What Governs Our Sleep?

Sleep is a natural state that could not be controlled or forced.

Our *circadian rhythm*, i.e. the body clock, is responsible for regulating our sleep-wake cycle. Governed by the rhythm,

- Our alertness increases in the morning.
- At around noon time, we tend to experience a drop in alertness, a phenomenon called “post-lunch dip”.
- Our alertness is gradually restored after the dip until it drops again at night time.

We continuously build up a *sleep drive* throughout the day as we engage in various activities.

Furthermore, in response to darkness, our body secretes a hormone called *melatonin* which can increase sleepiness.

- Our body clock run on its own in a roughly 24-hour cycle. Sleep occurs at night when our circadian rhythm dips and our sleep drive peaks, facilitated by melatonin production.
- However, human activities like exposure to light at night, shift work and travelling across time zones etc. could create a *mismatch between our circadian rhythm and external, environmental cues*, hence disrupting the sleep-wake cycle.

Sleep Across the Lifespan

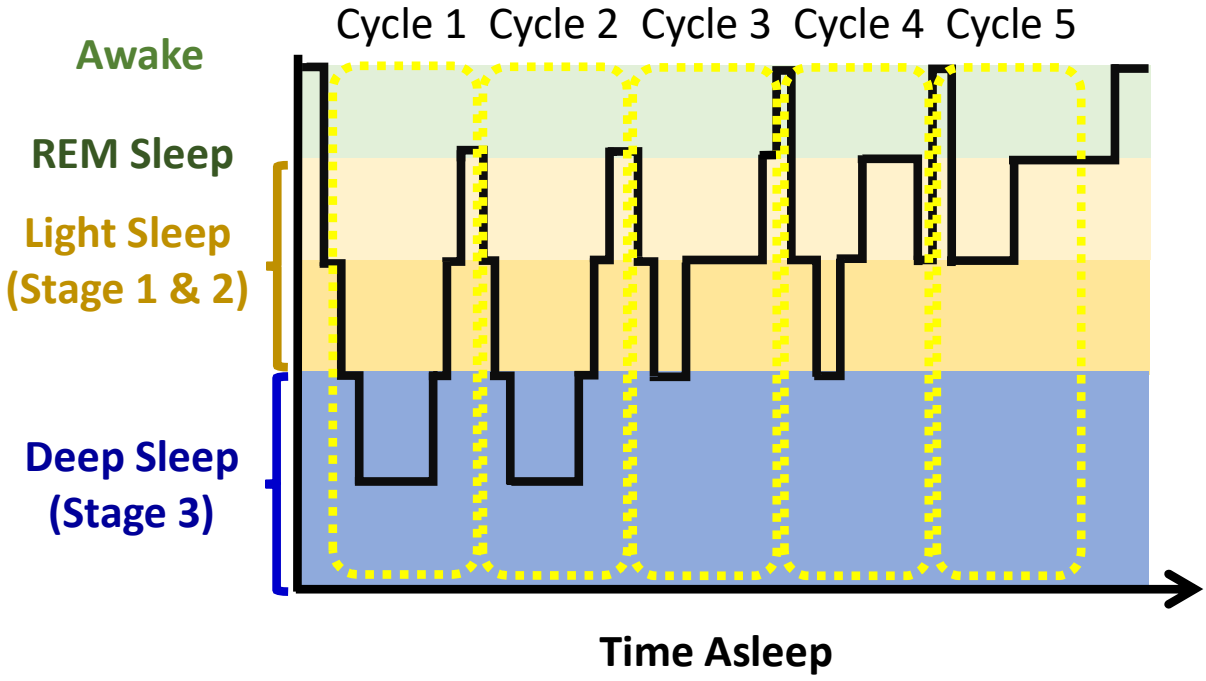
- Newborns sleep for about 16 to 18 hours a day in bouts, waking up when they are hungry and falling asleep again after feeding. The lonest continuous sleep period is about 3 to 4.5 hour for one-month old babies.
- By 3 months old, sleep consolidates and some begin to sleep through the night. The longest continuous sleep increases to around 6 hours.
- By one year old, hours of sleep decreases to about 12 to 13 hours a day and majority of infants can sleep through the night.
- By 18 months, most children transit to taking only one nap a day.
- Most children stop napping between 3 to 5 years old.

- The hours of sleep continues to decease as we age. On average, adolescences sleep for about 9 hours a day.
- Reaching adulthood, the average hours of sleep is 7 to 8 hours a day.

- Individual variations exist in terms of average hours of sleep. Some adults may only need 5 to 6 hours of sleep to feel refreshed while some others may need 8 to 9 hours of sleep.

Sleep Cycle (1)

Our sleep is made up of cycles approximately 90 minutes long. In each cycle, there are 3 stages of non-rapid eye movement sleep (non-REM) plus a stage of REM sleep (rapid eye movement). Our brain show different activities during each sleep stage.



Stage 1 NREM

- The lightest stage of sleep marked by transitioning from wakefulness to sleep.
- The mind starts to drift and it is easy to be waken up from stage 1 non-REM sleep.

Stage 2 NREM

- Still a light sleep stage but it becomes more difficult to wake a person up from stage 2 sleep.
- One might forget about being asleep at all if waken up at this stage.

Sleep Cycle (2)

Stage 3 NREM

- Used to be separated into stage 3 and stage 4 sleep.
- Deep sleep and difficult to wake a person up.
- One would feel groggy if waken up from stage 3 NREM sleep.

Rapid Eye Movement

- Associated with dreams.
- Eyes dart back and forth rapidly.
- Shows a loss of muscle tone and becomes almost paralyzed.
- Easy to wake a person up and one would be alert if woken up during this stage.

- Throughout a night of sleep, we go through several sleep cycles. Wakening at night in between these cycles is normal and we usually do not remember the awakenings.
- Generally, we spend more time in deep non-REM sleep in the earlier sleep cycles and longer duration of time in REM sleep in the later sleep cycles prior to wakening up in the morning.

- Newborns spend about half of the time asleep in REM sleep.
- Time spent in deep sleep increases from birth to about 4 years old and declines steadily since then.
- Older adults begin to spend more time in lighter sleep (stage 1 and stage 2) from about 60 years old.

Causes of Insomnia

1. *Working the night shift* requires us to stay awake at times when our circadian rhythm dips and we should be sleeping.
2. This is also applicable to travelling across multiple time zones where the daytime and nighttime is reversed, e.g. from Sydney to London.

3. Using electronic devices at night, *blue light emitted from the screens could confuse our brain* because sun light is supposed to be the major source of blue light in the natural environment.

Our body is biologically wired to produce melatonin at night in the dark which would increase sleepiness. *However, melatonin production is suppressed when our brain mistaken the blue light from electronic devices as a signal that it is still day time*. This could create sleep disturbances when we reach normal bed time but do not feel sleepy enough.

4. Finally, *stress and emotional issues could affect sleep because our body and mind are out in a state of prolonged heightened arousal*, preparing us for rapid responses to threats in the environment. Sleep is contradictory to the state of alertness.