# Cannabinoids and Health

Module 7

Lecture 4: Sleep and Sleep Disorders

# Why is sleep important?

- Sleep is involved in healing your heart and blood vessels – sleep deficits have been linked with heart disease, and stroke

- Sleep deficits lead to imbalances in hormones that govern eating and is associated with obesity

- Sleep also affects how the body reacts to insulin and sleep deficits lead to a higher than normal blood sugar level, increases risk for Type 2 diabetes

- Sleep keeps the immune system healthy and deficits can reduce effectiveness of the immune system


Image source: http://www.mysouthernhealth.com/importance-of-sleep/

# What is sleep?

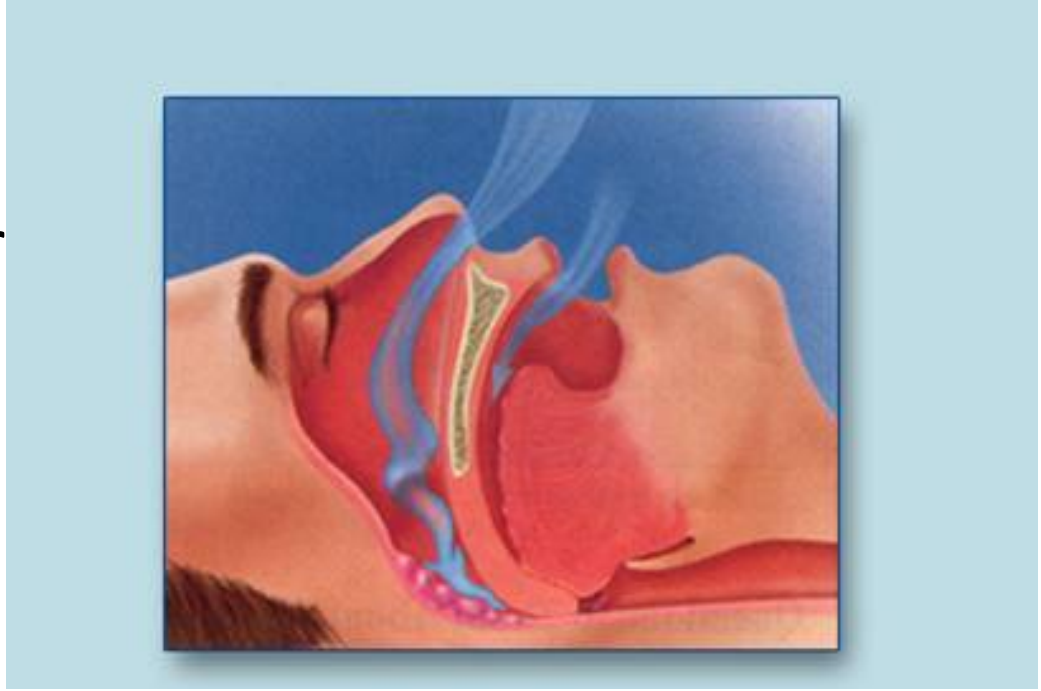
- Sleep is a behavior that follows a circadian rhythm
- Sleep is organized into cycles (e.g., it is not uniform throughout the night)
- Sleep is defined by four behavioral criteria:
  - Reduced motor activity
  - Decreased response to activity
  - Stereotypic postures
  - Reversability

# Sleep Stages

- Stage 1 (NREM)
  - lightest stage of NREM sleep
  - slow eye movements, muscle tone relaxes, brain activity slows (can be easily awakened)
- Stage 2 (NREM)
  - brain waves continue to slow
  - decreased body temperature, heart rate slows
- Stages 3 + 4 (NREM)
  - deep sleep (delta waves or slow waves)
- REM sleep
  - accounts for about 25% of sleep
  - in humans it occurs about once every 90 minutes
  - high neural activity, rapid eye movements and increased heart rate, low muscle tone

# Sleep Apnea

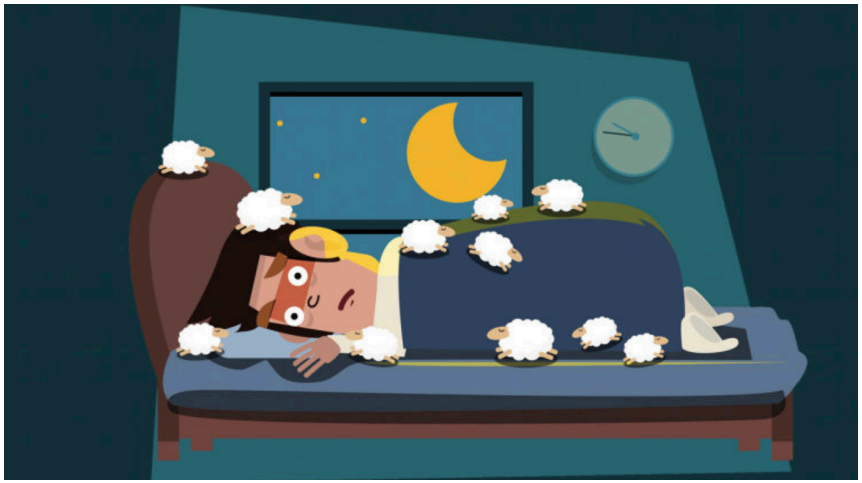
- Characterized by pauses or gaps in breathing due to an obstruction of the airway
- Signs and Symptoms
  - Loud, regular snoring
  - Large neck size
  - Obesity
- Associated with major medical conditions

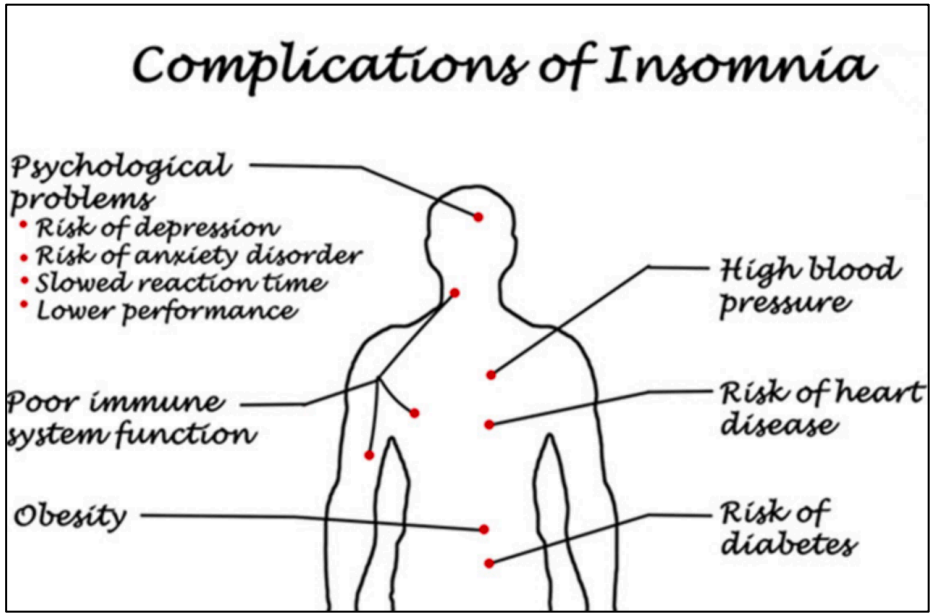


National Sleep Foundation

# Insomnia

- A perception or complaint of inadequate or poor sleep
  - Difficulty falling asleep
  - Frequent awakenings
  - Waking too early and having difficulty falling back to sleep
  - Waking unrefreshed
- Next day consequences





# Circadian Rhythm Disorders

- Disruption in a person's natural ("circadian") clock that regulates the ~24 hour cycle of biological processes
  - Delayed Sleep-Wake Phase: go to sleep late, wake up late, more common in children and adolescents, 7-10%
  - Advanced Sleep-Wake Phase: go to sleep early, wake up early, increases with age, 1% of middle-aged adults
  - Irregular Sleep-Wake Phase: irregular sleep-wake patterns
  - Non-24-Hr Sleep-Wake Rhythm: sleep time shifts later each day
  - Shift Work Disorder: non-traditional work schedule
  - Jet Lag: when traveling long distances

# Sleep Deprivation

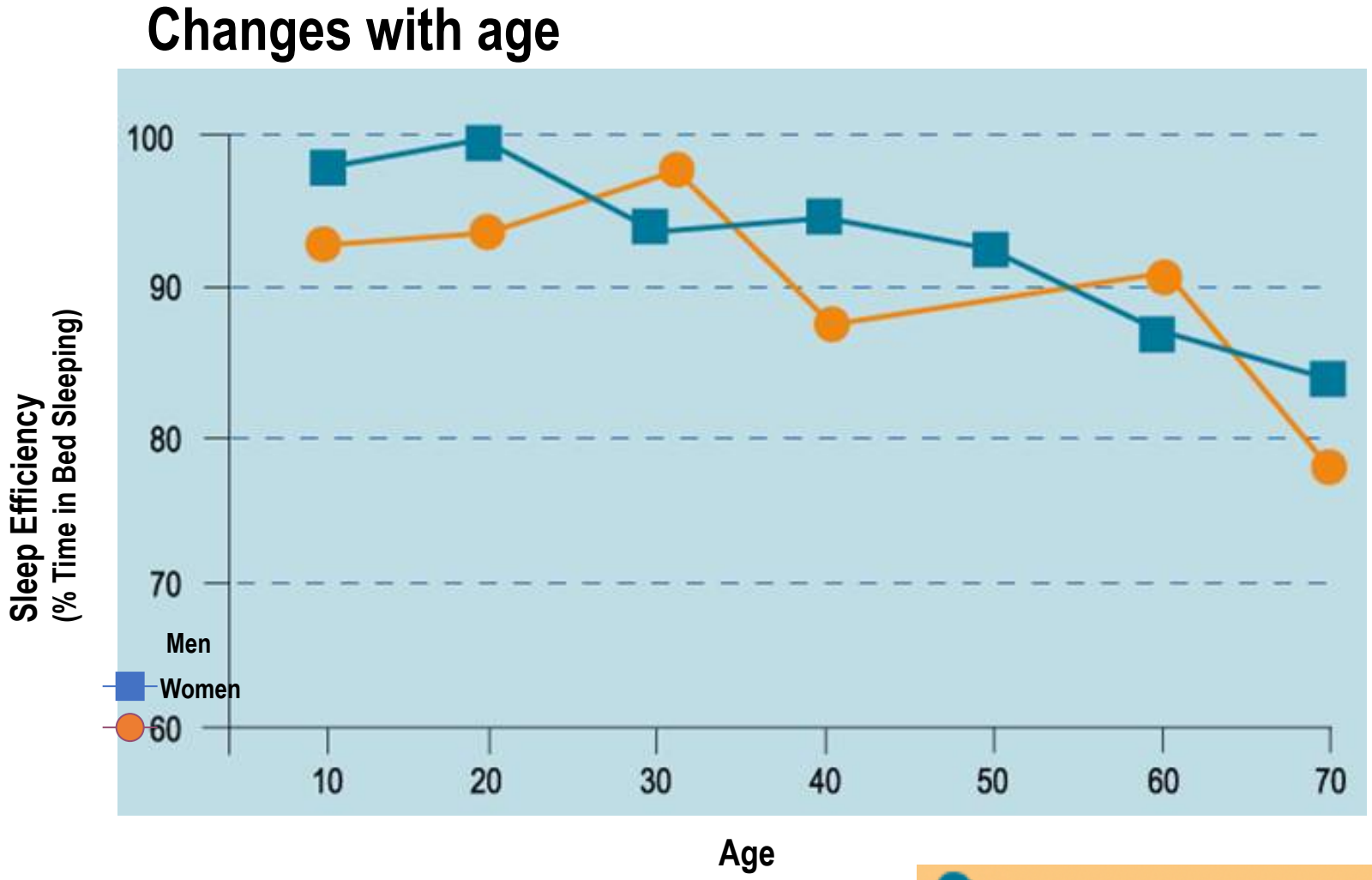
- In humans, sleep deprivation most negatively impacts cognitive performance (especially reaction time)
- The effects of sleep deprivation on driving performance are similar to the effects of alcohol
- Following sleep deprivation, people spend more time in REM sleep
- In animal studies, extreme sleep deprivation leads to illness and even death

# Sleep in the General Population

- Poor sleep is very common in the US!
- Data from the 2014 Behavioral Risk Factor Surveillance System on prevalence of healthy sleep duration (≥7 hours) in 444,306 adults:
  - Only 65.2% reported healthy sleep duration!
- Prevalence of healthy sleep lower in non-Hispanic blacks, American Indians/Alaska Natives, Native Hawaiians/Pacific Islanders, and multiracial respondents
- State-based estimates of healthy sleep duration ranged from 56.1% in Hawaii to 71.6% in South Dakota.

Liu et al., 2014, CDC, *Morbidity and Mortality Weekly Report*

# Sleep Efficiency (% of time asleep while in bed): Changes with Age

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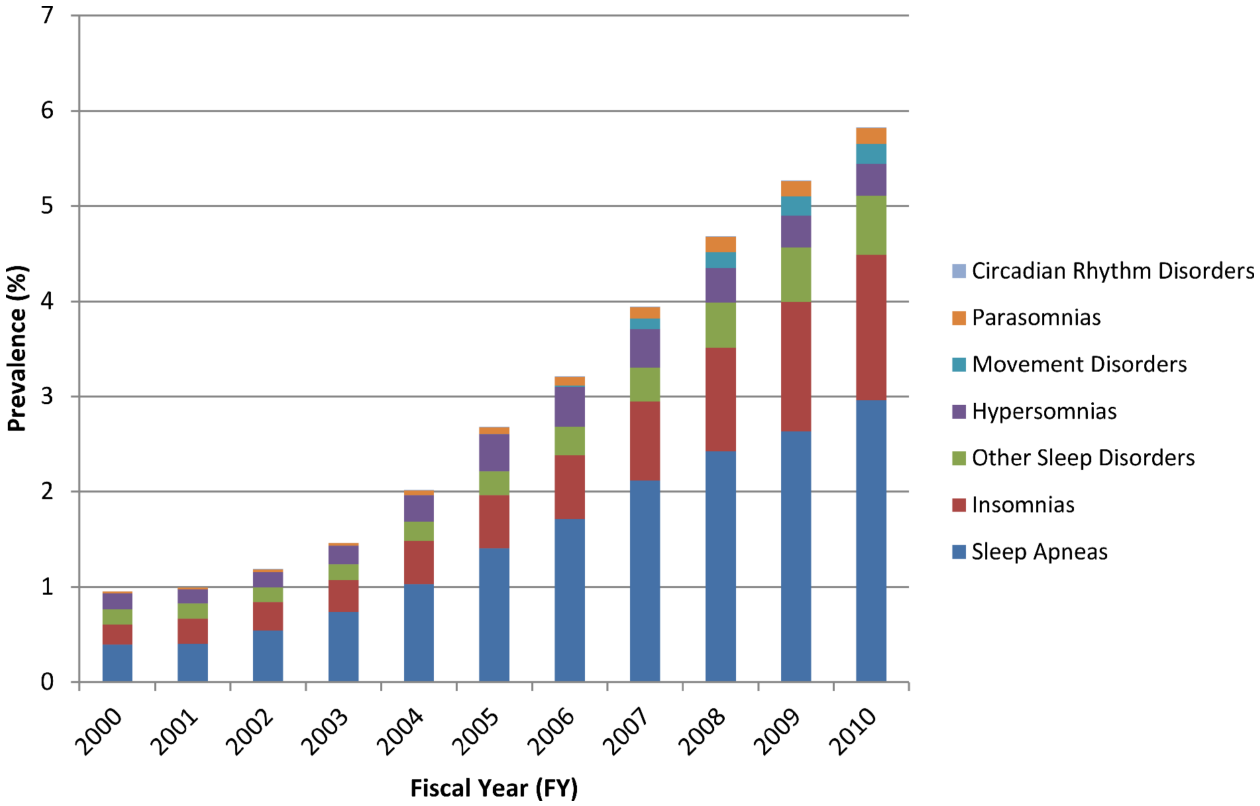
# Prevalence of Sleep Disorders: The Veteran Population




From: The National Veteran Sleep Disorder Study: Descriptive Epidemiology and Secular Trends, 2000–2010
Sleep. 2016;39(7):1399-1410. doi:10.5665/sleep.5972
Sleep |

# Sleep and Pain

- Sleep complaints are present in 67 to 88% of chronic pain patients
- Pain contributes to sleep disturbance (i.e., it makes sleep difficult)
- Sleep problems significantly increase the experience of pain
- Disturbed sleep may impact processes that contribute to development and maintenance of chronic pain
  - Neuroendocrine mechanisms
  - Inflammatory mechanisms?

Finan et al., 2013, *The Journal of Pain*

# Sleep and Anxiety/Depression

- A recent systematic review looked at associations between sleep, anxiety and depression:
  - insomnia and sleep quality were bidirectionally related to anxiety and depression
  - sleep problems predict higher levels of depression and a combined depression/anxiety variable
  - anxiety predicts excessive daytime sleepiness

Pasquale, 2013, *Sleep*

# Sleep and PTSD

- Sleep disturbance (particularly nightmares and insomnia) is a hallmark feature of PTSD and is also prevalent in veterans with Traumatic Brain Injury (TBI)

- Poor sleep has a negative impact on treatment of and recovery from PTSD and TBI

- Interventions that help with sleep may also help treatment of PTSD and TBI

Gilbert et al., 2015, *Clinical Psychology Review*

# Summary

- Only 65% of people report healthy sleep duration
- Many factors influence poor sleep (e.g., caffeine, alcohol, stress, etc)
- Poor sleep has a number of negative effects and is associated with chronic pain, anxiety and depression, and PTSD
  - Poor sleep worsens pain, PTSD, anxiety and depression
  - Chronic pain, anxiety/depression, and PTSD worsens sleep problems