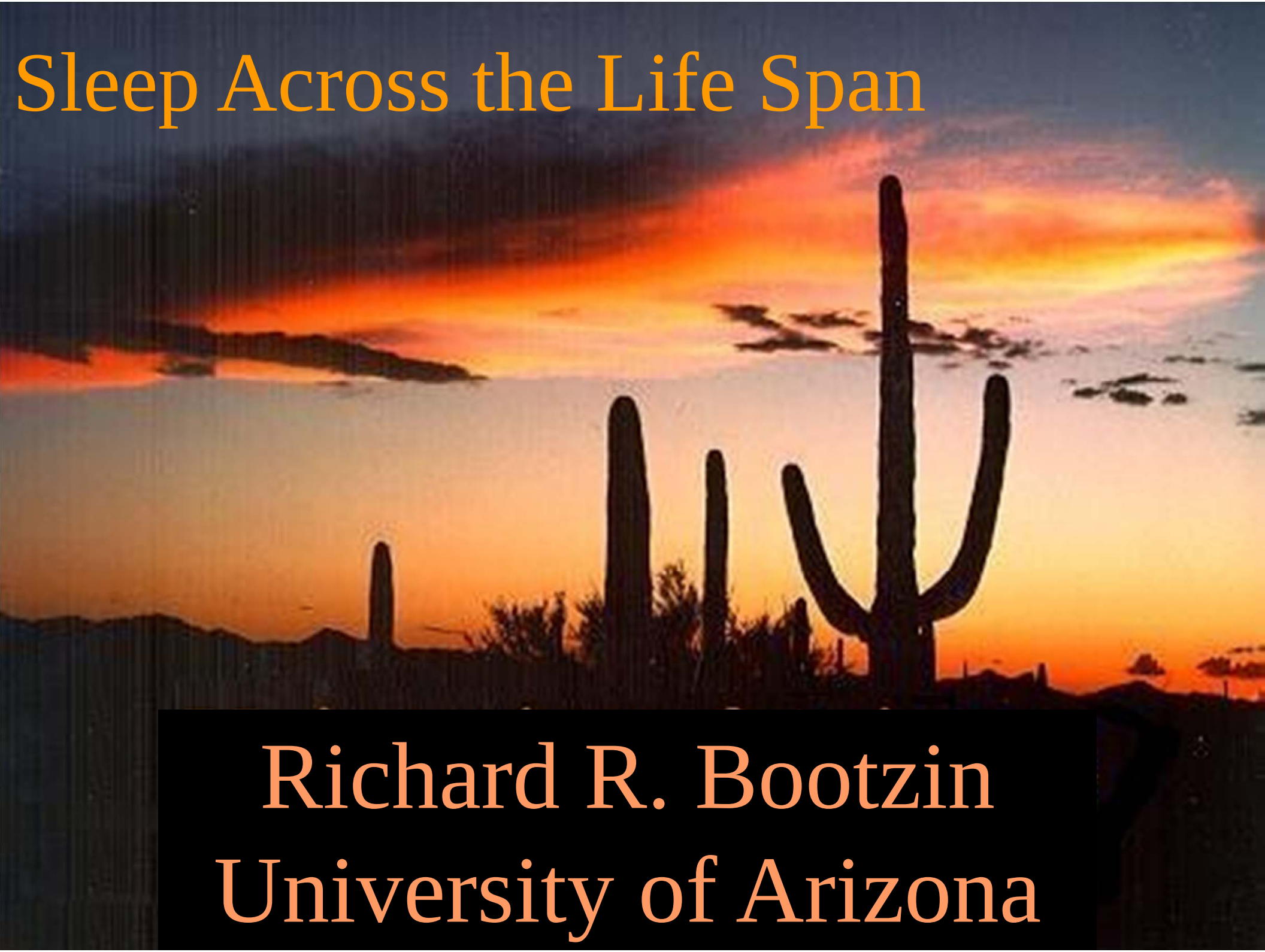
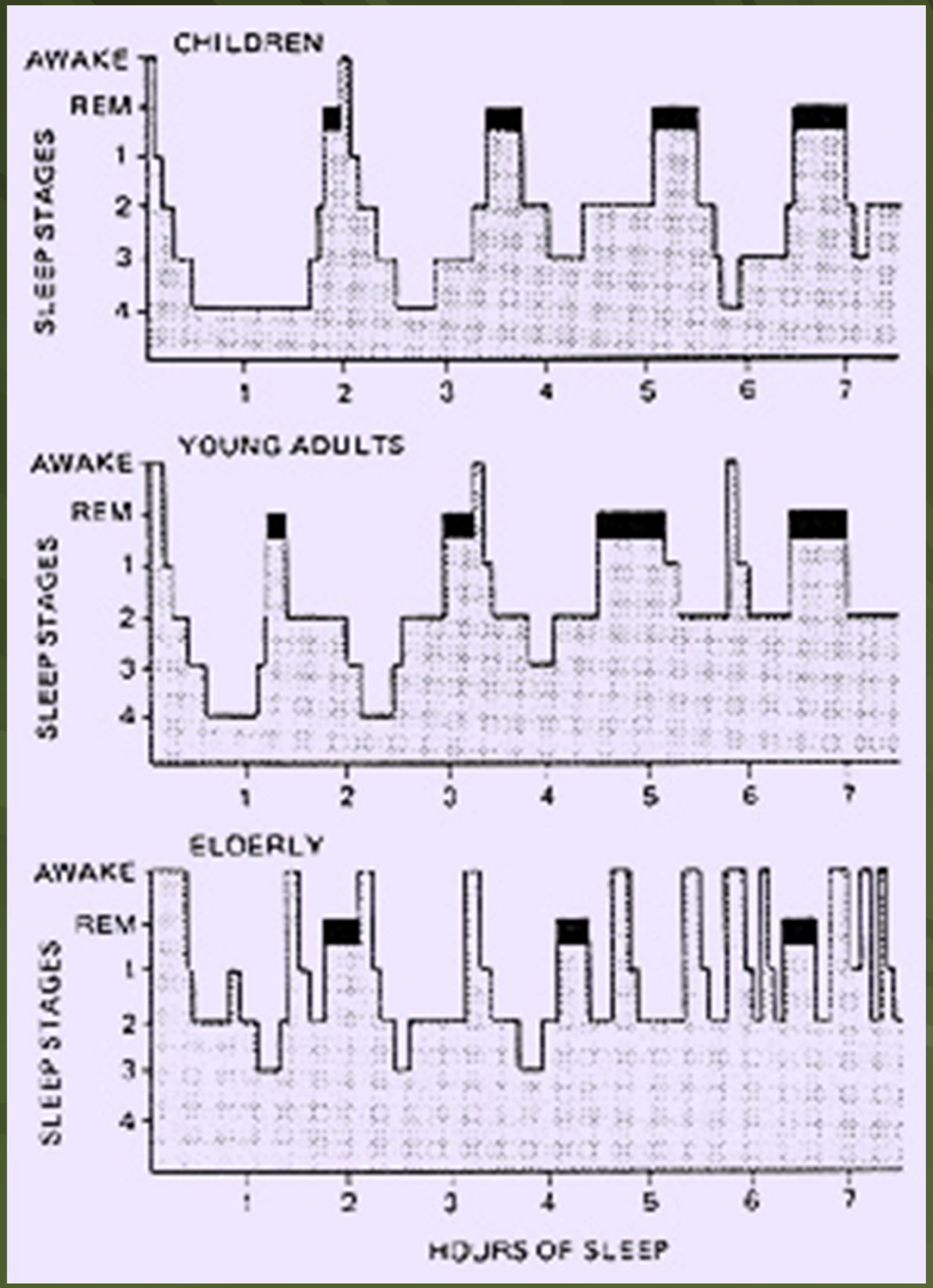
Sleep Across the Life Span

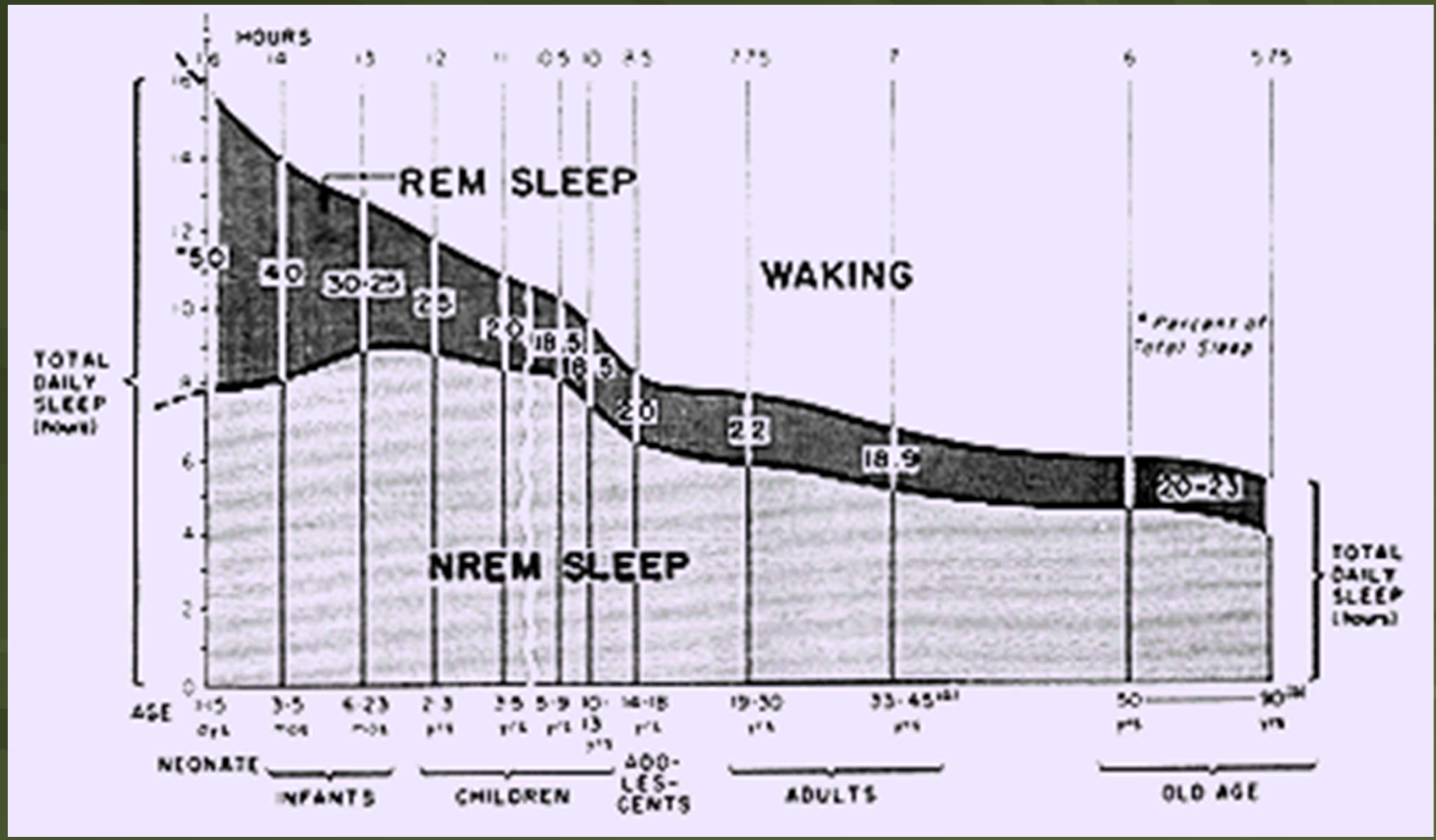


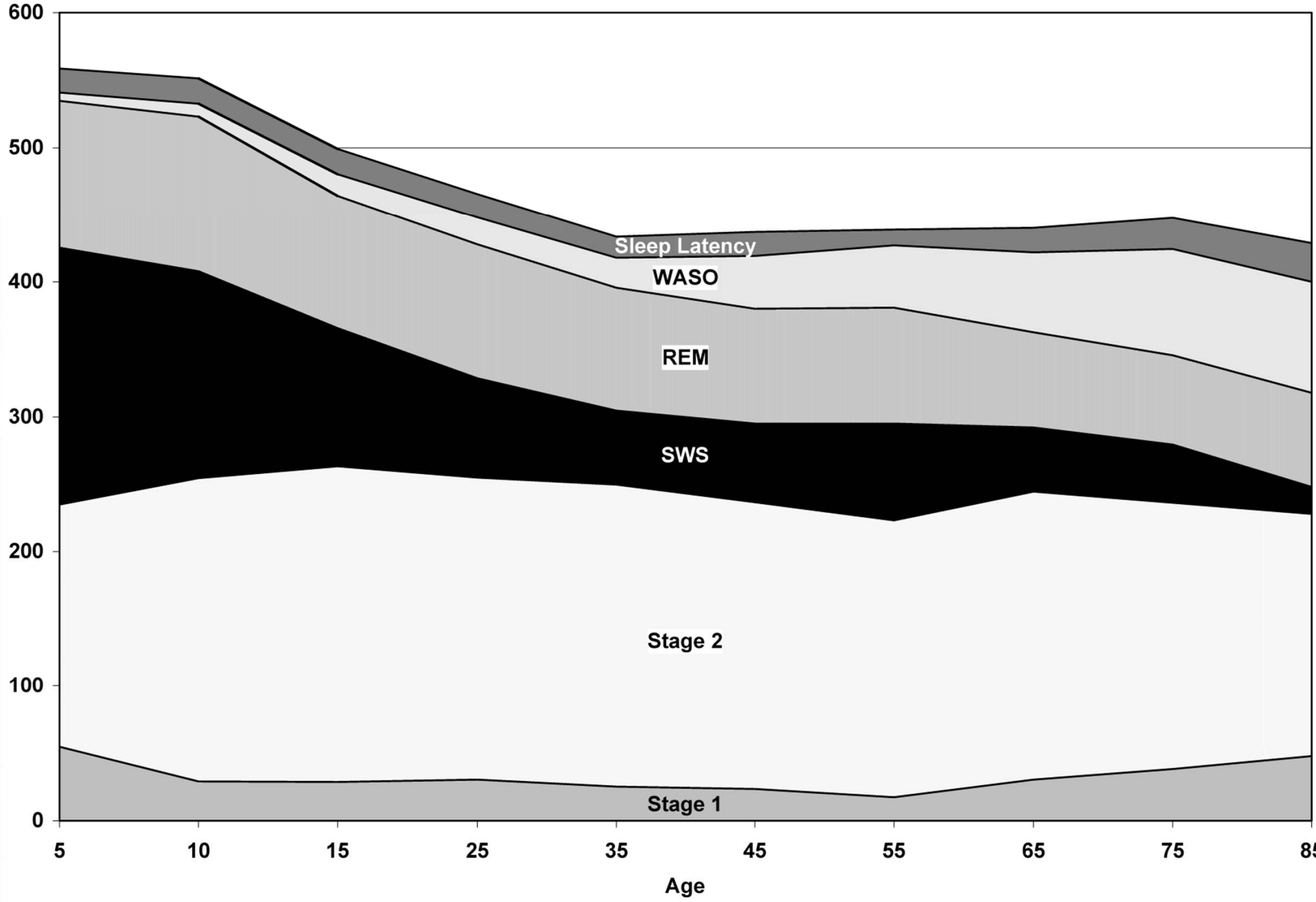
Richard R. Bootzin
University of Arizona

Hypnograms from polysomnography (all-night sleep studies)



Developmental Changes in Sleep





Ohayon, et al., *Sleep*, 2004

Infant Sleep Disturbance

- 15 to 35% of infants
- Developed by the combination of infant arousals and parent reactions (Blampied & France, *JABA*, 1993)
- Family disorganization and mother depression during pregnancy predictors of infant sleep disturbance at 12 and 18 mo (O'Connor, et al., *Early Human Development*, 2007)

Sleep as a Toddler Predicts Early-Onset Substance Abuse (Wong, et al, *Alcoholism: Clinical and Experimental Research*, 2004)

- High risk sample of sons of alcoholic fathers
- Sleep and overtiredness problems as rated by the mothers when the boys were 3 to 5 years old predicted the early onset of cigarette, alcohol, and other drug use at 12 to 14 years of age.
- Sleep problems in early childhood also predicted the development of attention problems and anxiety or depression in early adolescence.

Persistent sleep problems at 5, 7, and 9 years of age from a sample of more than 900 children from Dunedin, New Zealand,…

predicts anxiety disorders at ages 21 and 26

Gregory, et al.,
Journal of Abnormal Child Psychology, 2005

Longitudinal study of 3136 adolescents 11 to 17 years old assessed twice, one year apart (Roberts, Roberts, Chen, *Journal of Psychosomatic Research*, 2002)

Wave 2 odds ratios (based on high insomnia versus low insomnia scores during Wave 1 controlled for age, gender, and parental education)

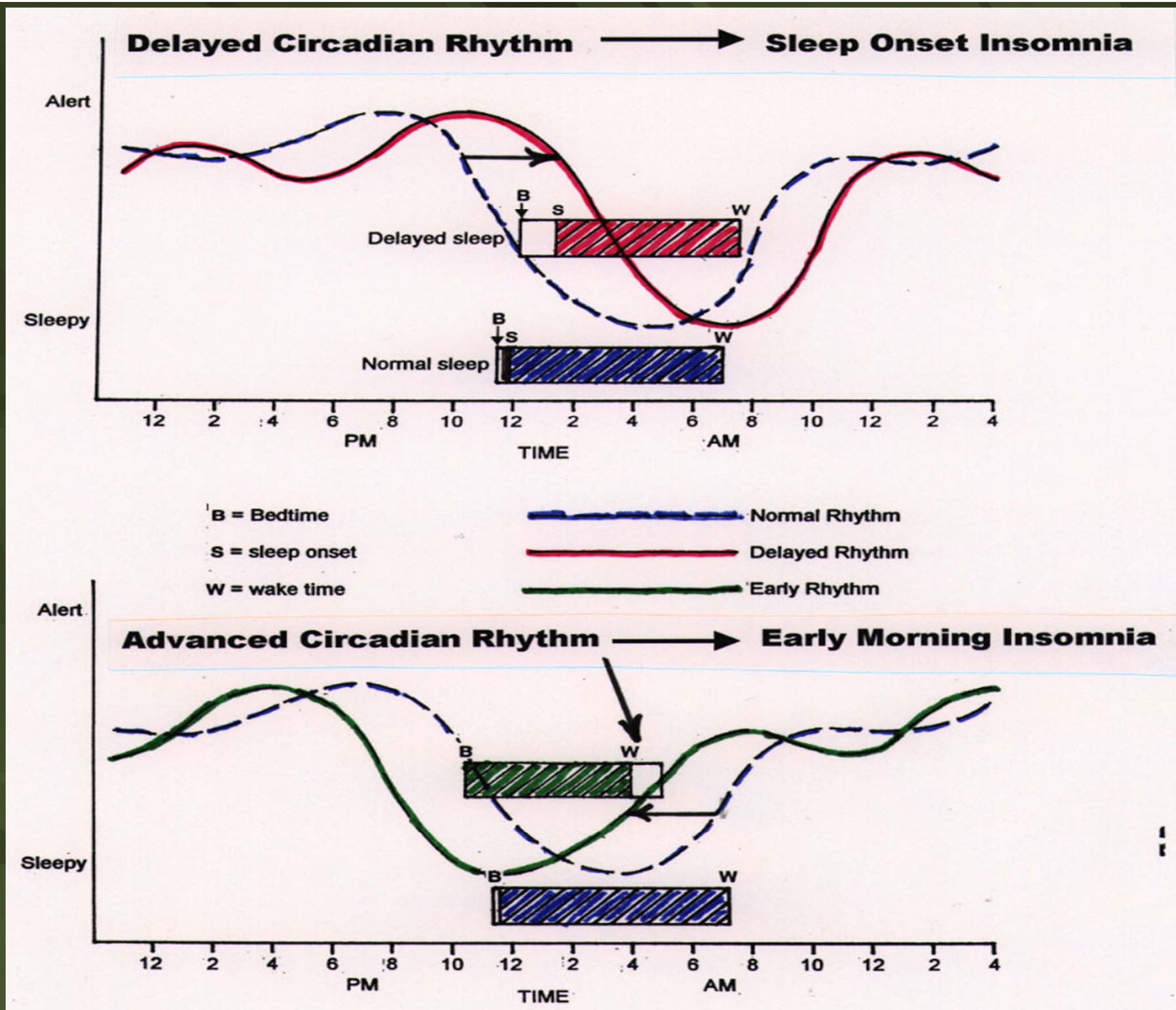
- Life satisfaction 4.63***
- Depression 3.58***
- Self-esteem 2.68***
- Social support 2.57***
- Impact of illness 2.50***
- Perceived mental health 2.30***
- Health limitation 2.12***

Analysis for Frequency of Mobile Phone Use and Time of Inbound and Outbound Text Messages

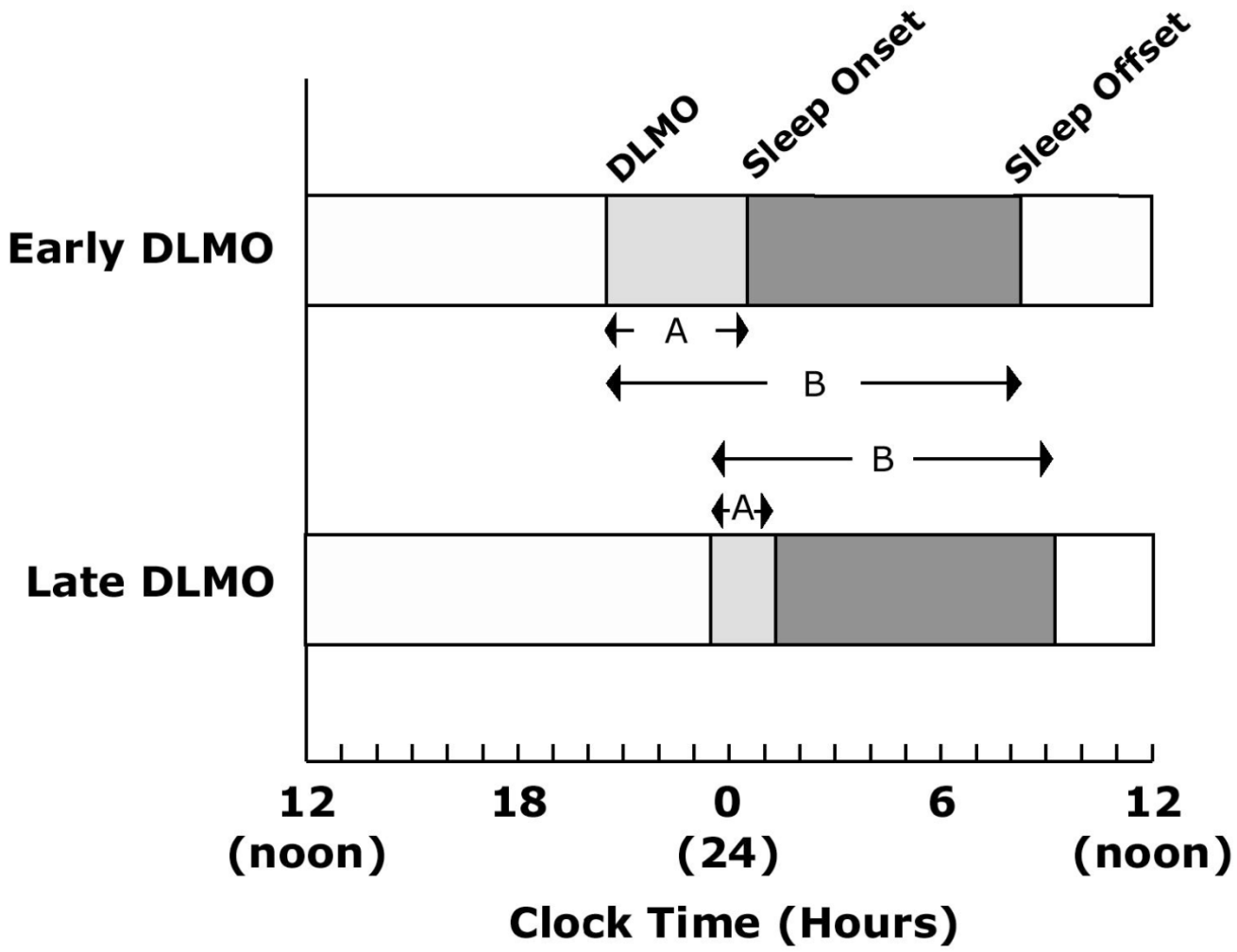
		Overall level of tiredness (row %)				
		Not tired	Somewhat tired	Very tired	Somewhat tired	Very tired
Use of Text and Telephone	**N**				**Odds ratio**	**Odds ratio**
Never	645	43.3%	48.2%	8.5%	1.0	1.0
Less than once a month	387	38.5%	47.5%	14.0%	1.1	1.8**
Less than once a week	311	35.4%	49.2%	15.4%	1.2	2.2***
About once a week	174	25.9%	57.5%	16.7%	2.0***	3.3***
More than once a week	84	21.4%	57.1%	21.4%	2.4**	5.1***
When do you use text messaging?						
Never	645	44.1%	47.9%	8.0%	1.0	1.0
Right after lights out	547	33.9%	52.5%	13.6%	1.4*	2.2***
Between midnight and 3 am	121	28.1%	52.1%	19.8%	1.7*	3.9***
Any time of the night	121	30.6%	51.2%	18.2%	1.5	3.3***

*P <0.05; ** P < 0.001; *** P <0.0001

From Van den Bulck, *Sleep*, 2007.


Delayed Circadian Rhythm
Sleep Onset Insomnia
Alert
Sleepy
B
S
W
Delayed sleep
Normal sleep
12 2 4 6 8 10 12 2 4 6 8 10 12 2 4
PM
AM
TIME
B = Bedtime
S = sleep onset
W = wake time
Normal Rhythm
Delayed Rhythm
Early Rhythm
Advanced Circadian Rhythm
Early Morning Insomnia

Hasler, et al. *Behavioral Sleep Medicine*, 2008



A: DLMO-Sleep Onset Phase Angle

B: DLMO-Sleep Offset Phase Angle

In adults

- In those 21 to 30 years old, the odds of new cases of depression were 3.95 of those assessed 3 years earlier with insomnia and 2.91 for those assessed earlier with hypersomnia (Breslau, et al., 1996)

- Sleep disturbance is an early marker and predictor of the recurrence of depression in formerly depressed patients (Perlis, et al., 1997)

Hypersomnia

U-shaped associations have been found between sleep duration and mortality (Kripke, et al., 2002) and morbidity (Youngstedt & Kripke, 2004).

- Heart disease
- Stroke
- Hypertension
- Diabetes,
- Obesity
- Metabolic syndrome
- Depression

Sex Differences in Sleep

Adults

- More light stage 1 sleep and awakenings in men
- More slow-wave sleep in women
- Subjective sleep worse in women
  - (60% of those with insomnia are women)

Armitage, et al. *Principles and Practices of Sleep Medicine*, 2005.

Menstrual Cycle and Sleep

- Sleep-wake diaries were completed by 32 healthy women twice daily for 2 menstrual cycles.
- During the luteal as compared to the follicular phase, there was a significant increase in sleep onset latency and significant decreases in sleep efficiency and sleep quality.
- Women having increased severity of other premenstrual symptoms (e.g., depressed mood, irritability, bloating, cravings) reported greater luteal increase in daytime sleepiness.

Manber & Bootzin, *Sleep*, 1997

Menopause

- Sleep complaints and daytime sleepiness occur in more than 50% of women
  - Sleep onset latency is the most frequent complaint, followed by nighttime awakenings and daytime sleepiness
- Hot flashes and night sweats (typically 3-5 min)

Moe, *Principles and Practices of Sleep Medicine*, 2005.

Menopause

Hormone Replacement Therapy

- Effectively treats hot flashes

Sleep apnea: increased risk in post-menopausal women

Moe, *Principles and Practices of Sleep Medicine*, 2005.

Prevalence of Insomnia

- 1-month insomnia—lifetime prevalence
  - Women: 31.1%
  - Men: 17.5%
- 2-3 week insomnia—lifetime prevalence
  - Women: 14.4%
  - Men: 12.0%
- No insomnia—lifetime prevalence
  - Women: 19.1%
  - Men: 25.7%

Buysse, et al., *Sleep*, 2008

Countermeasures for Sleepiness and Fatigue (Veasey, et al., JAMA, 2002) Most vulnerable time: 2 – 9 am

Sleep:

- 2-8 hr nap prior to 24 hrs of sleep loss
- 15 min nap every 2 to 3 hrs maintains performance during 24 hrs of sleep deprivation
- 2 hr naps every 12 hrs maintains performance during 88 hrs of sleep deprivation
- Naps need to be < 2 hrs to avoid sleep inertia

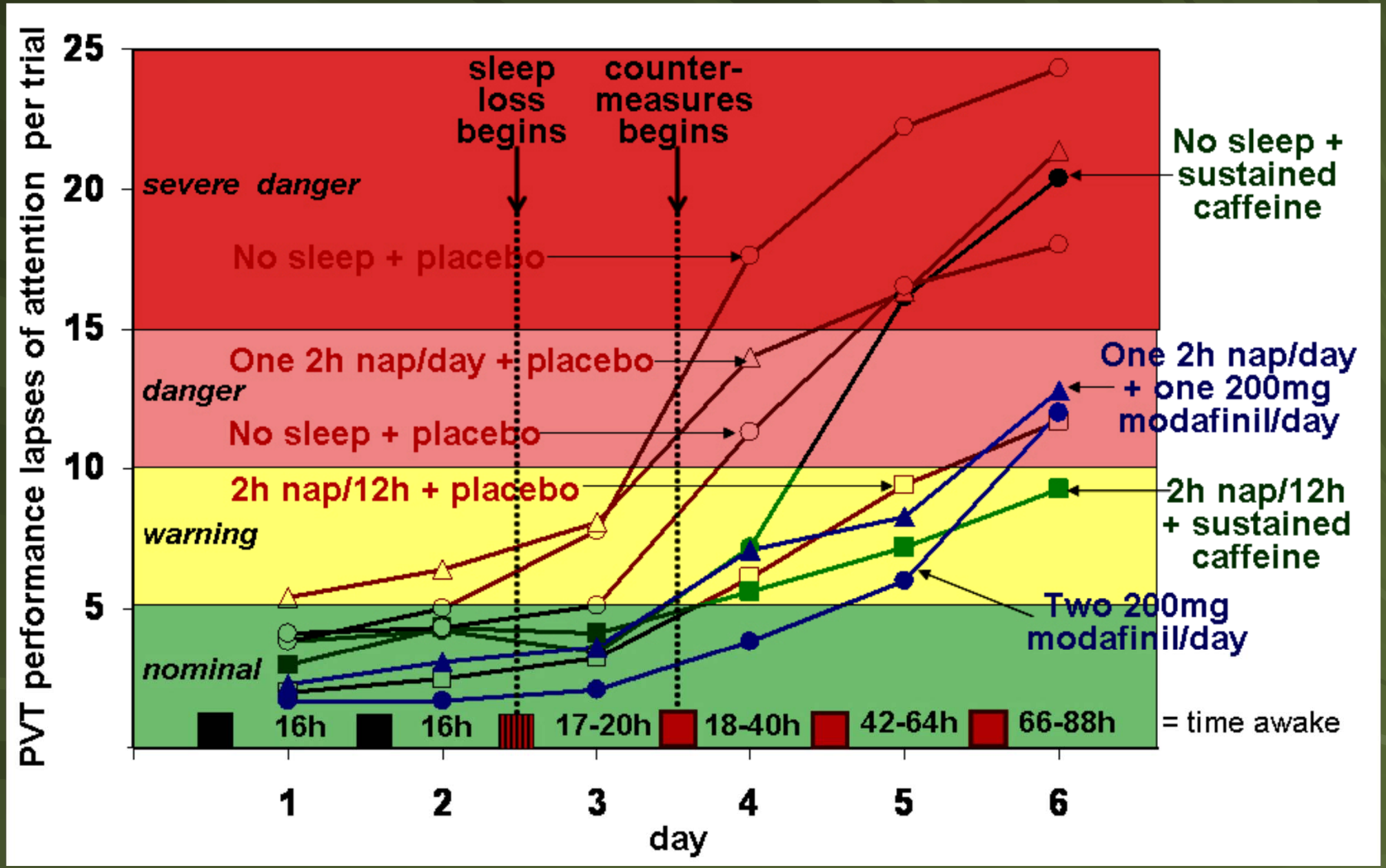

PVT performance lapses of attention per trial
25
20
15
10
5
severe danger
danger
warning
nominal
sleep loss begins
counter-measures begins
No sleep + placebo
One 2h nap/day + placebo
No sleep + placebo
2h nap/12h + placebo
No sleep + sustained caffeine
One 2h nap/day + one 200mg modafinil/day
2h nap/12h + sustained caffeine
Two 200mg modafinil/day
16h
16h
17-20h
18-40h
42-64h
66-88h
= time awake
1
2
3
4
5
6
day

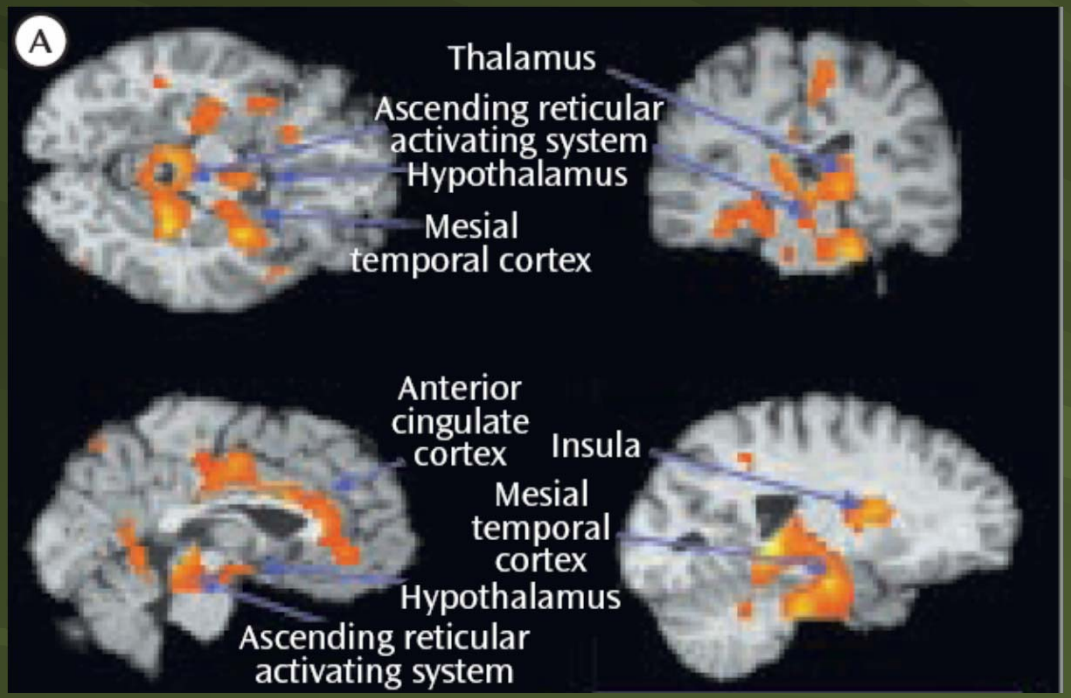
Table 1. Caffeine Content in Beverages

BEVERAGE	SERVING SIZE	CAFFEINE DOSE PER SERVING
Coffee	1 cup	60-150 mg
Decaffeinated Coffee	1 cup	2-5 mg
Starbucks Coffee®	8 ounces	250 mg
JavaFit™	8 ounces	300-400 mg
Starbucks® Coffee Latte	16 ounces	70 mg
Tea (loose or bags)	1 cup	20-50 mg
Hot Cocoa	1 cup	6 mg
Cola drinks	12 oz can	40 mg

References:
www.ibiblio.org/herbs/stimulant.html
www.kellymom.com/health/lifestyle/caffeine.html

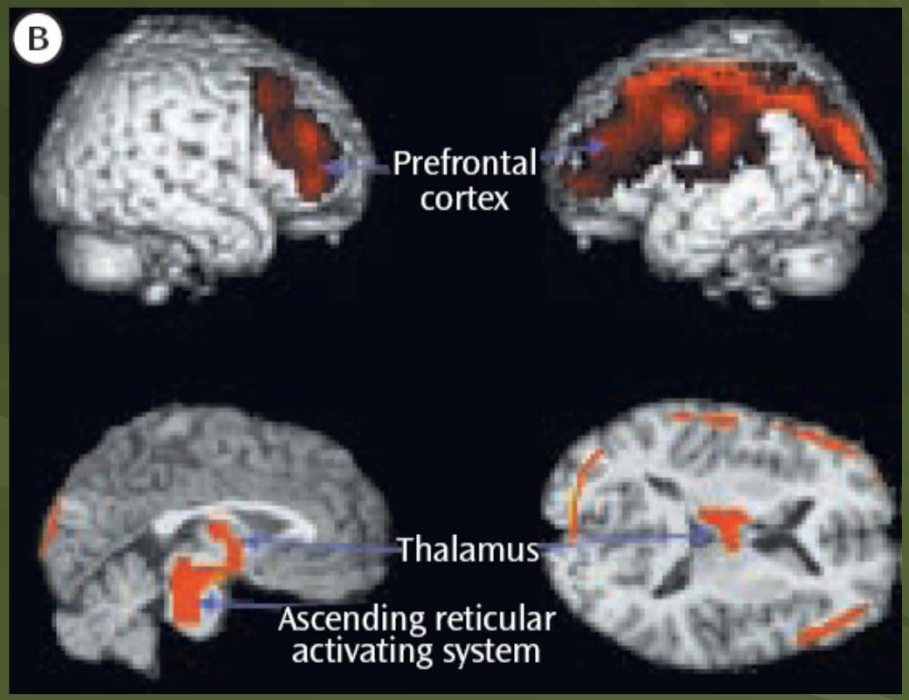
Neuroimaging of Arousal in Insomnia

Areas with <u>less decrease</u> in metabolic rate while asleep in insomniacs



Some brain areas "stay awake" during sleep

Areas with <u>more decrease</u> in metabolic rate while awake in insomniacs



Some brain areas are less available during wake

Nofzinger et al., 2004, *Am J Psychiatry*