

Work, Sleep, and Well-being

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Wake and Sleep Organization

Awake

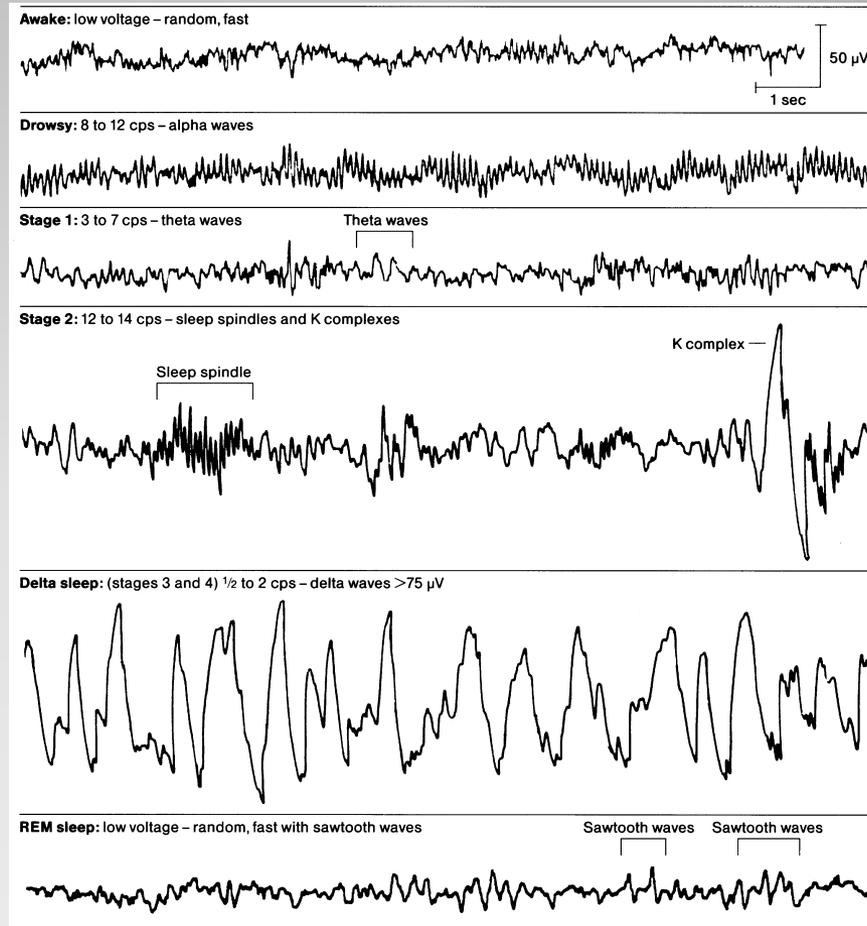
Drowsy

Stage 1 sleep

Stage 2 sleep

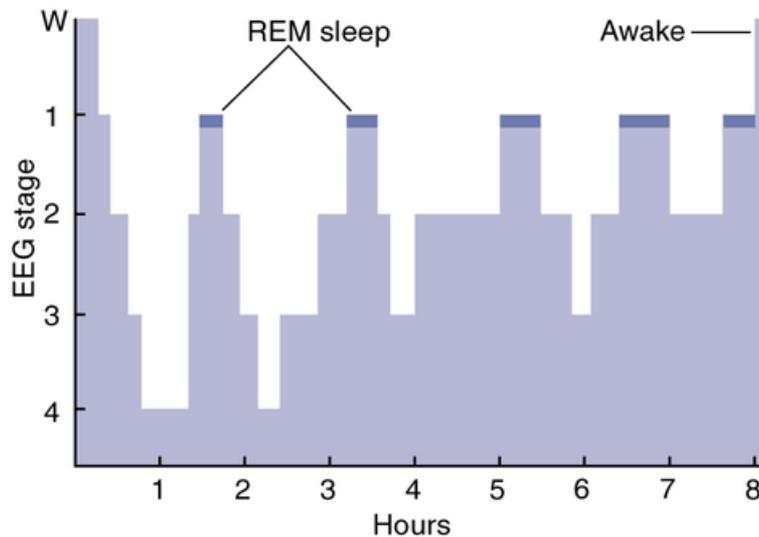
Stages 3-4 sleep

REM sleep



Wake and Sleep Organization

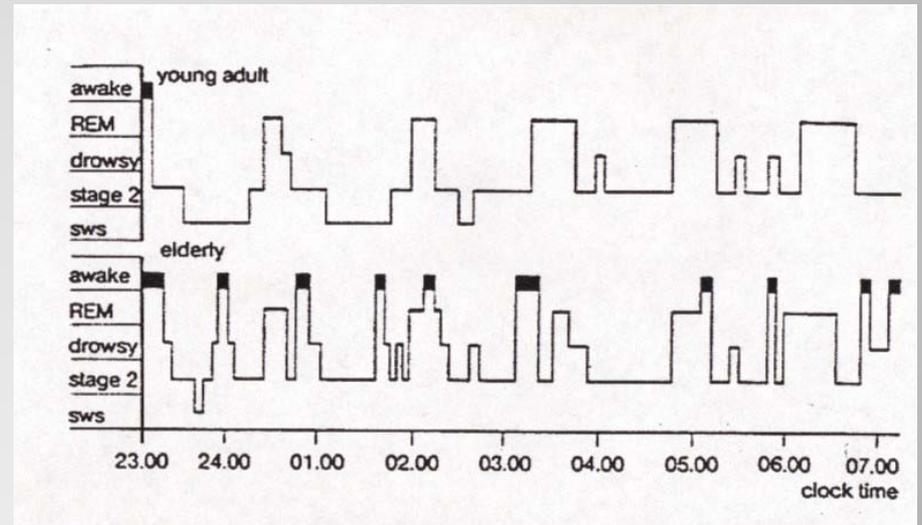
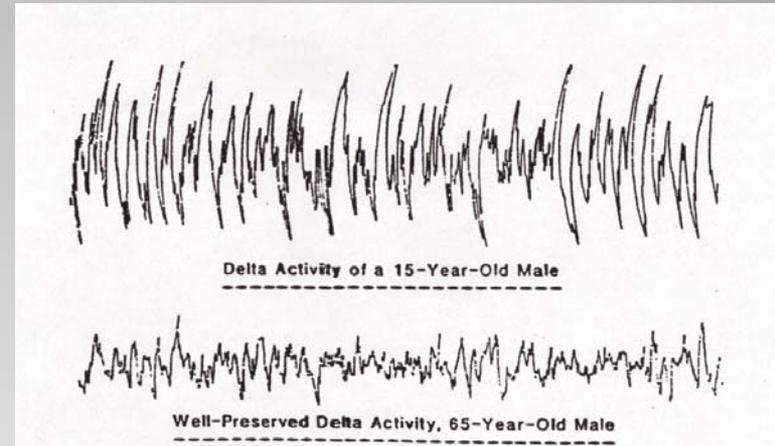
► Typical Pattern of the Stages of Sleep During a Single Night



- 90 min cycles
- REM sleep
 - Dreams
 - Waking up
- Why sleep?
- Why wake up?
- Sleep onset

Sleep and "Aging"

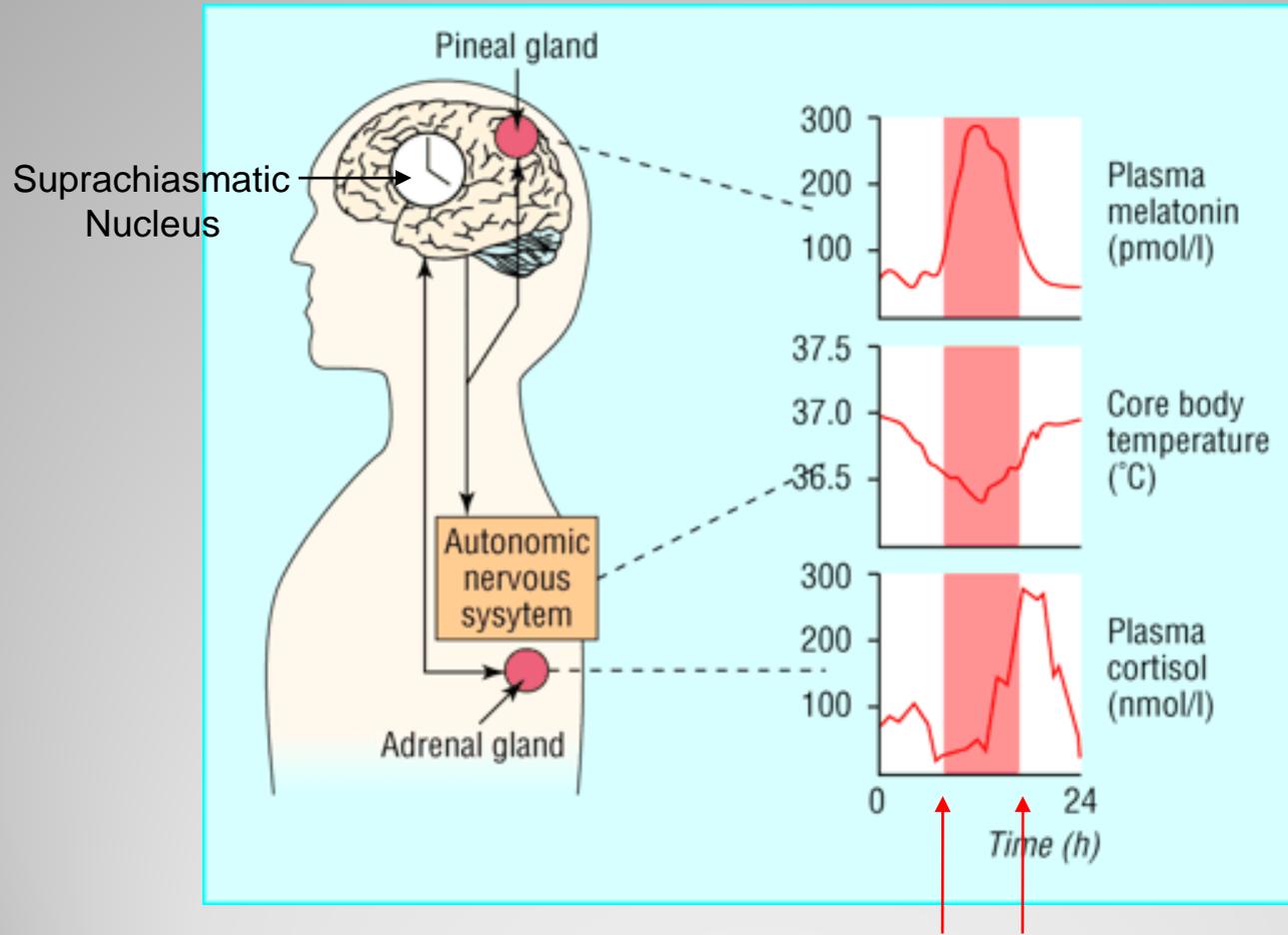
- Decrease delta power
- Increased awakenings
- Less SWS



Sleep as a Circadian Rhythm

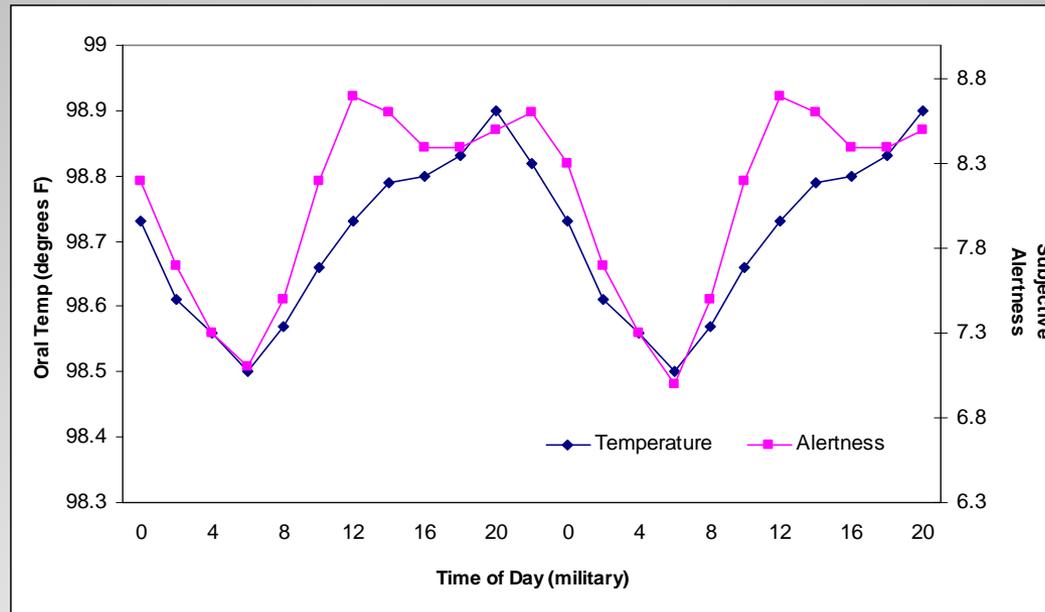
- Circadian Rhythms: Self-sustained biological rhythms that are normally synchronized to a 24-hour period by our sun.
- Humans naturally want to sleep at night and be awake during the day.
- People perform and feel better when circadian rhythms are undisturbed (Rouch, Wild, Ansiau, & Marquie, 2005).
- Unfortunately, shiftwork often requires work outside of the normal circadian rhythm.

Outputs of the Circadian System

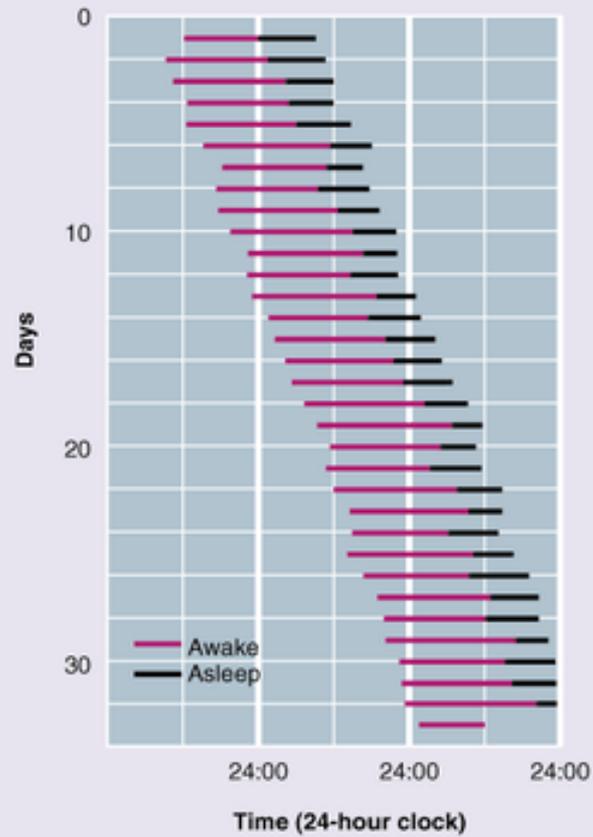


Night

Body Temperature and Subjective Alertness

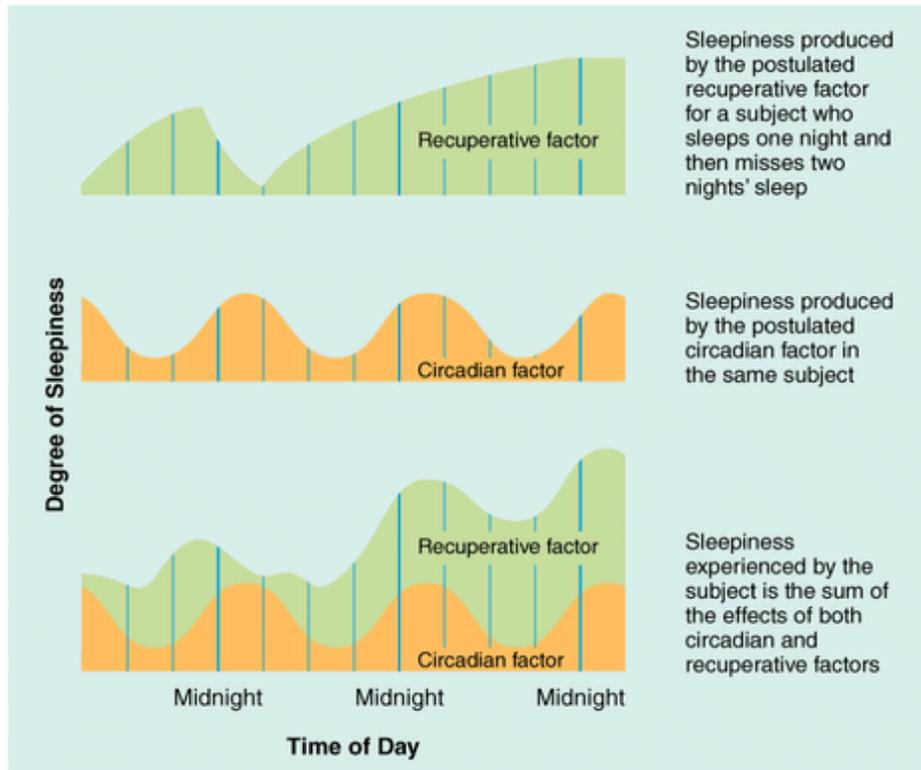


No Sun?



Need to Sleep

► Motivation to Sleep



Source: Adapted from Borbély, 1984.

Sleep Debt

- 71% of adults do not sleep the recommended eight hours (National Sleep Foundation, 2005).
- Sleep deprivation costs \$150 billion each year in higher stress and reduced worker productivity (National Commission on Sleep Disorders, 1993).
- 27% of adults are sleepy at work at least two days a week (National Sleep Foundation, 2000).

Shiftwork

- Common shift patterns
 - Rotating 8 hour shifts
 - 12 hour shifts
 - Permanent shifts
- Additional concerns
 - Direction of rotation
 - Speed of rotation
 - Mars rotation
- Biggest problems occur when working at night while being exposed to sunlight during the day.

Shiftwork

- Effects on sleep
 - Night shift
 - Evening shift
 - Early a.m. work onset
- Consequences of shiftwork
 - Health issues (Harrington, 2001; Raediker et al., 2006)
 - Psychosocial stress (Akerstedt, 2006)
- General recommendations
 - Slow rotation, permanent nights if needed (Pilcher et al., 2000)
 - Avoid long work hours (Johnson et al., 2006; Virtanen et al., 2009)

Sleep, Shiftwork and Safety

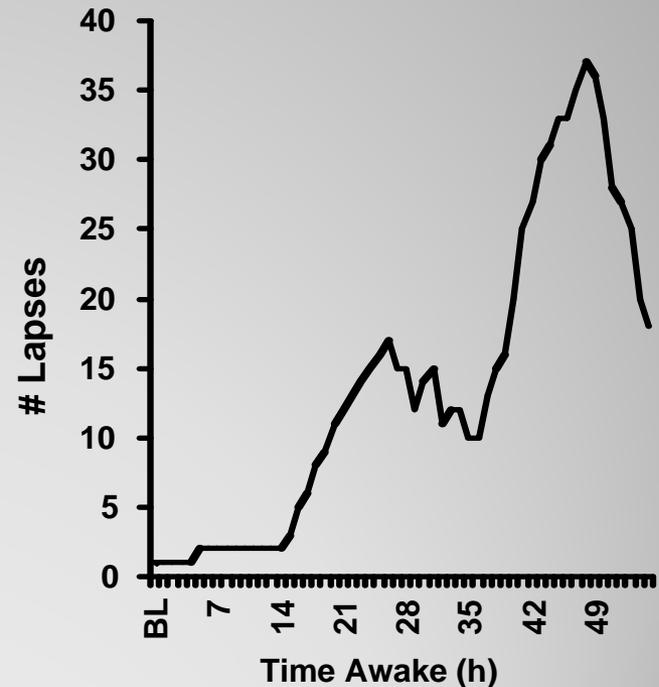
- Accidents related to sleep loss have been estimated to have an annual economic impact of \$43-\$56 billion.
- Traffic accidents
 - Early morning hours
 - Immediately following night shift
- A 2 sec lapse can result in a driver moving across multiple lanes of traffic (remember recognition of sleep onset problem).

Sleep Loss and Performance

- Sleep deprivation impairs functioning including mood, attention, and performance (Pilcher & Huffcutt, 1996).
- Controlled attention theory (Pilcher et al., 2007).
 - Tasks that are naturally interesting are least affected by sleep loss (e.g., video games).
 - Tasks that require the human to maintain active interest are more affected by sleep loss (e.g., boring/vigilance tasks).

Performance Lapses

- Adequate sleep: Few lapses on vigilance-based task during the daytime.
- Sleep deprivation and working at night: Increase in performance lapses.

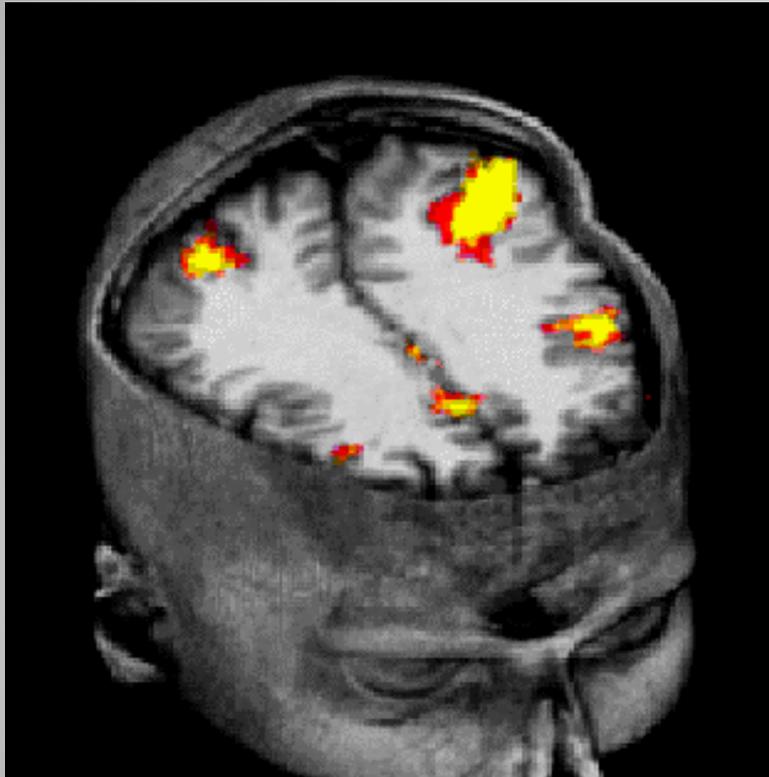


Complex Tasks

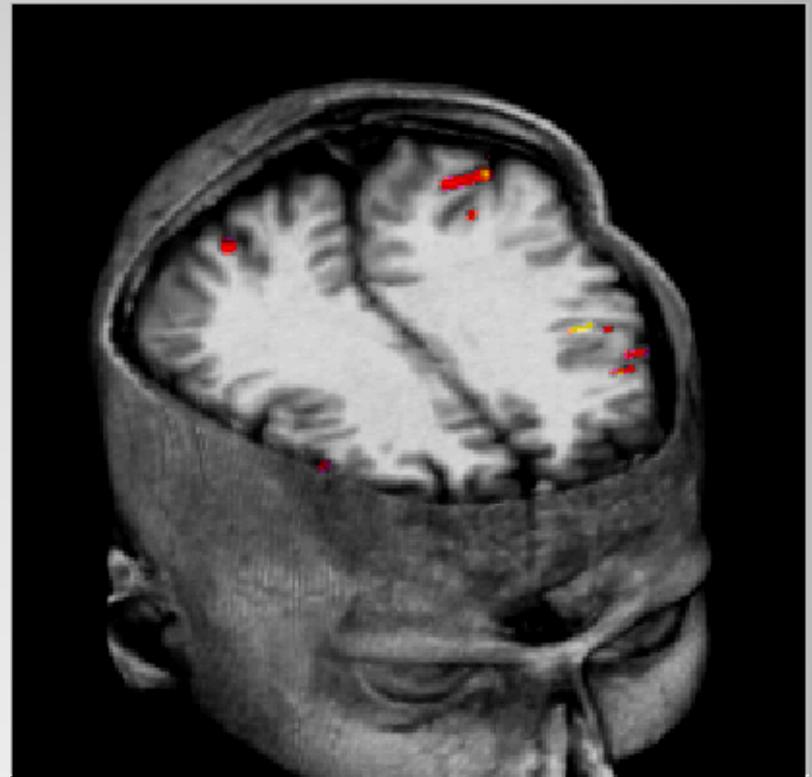
- Tasks requiring higher-level cognitive processing.
- Performance can decrease due to lack of attention and failure to complete problems (Linde, 1992).
- Lack of effort on difficult problems (Engle, 2004).
- Mixed results (Harrison & Horne, 2000).
 - Tasks that are intrinsically interesting or fun tend to be resistant.
 - Well-learned and rule-based tasks more likely to show a decrement.
 - May have compensatory recruitment and effort on some tasks.

Brain Activity and Performance on a Math Task

Normal Sleep



Sleep Deprivation



Adapted from Drummond et al., 1999

Countermeasures

- The best answer is to sleep at night and be awake and functioning during the day.
 - Adequate sleep at night is the BEST countermeasure.
- Naps
 - Particularly useful when taken in advance of night work or a long shift.
 - Can help even when well-rested.
 - 10 minute naps (power naps)
 - Individual effects
- Medications
 - Amphetamine
 - Modafinil
 - Caffeine (tolerance)

Countermeasures

- Bright Light or Blue Light
 - Can help stabilize circadian rhythms.
- Exercise
- Posture changes while sitting
 - Can be effective for attention.
- Stand up
 - Very hard to fall asleep when standing up.

On-Duty Alertness

- Increase physical activity.
- Engage in conversation or some other social activity at regular intervals.
- Increase the amount of light in immediate environment.
- Get fresh air.
- Use caffeine strategically.
- Nap before coming to work if working at night.
- Develop checklists for duties or activities that need to be performed that you know result in lack of attention.
- If possible, complete more interesting tasks during circadian nadir (~ 4 to 6 AM).
- But, remember - there is no substitute for sleep.

Good Sleep Habits

- Optimal: keep regular sleep/wake times.
- Try scheduling sleep duration to wake up during REM sleep (90 min intervals).
- Do not nap within 6 hours of bedtime.
- Develop a pre-sleep ritual or routine that signals to your body that it is time to sleep.
- Decrease ambient lighting before sleep.
- Eat only a light snack before sleep.
- Maintain a quiet and dark sleep environment - use ear plugs and eye shields if needed.
- Regulate temperature to correspond to your optimal needs - be comfortable.
- If you can't get to sleep in 30 minutes - get out of bed.
- Prioritize sleep.

Questions or Comments?

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