

The Interaction Between Sleep in Childhood and Obesity



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Outline

- The importance of sleep to health
- Data from population studies regarding sleep-obesity
- ALSPAC study
- Potential Mechanisms of sleep-obesity

Sleep and Childhood obesity

- Increased time spent watching TV, playing video games, internet, texting
- About 40% of schoolchildren feel sleepy in daytime

"Sleep is an acquired habit. Cells don't sleep. Fish swim in the water all night. Even a horse doesn't sleep. A man doesn't need any sleep."

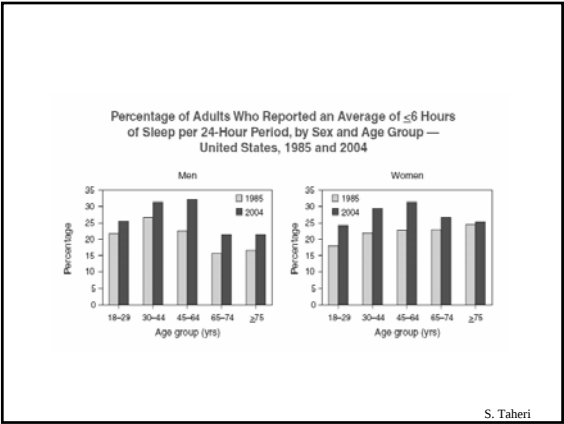
Thomas Edison

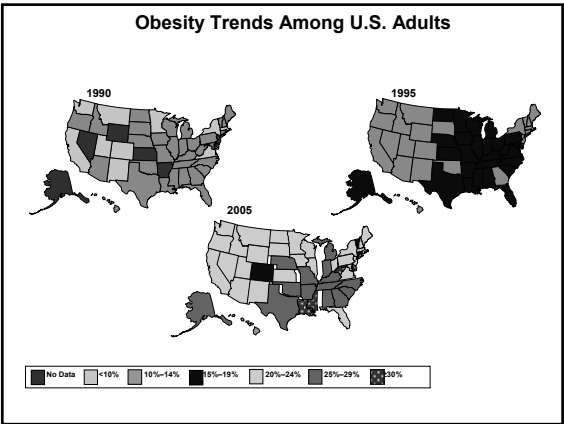
"If sleep does not serve an absolute vital function, then it is the biggest mistake the evolutionary process made"

Rechtschaffen

Sleep Loss

- The precise functions of sleep are unknown, but a link between sleep duration and mortality has recently been explored
- People are sleeping less hours: 30% of Americans (18-54 years), reported sleeping < 8hrs per weeknight; 16% reported sleeping < 6hrs (2003 Sleep in America poll)
- Sleep has a role in neurocognitive performance
- The importance of sleep in appetite and metabolism is now increasingly recognised



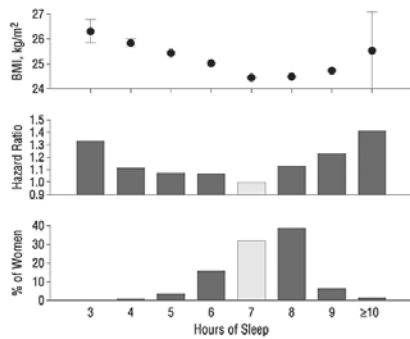


Short Sleep Duration & Obesity

- 1992: *Locard et al* – 1031 French children aged 5 years: Children sleeping <11 hours were significantly more obese – adjusted OR 1.4 (1.1-1.9) Vs >11 hours
- 2000: *Vioque et al* – 1772 Spanish subjects ≥ 15 years – adjusted OR 0.43 (0.27-0.67) for ≥ 9 hrs sleep Vs ≤ 6 hours

Kripke et al.

- Cancer Prevention Study II of the American Cancer Society
- 1.1 million people
- Aged 30 to 102 years



Kripke, D. F. et al. Arch Gen Psychiatry 2002;59:131-136.

Table 1 Impact of duration of sleep on overweight (BMI > 90th percentile), obesity (BMI > 97th percentile) and high body fat (BIA > 90th percentile) in 5- and 6-y-old children

Duration of sleep	Overweight		Obesity		High body fat	
	%	95% CI	%	95% CI	%	95% CI
≤ 10 h (n = 961)	14.5	12.6–17.2	5.4	4.1–7.0	15.6 ^a	11.1–21.0
10.5–11 h (n = 3910)	10.0	9.1–11.0	2.8	2.3–3.3	9.8 ^b	8.0–11.9
≥ 11.5 h (n = 1774)	7.4	6.2–8.7	2.1	1.5–2.9	7.0 ^c	4.9–9.7

^an = 225; ^bn = 968; ^cn = 483.

von Kries R, Toschke AM, Wurmser H, Sauerwald T, Koletzko B. Int J Obes Relat Metab Disord 2002; 26:710-6

Japanese Study 1

- Toyoma Cohort Study
- Cross-Sectional
- 6-7 Year olds
- Anthropometry and questionnaire to parents
- 8274 children (4194B, 4080G)

Child Care Health Dev. 2002 Mar;28(2):163-70.

Relationship between sleeping hours and obesity after adjustment for potential confounding factors

Sleep (hrs)	MOR (CI)
< 8	2.87 (1.61-5.05)
8 – 9	1.89 (1.34-2.73)
9 – 10	1.49 (1.08-2.14)
> = 10	1.00
p value for trend	<0.001

OR adjusted for age, parental obesity, physical activity, TV watching, frequency of taking breakfast, Snack frequency; Sekine et al. 2002. Child: Care, Health & Development 28, 2, 163-170

US Study - Texas

- Heartfelt study
- 383 Adolescents
- 11-16y
- Public schools in Texas
- Anthropometric measures
- One 24-hr actigraphy

AMERICAN JOURNAL OF HUMAN BIOLOGY 14:762-768 (2002)

US Study - Texas

For every hour of sleep time, the odds of obesity decreased by 80%

Mean daytime physical activity was inversely associated with sleep disturbance time

The ALSPAC Study

- ALSPAC = Avon Longitudinal Study Of Parents And Children
- ALSPAC recruited 14,541 pregnant women in 1991-92.
- These children, now 14-15 years old, have been followed up since birth and 11,500 are still participating in the study.
- Detailed information has been collected since early infancy on sleep in children and their parents, together with detailed information on a wide range of factors e.g. environmental, socioeconomic and psychological factors, health, growth, body composition, diet, cardio-respiratory fitness, and a wide range of anthropometric measures.

ALSPAC: early-life factors that may predispose to childhood obesity at age 7 years

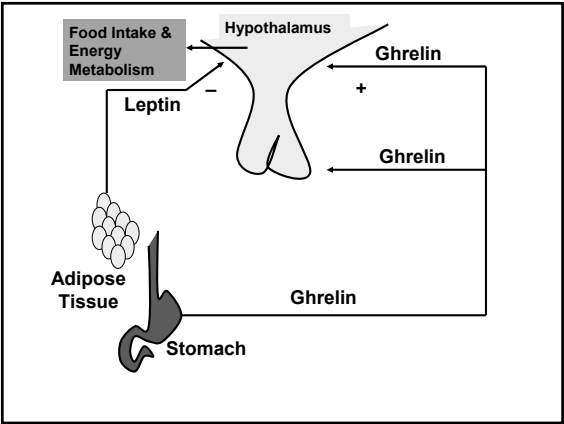
- 25 putative factors predisposing child at age 2.5y becoming obese at age 7y
- 8 factors that were significantly associated with increased risk of obesity
 1. Early body mass index (BMI);
 2. Parental obesity (both parents > 1 parent)
 3. TV watching aged 3 years
 4. Birth-weight
 5. Weight gain in first year
 6. Sleep at age 30 months
 7. Catch-up growth
 8. Early maternal smoking in pregnancy

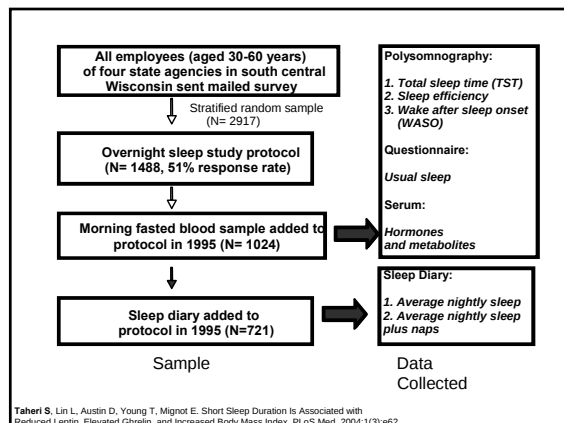
Sleep Duration Quartiles N=7758	Odds Ratio	95% Confidence Interval
Q1: <10.5 h	1.45	1.10-1.89
Q2: 10.5-10.9 h	1.35	1.02-1.79
Q3: 11-11.9 h	1.04	0.76 - 1.42
Q4: >12 h	1	
		P<0.01

Reilly JJ, Armstrong J, Dorosty AR et al.
Early life risk factors for obesity in childhood: cohort study.
BMJ 2005;**330**:1357.

Why?

Hypothesis

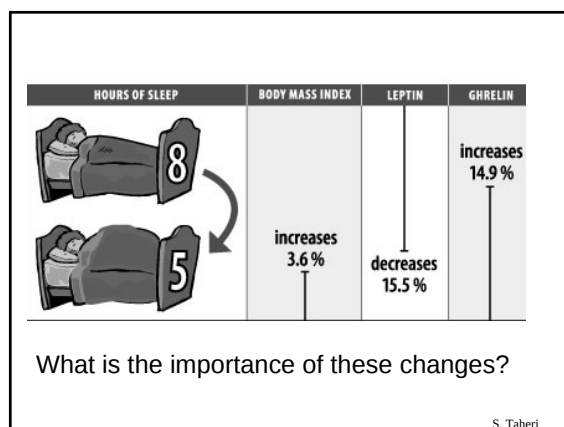


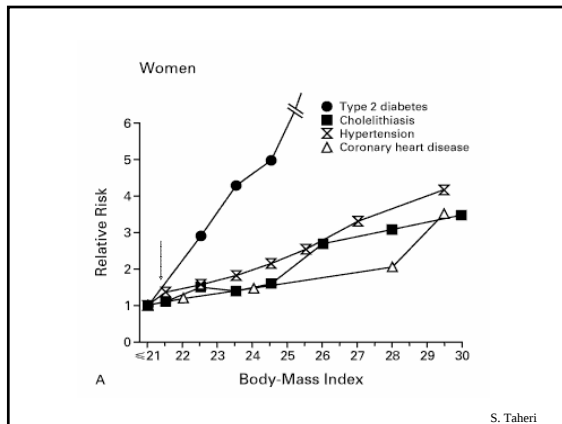


The study population

Variable	Mean (SD)	N (%)
Age (years)	52.7 (8.2)	
Male		551(53.8%)
BMI (kg/m ²)	29.7 (26.2, 34.7)	
Sleep duration variables		
<i>Polysomnography-derived:</i>		
Total sleep time (hrs)	6.2 (1.1)	
Sleep efficiency (proportion)	0.82 (0.11)	
Wake after sleep onset (hrs)	1.1 (0.71)	
<i>Self-reported:</i>		
Usual sleep	7.2 (0.99, N = 1023)	
Average nightly sleep (hrs)	7.5 (0.91, N = 721)	
Average nightly sleep with naps (hrs)	7.7 (0.94, N = 714)	

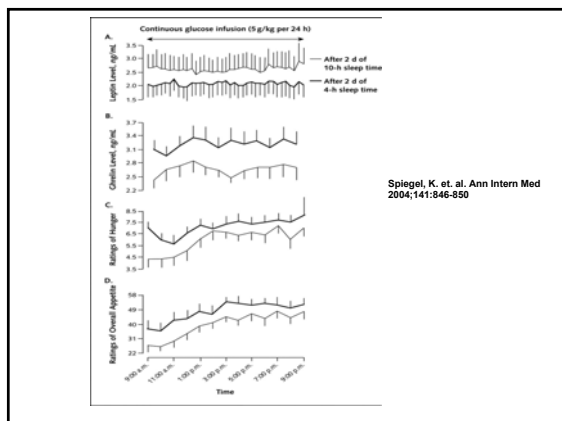
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CONSIDERATIONS

- Cross-sectional study
- Other hormones may be involved
- Single hormone measurements
- Single-night polysomnography
- Stability of self-reported "usual" sleep duration and polysomnographic measures of sleep duration over time
- Possible confounding effect of sleep-disordered breathing





Factors Affecting Sleep At 81 Months

Sleep longer if:

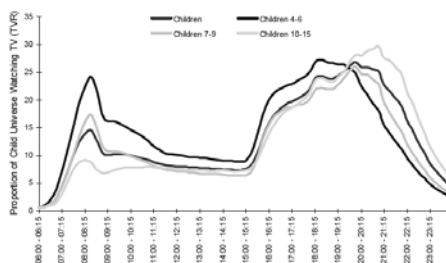
Mother -

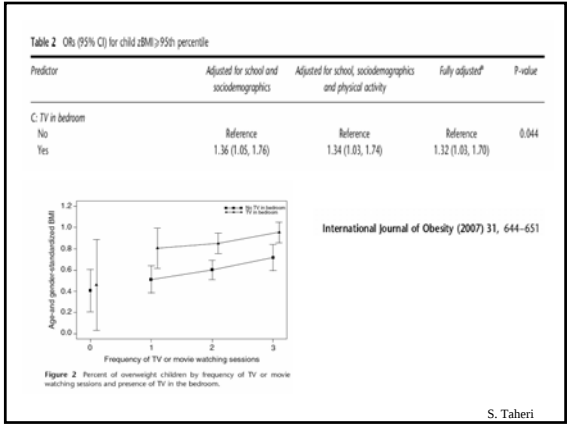
- i. younger (β coefficient = -0.023 hours of sleep/maternal age years; $p < 0.001$)
- ii. did not drink alcohol during the 2nd trimester (< 1 glass/week Vs > 1 glass/week, $\beta = -0.128$; $p < 0.001$)

Child -

- i. watched less television (hours/week) at 38mths (Vs < 7 hours; 7-8 hours: $\beta = -0.014$; > 9 hours: $\beta = -0.095$; $p < 0.001$)
- ii. spent more time outdoors (hours/week) at 38mths (Vs < 7 hours; 7-13 hours: $\beta = -0.038$; 14-20 hours: $\beta = -0.025$; $p < 0.001$).

Children's viewing peaks in the morning (8.15 am) and in the evening (7.45 pm) when 27% of the population is tuned in

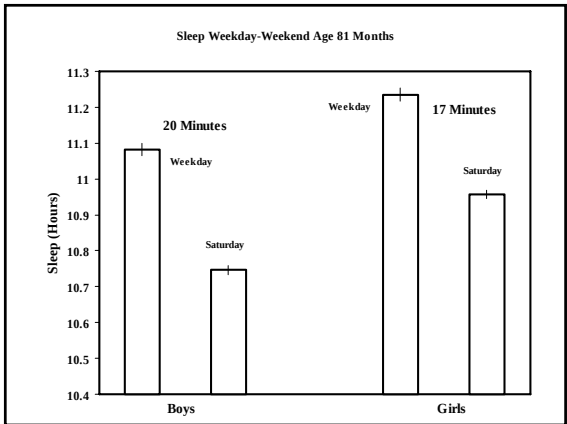




Having a TV in the bedroom is a risk factor for child overweight....

Further study is needed to fully understand the mechanism by which having a TV in the bedroom increases children's risk for overweight.

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Conclusion

- Short sleep duration is strongly associated with obesity
- Public Health Measures - promoting more sleep, less TV

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