidation occurs during sleep?

OR

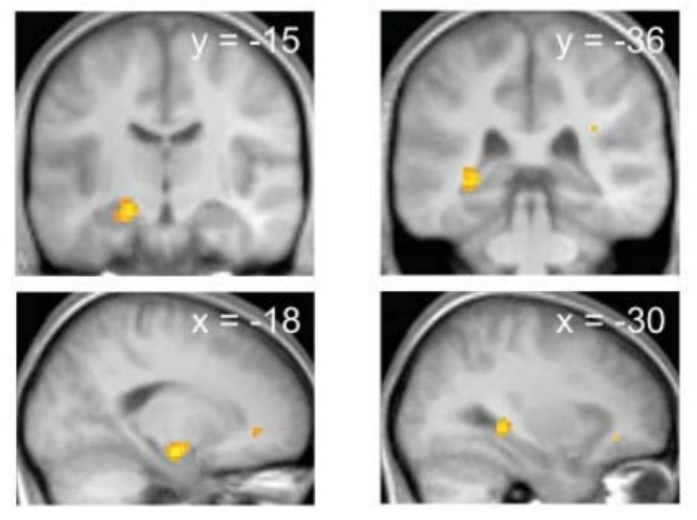
Learning | Sleep | Memory Test

20:00 → 24:00 → 9:00

Those who had the odor presented during slow-wave sleep performed significantly better at test



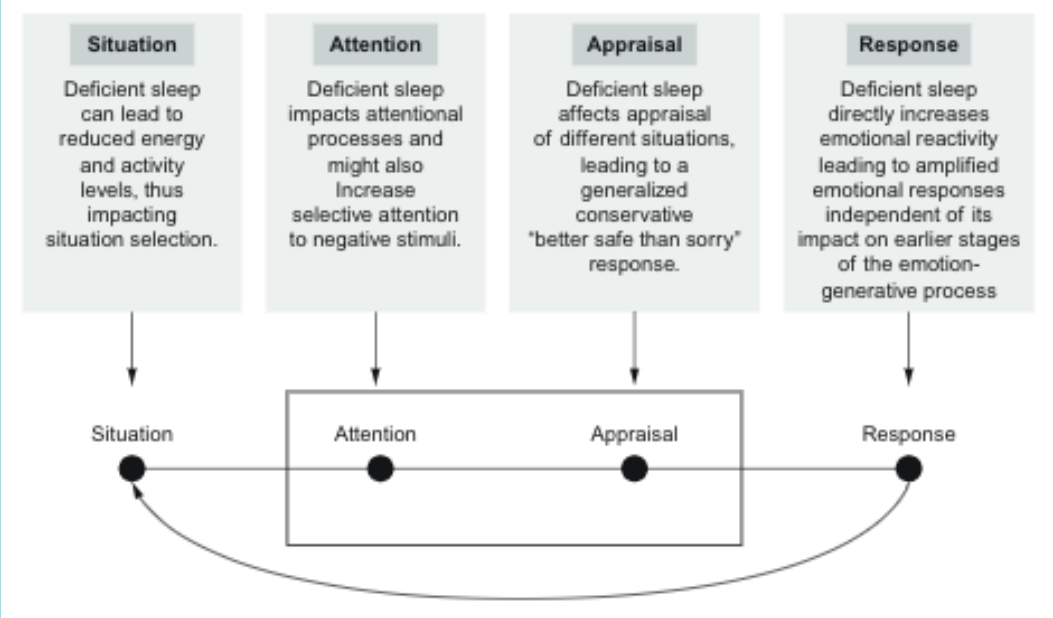
Odor given during slow-wave sleep led to higher signal levels in regions related to memory performance

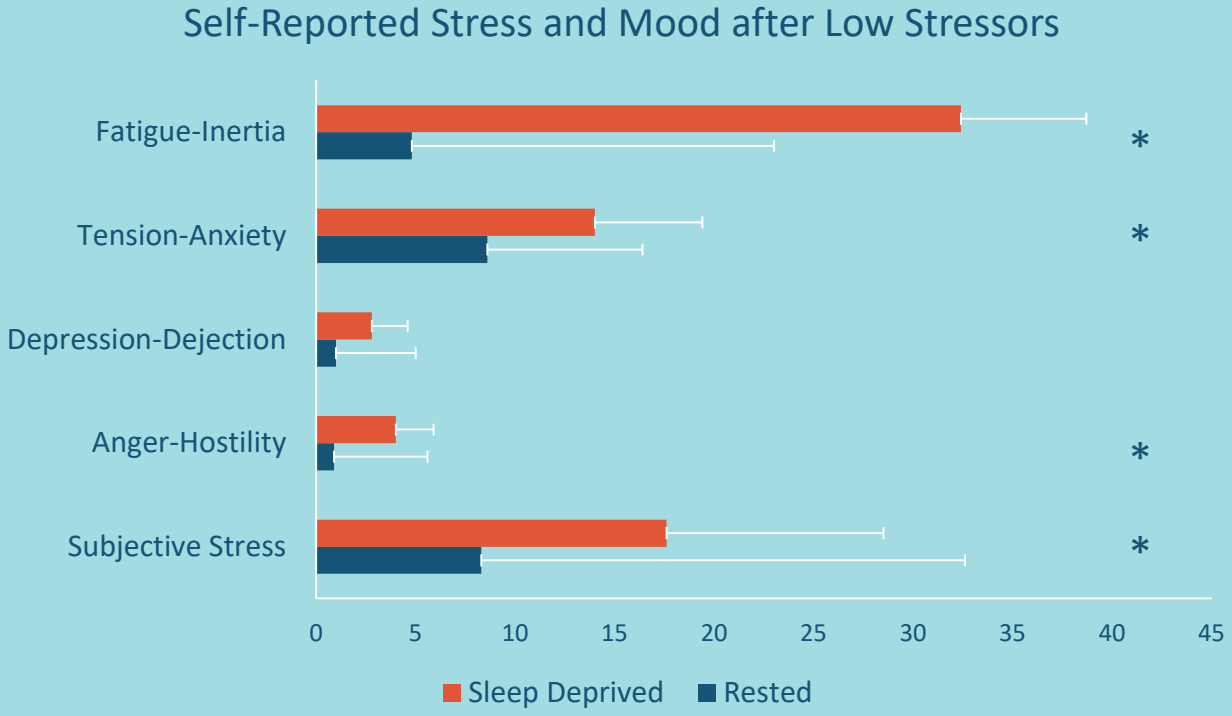


Rasch, 2007

Emotional Regulation

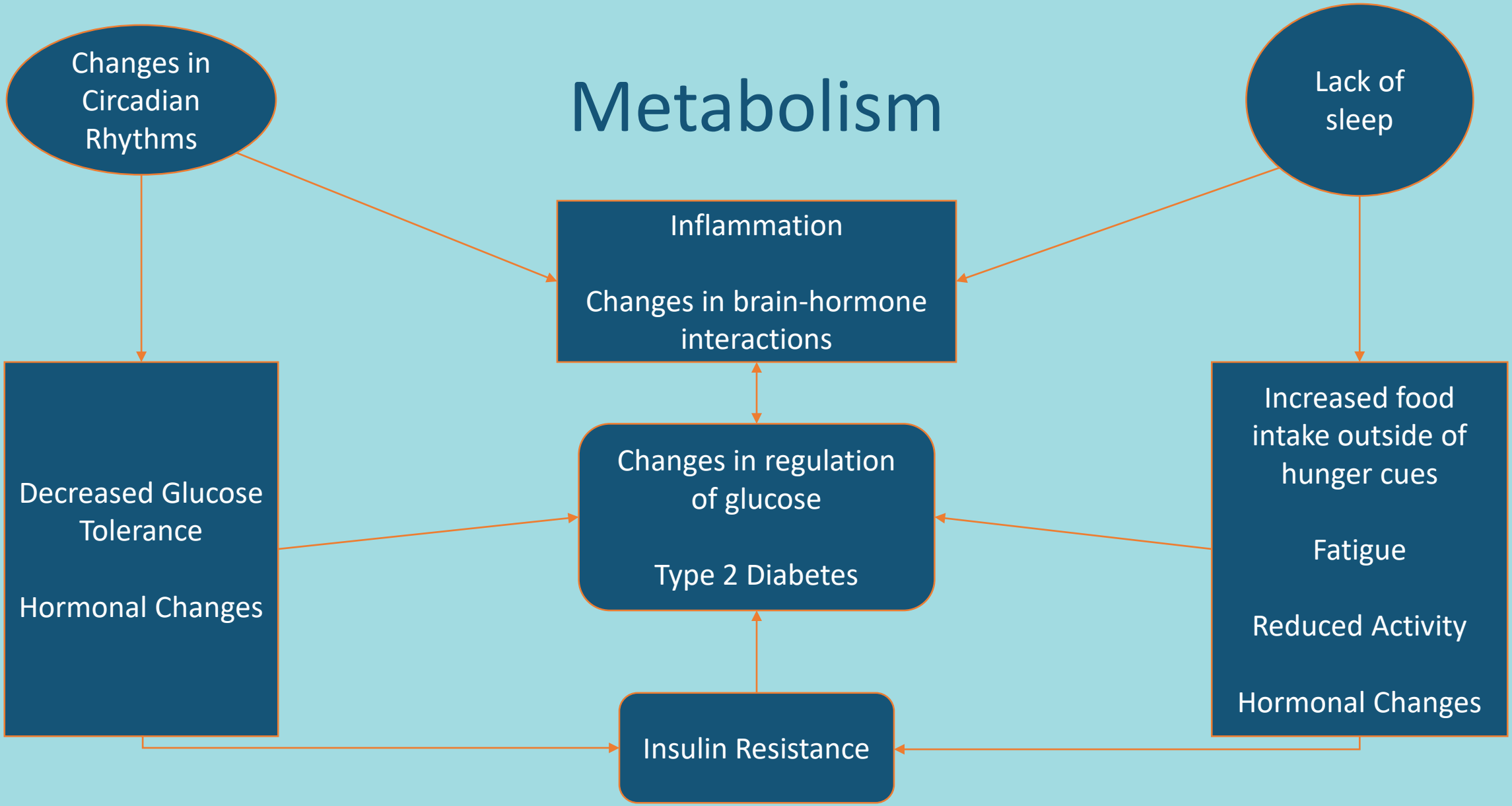
- Lack of sleep has been shown to negatively impact how we are able to emotionally regulate in both adulthood and adolescence





Minkel, 2012
Fairholme & Manber, 2015

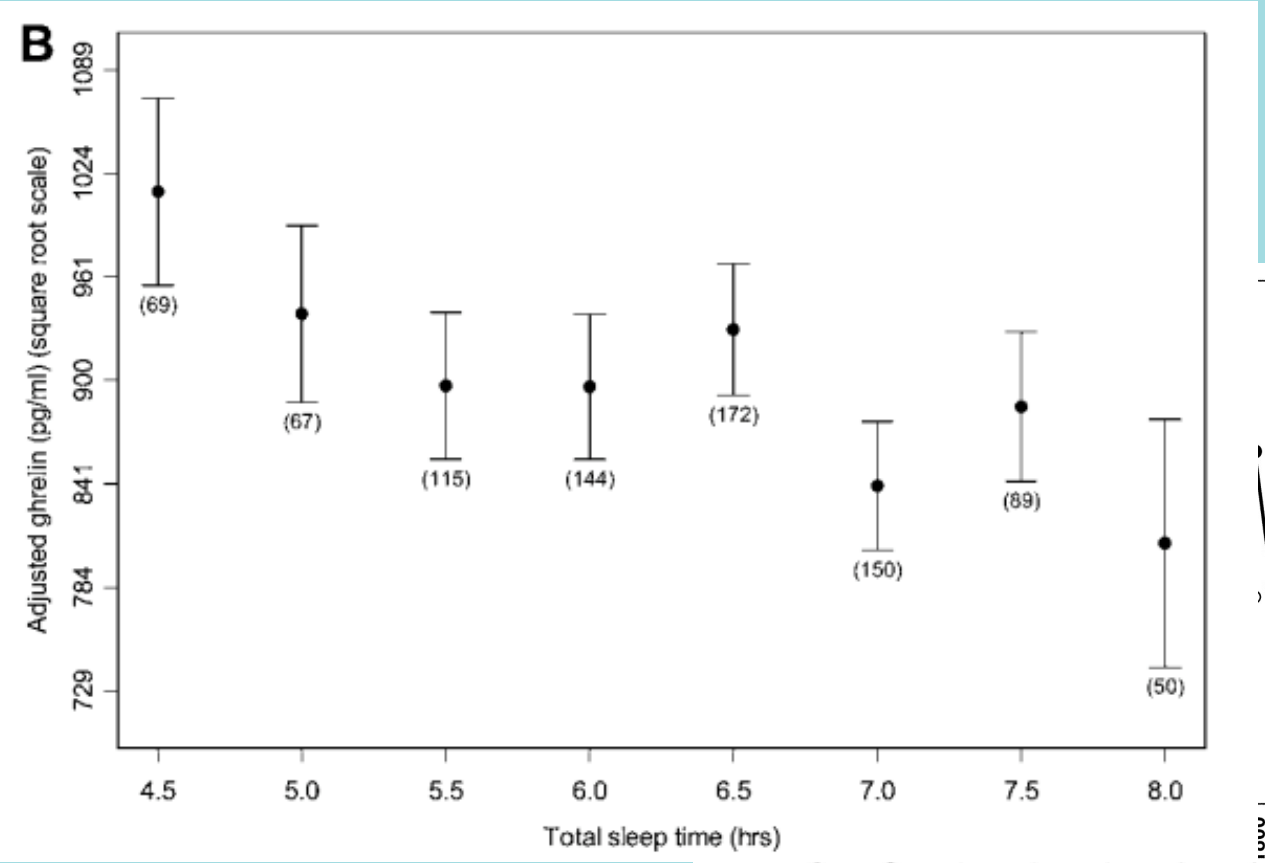
Metabolism



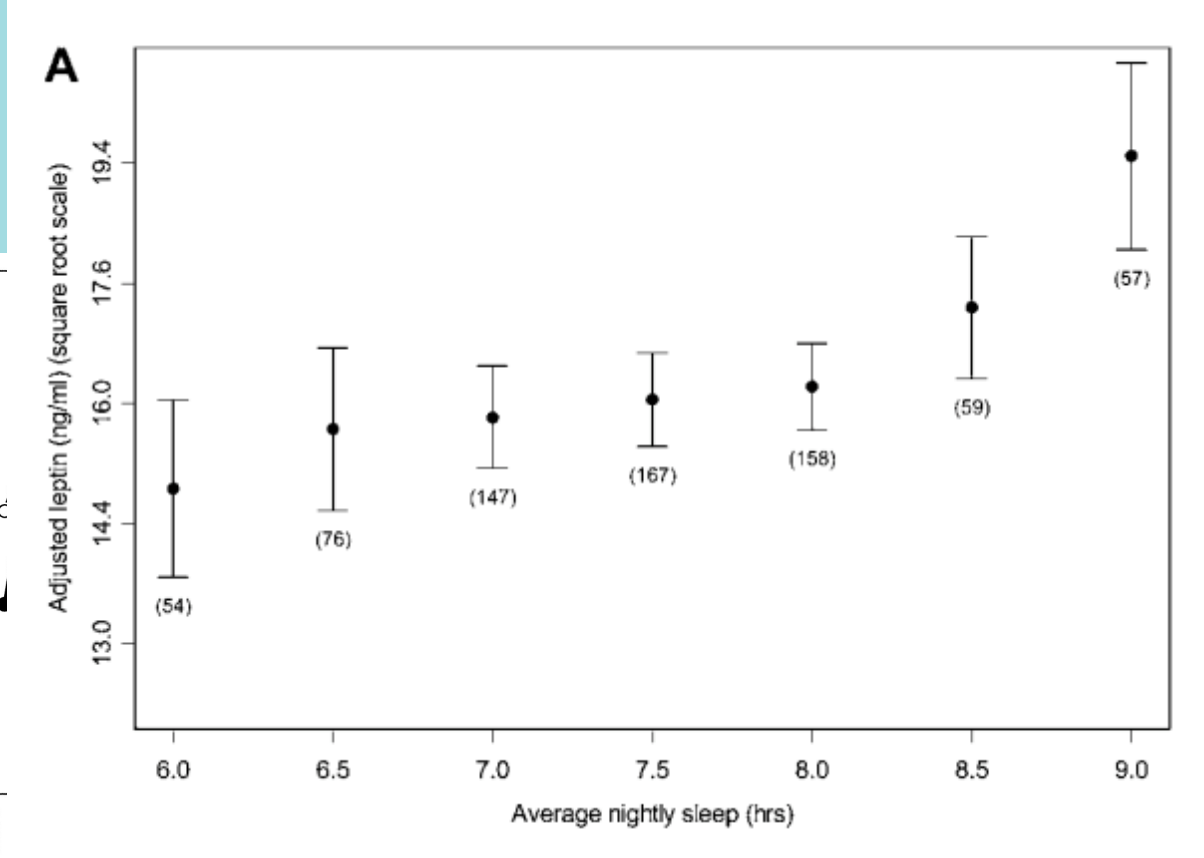
Sharma & Kavuru, 2010

Sleep, Hormones, and Appetite

Ghrelin
Appetitive Hormone



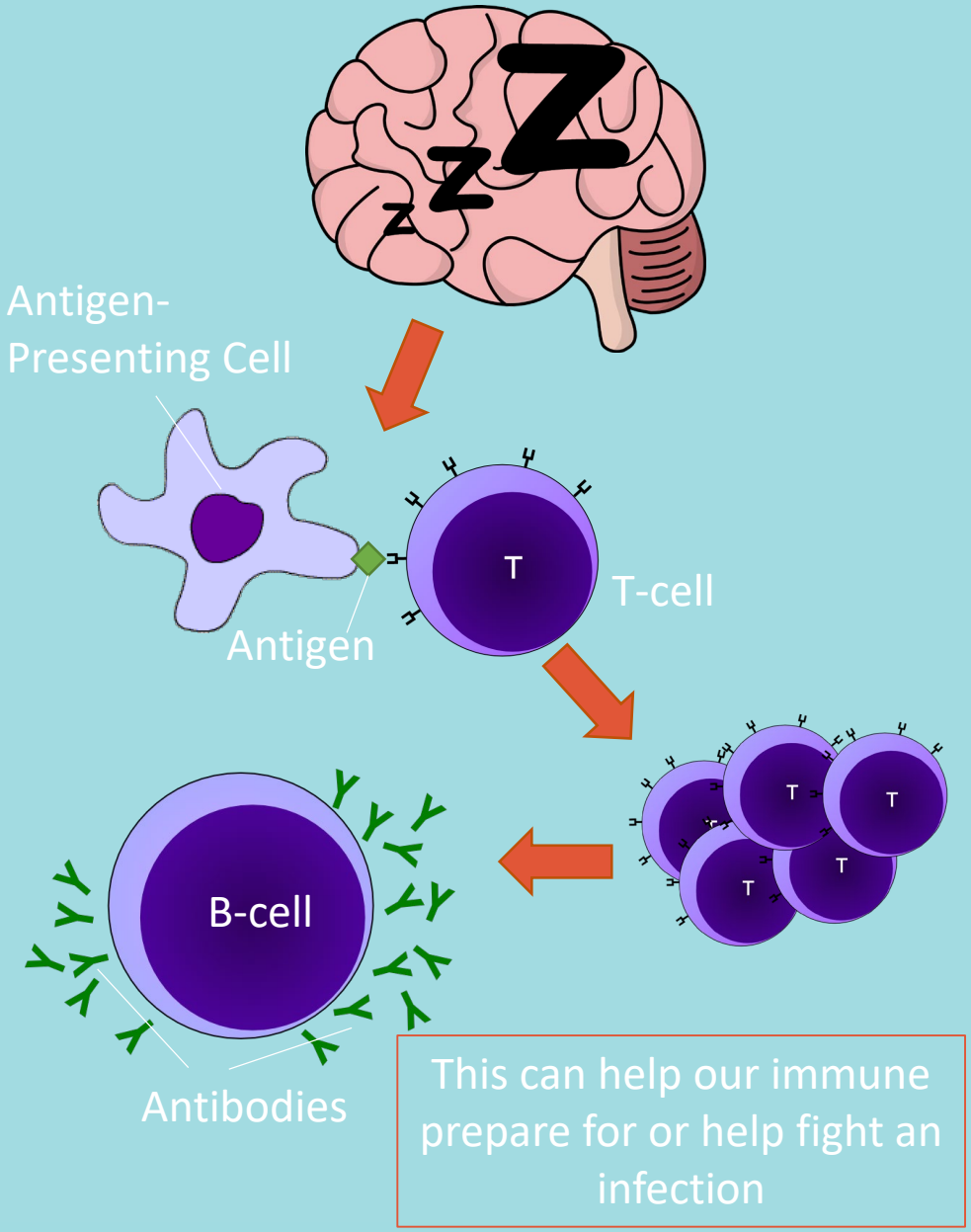
Leptin
Satiety Hormone



Taheri, 2004
Cummings, 2001

Immune System

- During sleep, our body creates molecules which help regulate the inflammation in our body
  - Some of these inflammatory markers help promote sleep
- When we are sick, our body creates more of these inflammatory markers during sleep which can help us fight infections



Besedovsky, 2011

Sickness behavior

- When we are sick, our body induces a variety of behaviors to make us slow down
  - Fatigue & Lethargy
  - Muscle aches
  - Fever
- This is done to force us to rest so our body can recover faster and easier than if we were still active and moving around every day
- It is important to listen to our bodies signals when we are sick and to rest in order to promote proper immune functioning to fight off illness

Dantzer, 2001
Kelley, 2003

Sleep Disruptions

& implications for our health

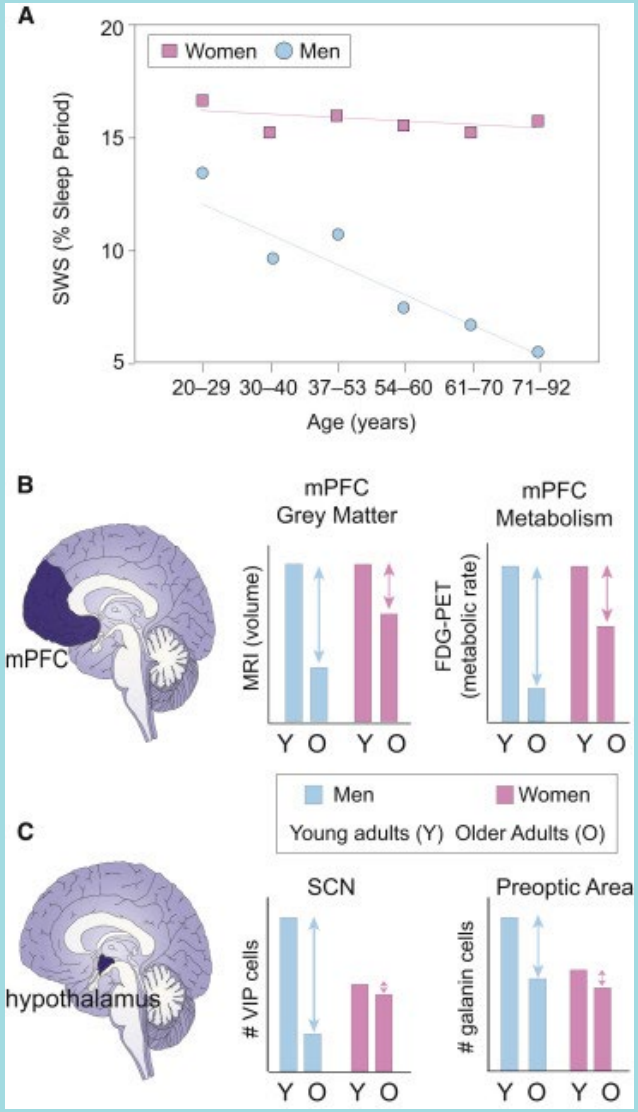
Shift work

National Toxicology Program Draft Report on Carcinogens Monograph on Night Shift Work and Light at Night

- Shift work occurs in jobs where employees must work outside of normal business hours which may cause disruptions to the natural dark-light cycles of daily life
  - Night shifts involve working any amount of time between 1 AM and 5 AM
- Not all shift workers will experience the same levels of circadian disruption
- Night shift work will suppress or disrupt night-time melatonin production which will disrupt circadian cycling
- Bodily adaptation to night work is dependent on a variety of factors but is not common

Aging

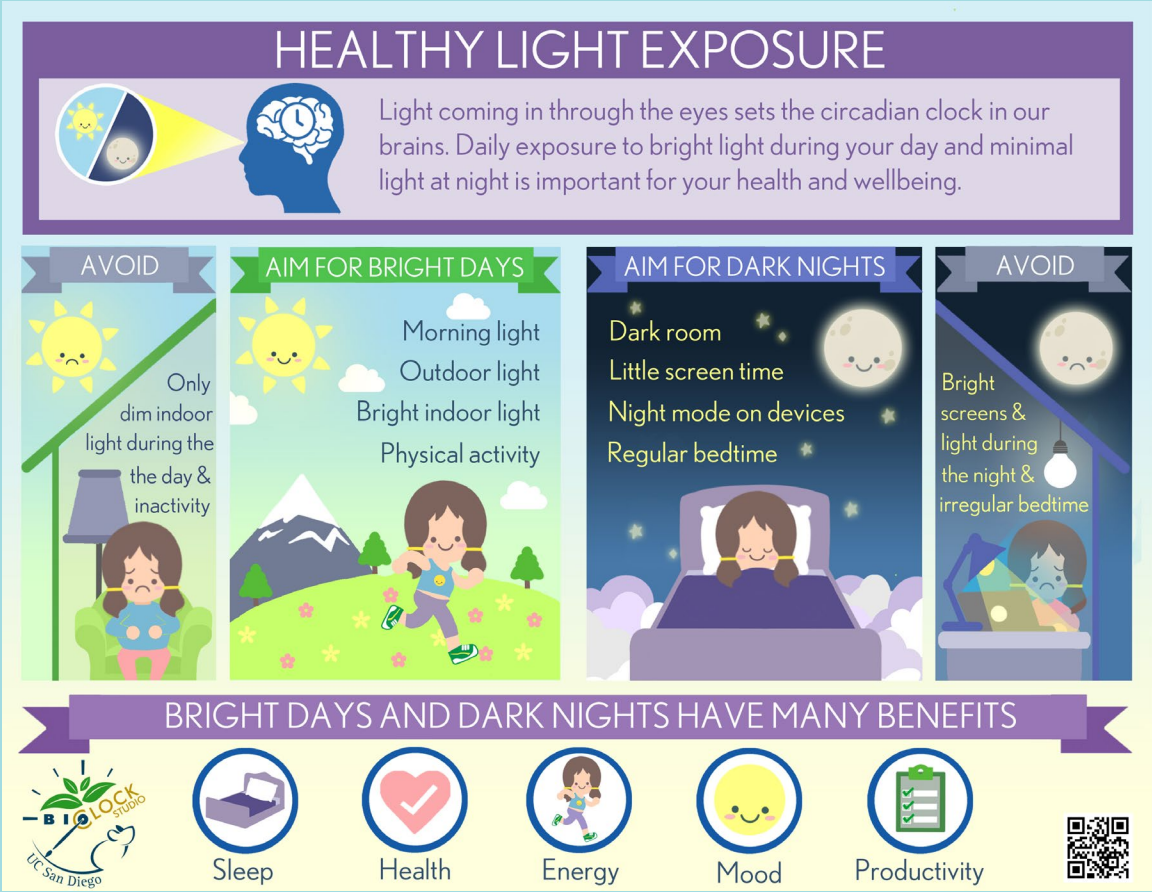
- As we age, our sleep quality and duration decreases
  - Specifically the amount of time spent in REM sleep decreases with age
- There are a variety of changes our brain undergoes as we age related structure, metabolism, and activity of regions
- There is some evidence that older adults may just need less sleep



Mander, 2017

Light Exposure

Society for Research on Biological Rhythms Public Outreach Briefs



- Light exposure during the day and reduced exposure at night can be beneficial for good sleep
- Light interacts with the suprachiasmatic nucleus, impacting our sleep-wake cycling

How do I sleep better?

https://www.sleepfoundation.org/articles/healthy-sleep-tips

Stick to a schedule

Try to consistently go to bed and wake up at the same time every day, even on weekends.

Wind-down routine

Take time to do relaxing activities before bed (i.e. read, meditate, or journal).

Exercise regularly

Consistently exercising every day will help you sleep better. Exercise at any time!

Light exposure

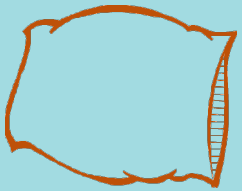
Expose yourself to bright, natural light during the day and sleep in the dark.

Record your sleep

If you are having trouble sleeping, record your sleep habits and talk to your doctor.

Sleep at night

Avoid taking naps during the afternoon to make sure you sleep well at night.



Get comfy

Keep your bedroom cool (60-67°) and get a mattress & pillows that are comfortable.

How much sleep do I need?

https://www.sleepfoundation.org/articles/how-much-sleep-do-we-really-need

- **Newborns (0-3 months**): Sleep range 14-17 hours
- **Infants (4-11 months):** Sleep range 12-15 hours
- **Toddlers (1-2 years):** Sleep range 11-14 hours
- **Preschoolers (3-5):** Sleep range 10-13 hours
- **School age children (6-13):** Sleep range 9-11 hours
- **Teenagers (14-17):** Sleep range 8-10 hours
- **Younger adults (18-25):** Sleep range 7-9 hours
- **Adults (26-64):** Sleep range 7-9 hours
- **Older adults (65+):** Sleep range 7-8 hours

Dreaming

- It is not fully understood why we dream!
- There are a variety of theories for why we dream
  - Dreaming may help us process information and emotions experienced during our daily lives
  - Dreaming may be a process which occurs during memory consolidation, since memories are reactivated during consolidation
  - Dreams are sometimes tied to mental illness (i.e. those with PTSD are more likely to have nightmares)
- Dreams occur during REM sleep, which decreases with age which is why you may have a harder time remembering dreams as you get older

Key Takeaways

1. Sleep is a required process our body undergoes for about 1/3 of our lifetime
2. Sleep is very important for memory consolidation and proper learning mechanisms
3. Sleep disruptions can be detrimental for our immune, cognitive, and metabolic functions, so it is important we practice good sleep practices
4. Dreaming is a process which is not fully understood by scientists today

Next week: **Decoding that diet you saw on the internet: keto, gluten-free, and fasting**

Ruyu Liu, M.S. R.D.

12-1 PM CDT

Ask the Experts: Mental and Behavioral Health During COVID-19

Zoom webinar happening Monday, June 22

12-1 PM CDT

Registration: https://publish.illinois.edu/contemporary-challenges/mentalhealth/