

Sleep Hacks
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1. Intro
 - a. How I got interested in sleep
 - b. Why you should be interested in sleep
 - c. "Tired" - Sleepy vs. Fatigued
2. What is sleep?
 - a. Dement's two characteristics of sleep
 - i. Perceptual wall between conscious mind and outside world
 - ii. Immediately reversible
 - b. Stages of sleep
 - i. Awake - beta waves - high frequency, low amplitude
 - ii. NREM
 1. N1 - Theta waves, easy to wake
 2. N2 - Sleep spindles, k-complexes
 3. N3 - Delta waves (low freq), difficult to wake, growth hormone
 - iii. REM
 1. Rapid eye movement
 2. Atonia
 3. Dreaming
 4. Theta with bursts of alpha and beta
 5. Easy to wake
 - iv. N1 -> N2 -> N3 -> N2 -> REM
3. Circadian rhythm
 - a. We have an internal clock that regulates when we sleep
 - b. Originally believed to be 25 hours
 - c. Actually about 24:10 without artificial light
 - d. Opponent process model
 - i. Sleep debt
 1. Increases when we are awake
 2. Decreases when we sleep, about twice as fast
 3. Makes us sleepy
 - ii. Clock-dependent alerting
 1. Counteracts sleep debt
 2. Two peaks: morning, and evening
 - iii. More on sleep debt
 1. Specifics unknown, controversial
 - e. Role of light
 - i. Drives our circadian rhythm

- ii. Eyes have melanopsin-containing ganglion cells (different from rods and cones)
 - iii. Pineal gland produces melatonin, inhibited by light
 - iv. Can shift our circadian rhythm forward or back
- 4. Sleep hygiene
 - a. Regular sleep/wake time every day
 - b. Avoid alcohol and caffeine 6 hours before bed
 - c. Exercise in the morning or late afternoon
 - d. Use the bed for sleep and sex only
 - e. Block out light and sound, but white noise can help
 - f. Get comfy!
 - g. If you can't sleep, get out of bed
- 5. Circadian rhythm hacking
 - a. Light therapy
 - b. Darkness therapy
 - c. Virtual darkness therapy
 - d. Melatonin supplements
 - i. As a sedative
 - 1. Label: high dose (3-10mg) shortly before bed
 - 2. Up to 40 times higher than natural levels
 - 3. Causes grogginess in the morning
 - 4. Tolerance
 - ii. As a circadian phase shift [3]
 - 1. Lower doses (0.5mg)
 - 2. Close to natural levels
 - 3. Several hours before bed
 - 4. Shifts circadian rhythm a little each day
 - e. Antihistamines
 - i. Diphenhydramine (benadryl)
- 6. Napping
 - a. Stages N1 and N2 only
 - b. 10-15 minute naps can be immediately refreshing
 - c. 30 minutes is most effective for most people
 - d. Perceived effect can be different from actual effect!
 - e. Length can depend on how sleepy you are
 - f. Best to nap during afternoon lull
 - g. Caffeine nap
- 7. Lucid Dreaming
 - a. 20% have lucid dreams naturally
 - b. 60% can achieve them with training and practice
- 8. Polyphasic sleep: panel on Sunday
- 9. Conclusion
 - a. Better mood and performance

b. Easy to hack your sleep but requires diligence

References:

[1] William C. Dement. *The Promise of Sleep*.

[2] A. Roger Ekirch. *At Day's Close: Night in Times Past*, A. Roger Ekirch

[3] A.J. Lewy, et. al. "Low, but not high, doses of melatonin entrained a free-running blind person with a long circadian period." *Chronobiol Int*. 2002 May;19(3):649-58.

[4] Seugnet, Laurent, et al. "Identification of a biomarker for sleep drive in flies and humans." *Proceedings of the National Academy of Sciences* 103.52 (2006): 19913-19918.