SLEEP AND HEALTH IN ADOLESCENTS

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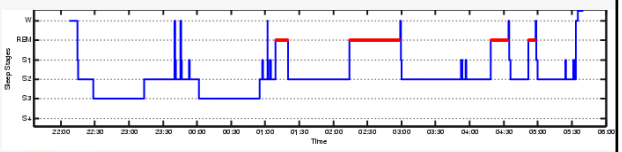
CONTENT

- What is sleep?
- What's special in adolescents
- Sleep problems in adolescents
- Factors affecting adolescent sleep
- Consequences
- Sleep intervention in adolescents

Defining Sleep

Sleep Physiology

- Cycles of NREM & REM sleep
- Defined by EEG, also by EOG, EMG, ECG and breathing measurements



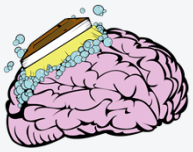
Characteristics of sleep stages

	Wake	NREM	REM
Sensation and perception	Vivid, externally generated	Dull or absent	Vivid, internally generated
Thought	Logical and progressive	Logical and perseverative	Non-logical and bizzare
Movement	Continuous and voluntary	Episodic and involuntary	Commanded but inhibited

Hobson JA. Nat Rev 2009

FUNCTION OF SLEEP

- Restoration & repair - rest and 'detoxification'
- Hormonal surge and Growth
- Immunity
- Memory offline consolidation
- …



OFFLINE MEMORY CONSOLIDATION PROCESS DURING SLEEP

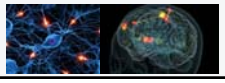
Memory encoded at daytime

Replay & Reactivation during different sleep stages

NREM REM

Performance improve by 20-33% compared to control of waking state

Consolidation
Synaptic homeostasis
Active System re-organization



Transfer of memory representations to other neuronal networks for long-term storage

Walker et al., Neuron 2002; Fischer, et al., PNAS 2002

Sleep as a state to enhance removal of neurotoxic waste from our brain!

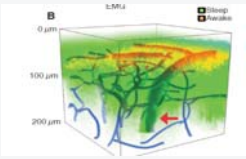
Glymphatics

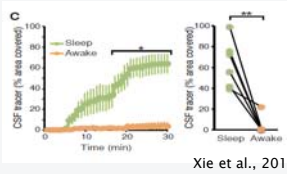
Natural Detoxification

During sleep
60% increase in interstitial space

↑ Exchange of cerebrospinal fluid with interstitial fluid

↑ Removal of neurotoxic waste (e.g. β amyloid)

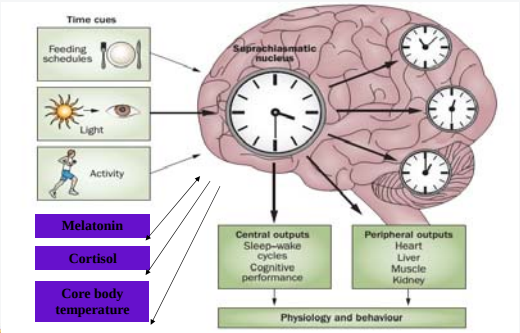




Xie et al., 2013

SLEEP-WAKE CONTROL

Circadian rhythm



Videnovic, A., Nat Rev Neurol,2014

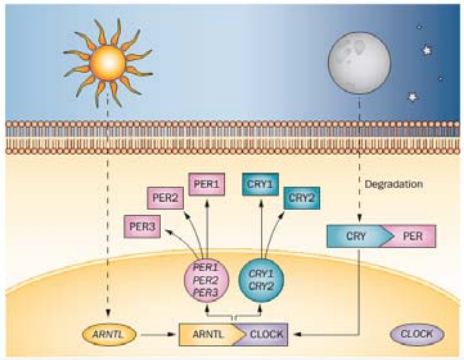
The 2017 Nobel Prize in Physiology of Medicine

Jeffrey C. Hall

Michael Rosbash

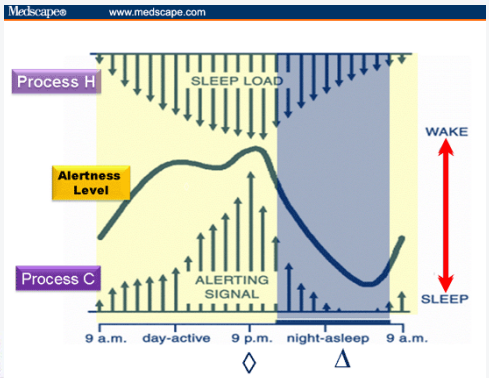
Michael W. Young

For their discoveries of mechanisms controlling circadian rhythms



Videnovic, A., Nat Rev Neurol,2014

SLEEP-WAKE MODEL



WHAT'S SPECIAL IN ADOLESCENTS?

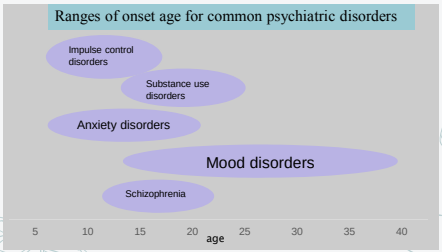
ADOLESCENCE

- One of the most critical and vulnerable stages of the lifespan
- A transition characterized by substantial changes in biological, personal and psychological aspects
- A time of increased vulnerability for developing emotional problems

(Merikangas et al. 2009)

ADOLESCENCE

- Many psychiatric disorder emerge during adolescence
- Adolescence has dramatic changes in body and behavior

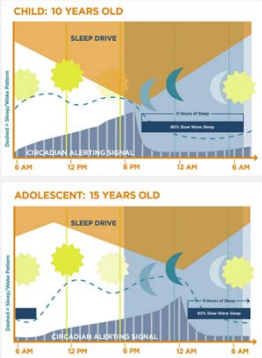


Kessler, et al., 2005; Kessler, et al., 2008; Giedd, et al., Nat Rev Neurosci 2008

Sleep in Adolescence

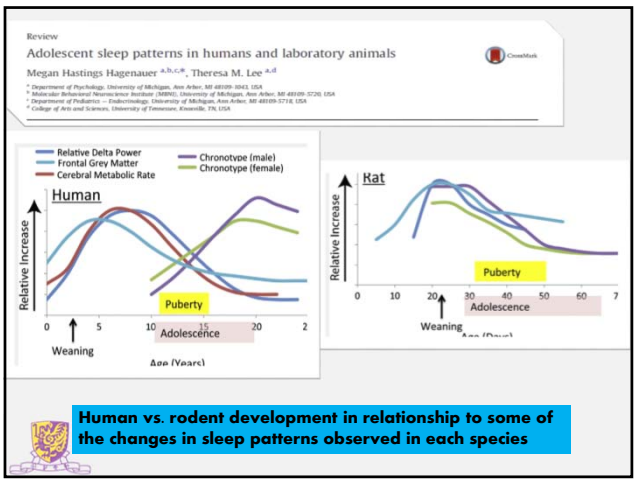
Developmental changes in the circadian & sleep characteristics:

- A gradual change toward evening circadian phase preference due to biological & psychosocial factors
- Changes in sleep characteristics:
  - Delayed bedtime
  - Delayed weekend wake-up time
  - Increased daytime sleepiness



Carskadon, et al., 1993; Crowley, et al., 2007; Giennotti, et al; 2002; Huang, et al. 2010

Hummer & Lee, *Neuroscience & Biobehavioral Reviews*, 2016

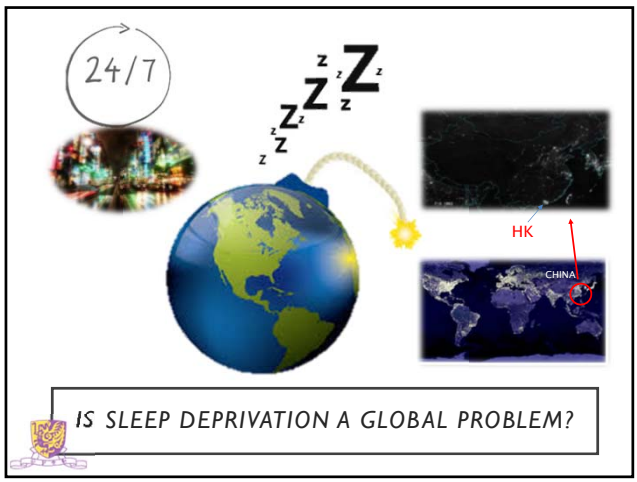


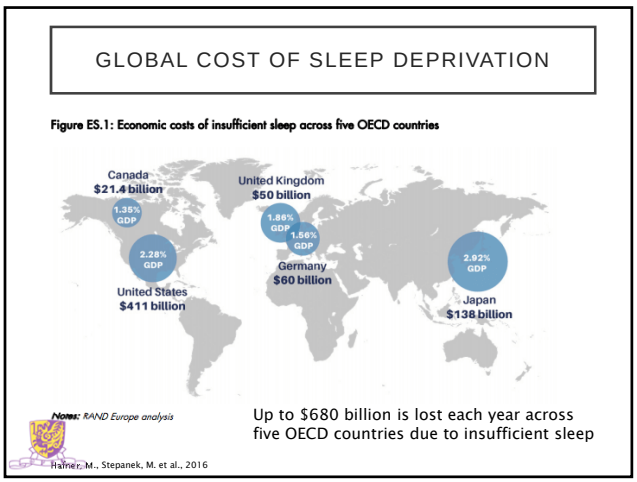
Human vs. rodent development in relationship to some of the changes in sleep patterns observed in each species

SLEEP DEPRIVATION

WHAT DO YOU THINK ABOUT SLEEP?

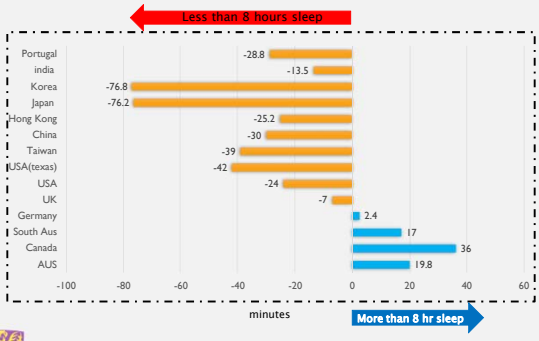
- 我認為睡眠很重要
- 我會犧牲我的睡眠去做其他事情(出街,工作)
- 一晚的通宵並不會對我有影響
- 睡不夠是可以補返的





OVERVIEW OF SLEEP DATA IN CHILDREN AND ADOLESCENTS

SLEEP DATA AMONG ADOLESCENTS ACROSS DIFFERENT REGIONS



Aus: Olds, et al.; 2010 TW: Huang, et al; 2010 China: Liu, et al., 2008; Korea: Kim, et al., 2011; Canada: Chaput & Janssen, 2016
HK: Kong AP, et al., 2011; USA: NSF 2006; Portugal:Paiva et al, 2015; UK: Maslowsky, & Ozer, 2014; South Aus: Short, et al., 2013

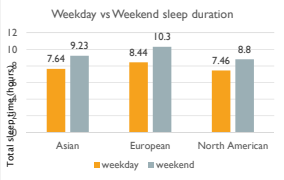
Review Article

Recent worldwide sleep patterns and problems during adolescence: A review and meta-analysis of age, region, and sleep

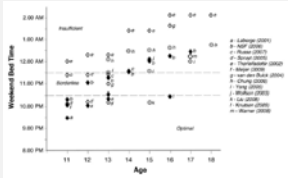
Michael Gradisar *, Greg Gardner, Hayley Dohnt

Sleep Medicine, 2011

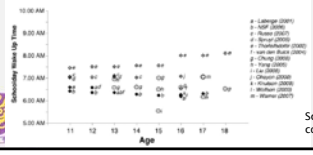
Include 41 surveys of worldwide adolescent sleep patterns from1999–2010



Shorter sleep duration in Asian and north American compared to European

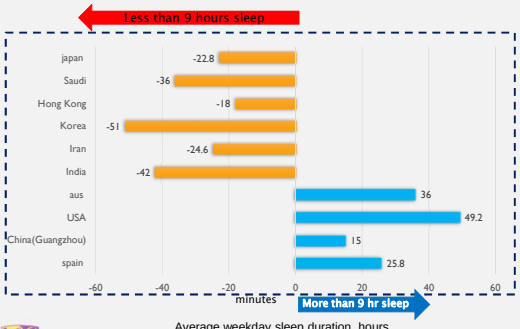


The shorter sleep duration in Asian is mainly due to the later bedtime



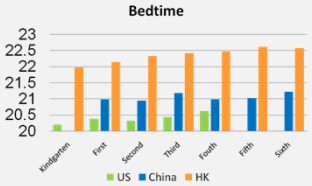
Schoolday wake up time remain relatively consistent when compared to bedtime

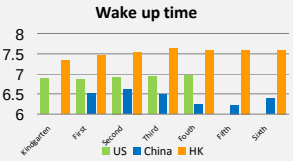
SLEEP DURATION AMONG CHILDREN ACROSS DIFFERENT REGIONS



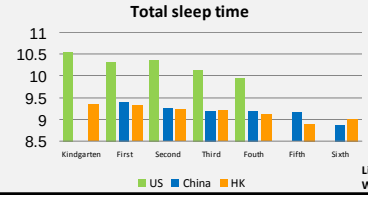
Average weekday sleep duration, hours

Reference: Blair, et al., 2012. Gupta 2016; Amintehran, 2013; Yang et al 2005; BaHammam et al 2006; Canet, 2010; Cooper et al 2012; Sakamoto et al. 2017; Wang et al., 2017





Children in China & HK sleep less and have later bedtime than US children



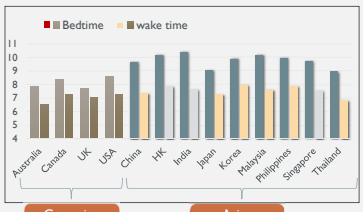
Liu X et al. Pediatrics 2005
Wing & Li et al. Pediatrics 2009

Original Article

Cross-cultural differences in the sleep of preschool children

Jodi A. Mindell[a,*], Avi Sadeh[b], Robert Kwon[c], Daniel Y.T. Goh[d]

Sleep Medicine, 2013

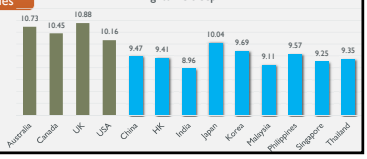


Caucasian countries

Asian countries

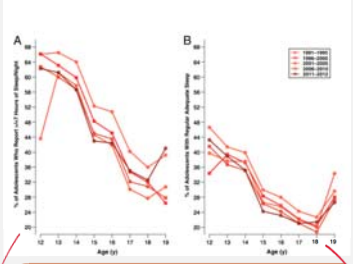
Study findings:
Asian countries had significant later bedtimes and shorter nighttime sleep than Caucasian countries

Nighttime sleep



The results indicate significant cross-cultural differences in sleep patterns and sleeping arrangements.

US TEENS – A GREAT SLEEP RECESSION



A. How often do you get at least 7 hrs of sleep?
B. How often do you get less sleep than you should?

Largest decrease from 71.5% in 1991 to 63.0% in 2012.

Keyes, Maslowsky, Hamilton, & Schulenberg
Pediatrics, 2015

Data from 1991 – 2012 (N=272077)
8th, 10th, and
12th grade students in ~130 US public and private high schools

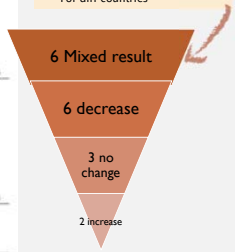
Age-period-cohort models

Conclusions:
- *Adolescent sleep generally declined over 20 yrs*
- *Girls less like to report getting ≥7hrs compared to boys*
- *Racial/ethnic minorities and low SES were more likely to have adequate sleep*

A REVIEW PAPER ON SECULAR TREND OF SLEEP DURATION

Trend identified	Reference		Country	Year measured	Age graphed	Age studied
Decrease	26	Dollman	Australia	1985-2004	10-15	10-15
	27	Iglowstein	Switzerland	1988-2000	14	1-16
	28	Kohyama	Japan	1937-1970	na	2-6
		Kohyama	Japan	1955-1995	na	1
	29	Thorleifsdottir	Iceland	1985-1995	na	1-19
	46	Webb	USA	1910-1969	13-17	8-17
	47	Tynjälä (2002)	Finland	1994-1998	15	13 &15
Mixed	32a,b	Paakkonen	Finland	1988-2000	10-16	10-18
	33	Randler	Germany	1907-2007/8	13-14	12-16
	43a,b	Visage	Finland	1990-2000	16-19	16-19
	44a*	Zuzanek	Finland	1987/8-1999/00	15-19	15-19
	44b	Zuzanek	Germany	1991-2001	15-19	15-19
	44c	Zuzanek	Canada	1986-1998	15-19	15-19
	44d	Zuzanek	Norway	1980-2000	15-19	15-19
	45a	Statistics Bureau	Japan	2001-2006	10-14	10-14
	45b	Statistics Bureau	Japan	2001-2006	15-19	15-19
	75	Tynjälä (2010)	Finland	1994- 2006	15	13 &15
No change	31	Huysmans	Netherlands	1980-2000	15-18	15-18
	41	Weinstein	USA	1911-1980	13-16	1-16
	42a	Knutson	USA	1981-1997	15-17	15-17
	42b	Knutson	USA	1981-1997	15-17	15-17
Increase	30	Hofferth	USA	1981-1997	9-12	3-13
	40a,b	Soupourmas	Australia	1992-1997	15-19	15-19

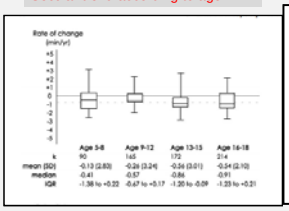
- Schooldays vs non-schooldays
- For diff age groups
- For diff countries



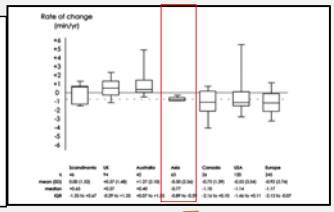
Matricciani, Olds, Williams, Sleep, 2011

690,747 children from 20 countries
Data from 1905-2008

Secular trend according to age



Secular trend according to regions



Asia

Contents lists available at ScienceDirect

Sleep Medicine Reviews

journal homepage: www.elsevier.com/locate/smrv

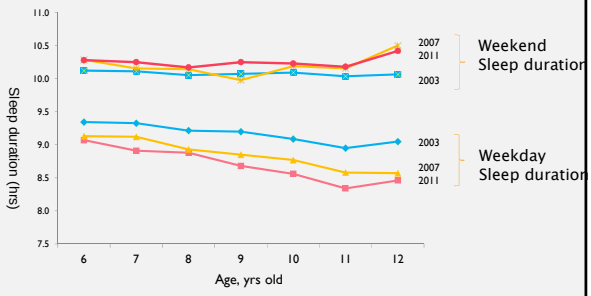
CLINICAL REVIEW

In search of lost sleep: Secular trends in the sleep time of school-aged children and adolescents

Lisa Matricciani[a,c,*], Timothy Olds[a,b,c], John Petkov[a]

How about Hong Kong?

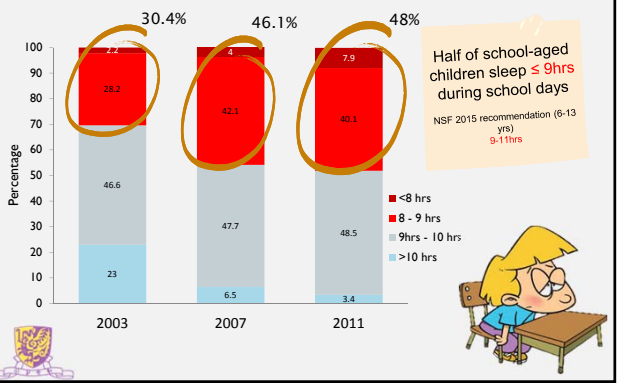
HONG KONG CHILDREN SLEEP-WAKE PATTERN (2003, 2007, 2011)



Prominent weekday and weekend difference in sleep duration among school-aged children

Wing et al., 2009; Kong et al. 2011

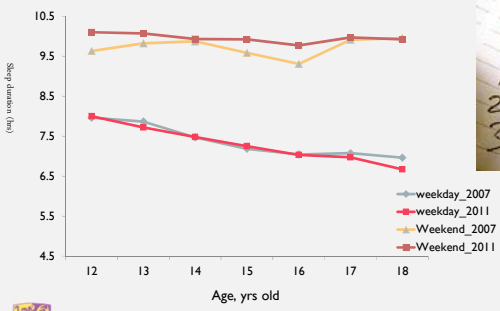
HONG KONG CHILDREN'S SLEEP DURATION IN 2003, 2007 & 2011



Half of school-aged children sleep ≤ 9hrs during school days

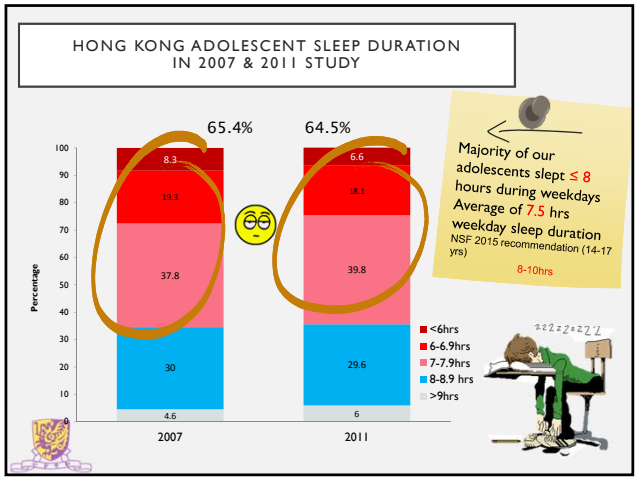
NSF 2015 recommendation (6-13 yrs) 9-11hrs

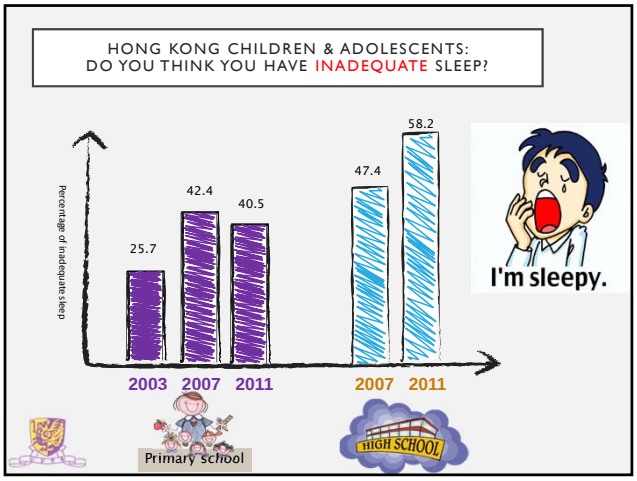
HONG KONG ADOLESCENT SLEEP-WAKE PATTERN (2007, 2011)

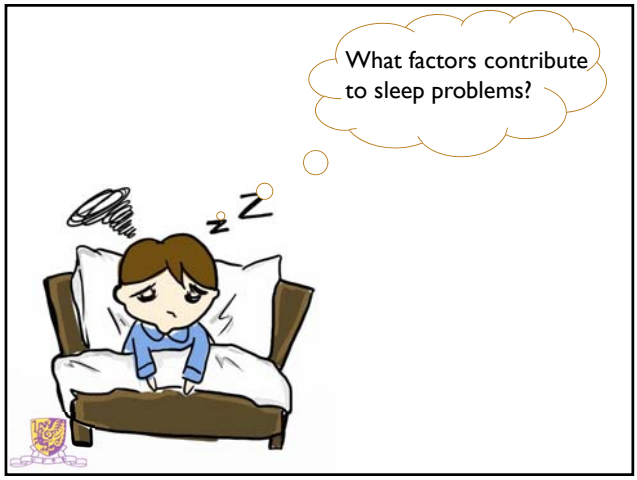


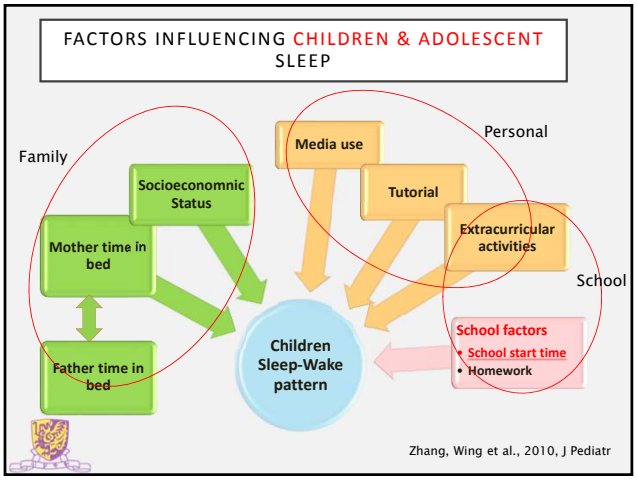
Weekend compensation is also very common in adolescents

Kong et al., 2011; Wing et al., 2015


HONG KONG ADOLESCENT SLEEP DURATION
IN 2007 & 2011 STUDY
65.4%
64.5%
Percentage
100
90
80
70
60
50
40
30
20
10
0
8.3
19.3
37.8
30
4.6
6.6
18.1
39.8
29.6
6
2007
2011
<6hrs
6-6.9hrs
7-7.9hrs
8-8.9 hrs
>9hrs
Majority of our adolescents slept ≤ 8 hours during weekdays
Average of 7.5 hrs weekday sleep duration
NSF 2015 recommendation (14-17 yrs)
8-10hrs

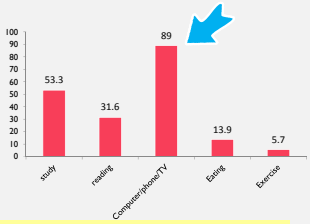

HONG KONG CHILDREN & ADOLESCENTS:
DO YOU THINK YOU HAVE INADEQUATE SLEEP?
Percentage of inadequate sleep
25.7
42.4
40.5
47.4
58.2
2003
2007
2011
2007
2011
Primary school
HIGH SCHOOL
I'm sleepy.


What factors contribute to sleep problems?


FACTORS INFLUENCING CHILDREN & ADOLESCENT SLEEP
Family
Personal
School
Media use
Socioeconomnic Status
Tutorial
Extracurricular activities
Mother time in bed
Father time in bed
Children Sleep-Wake pattern
School factors
• School start time
• Homework
Zhang, Wing et al., 2010, J Pediatr

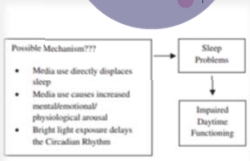
Individual Factors

EXCESSIVE ELECTRONIC MEDIA USE



Nearly 90% of students engaged in electronic media use near bedtime

Unpublished data



Review Article

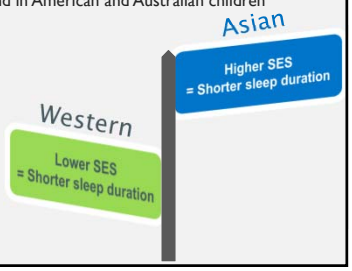
Electronic media use and sleep in school-aged children and adolescents: A review

Neralie Cain, Michael Gradisar *

Sleep Medicine Review, 2010

FAMILY FACTORS -- SES

- HK: Families with higher SES status, with presumably higher academic expectation for their children, may have driven their children academically, with consequent curtailment of TIB.
- In contrast with the result found in American and Australian children



Keyes, et al., 2015; Zhang et al., 2010

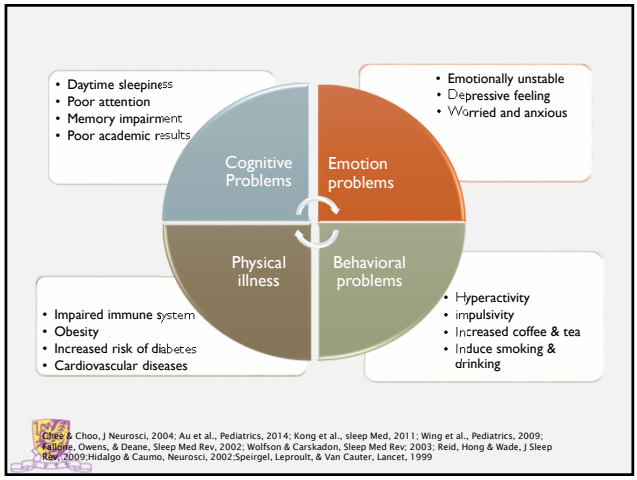
Busy schedule:
weekly schedule of a 10-year old boy/girl in HK

	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
0645	Wake up						
0715	School bus						
0800- 1530	School time					Piano class 0930-1030 Violin class 1130-1230	Music theory 1000-1100
1530- 1615	School bus					English class 1500- 1700	
1615-1700	TV/ Rest						
1700-1900	Mandarin class	Swimming class	Math class	Swimming class	Calligraphy		
1900-2000	Dinner					Electronic media use	
2000-2230	Homework						
2230-2330	Bathing, "private time" : surfing internet…						
2330/ 0000	Bedtime						

SLEEP DEPRIVATION: IT IS NOT JUST CHILDREN'S PROBLEM, BUT ALSO FAMILY ISSUE

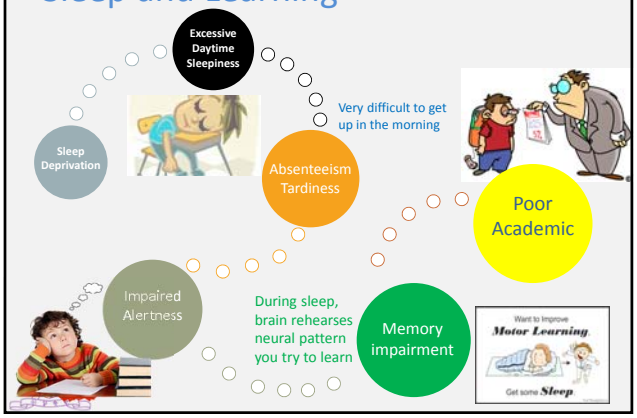
- Limited time for unlimited tasks!
- A modern trend for "intensive training" since early age with scarification of sleep for "higher achievement"

Adverse Consequences of SLEEP Deprivation in adolescents – Does it matter?



Chee & Choo, J Neurosci, 2004; Au et al., Pediatrics, 2014; Kong et al., sleep Med, 2011; Wing et al., Pediatrics, 2009; Fallone, Owens, & Deane, Sleep Med Rev, 2002; Wolfson & Carskadon, Sleep Med Rev; 2003; Reid, Hong & Wade, J Sleep Rev, 2009;Hidalgo & Caumo, Neurosci, 2002;Speirgel, Leproult, & Van Cauter, Lancet, 1999

Sleep and Learning

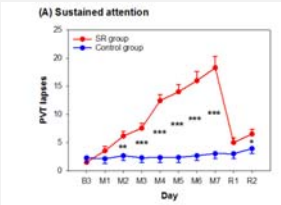


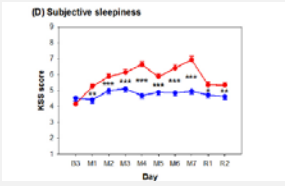
SLEEP RESTRICTION ON COGNITIVE PERFORMANCE

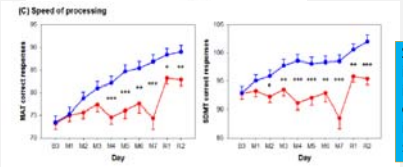
- N = 56 healthy adolescents
- 2 weeks
- Control vs sleep restriction group
- 3 baseline nights (TIB = 9 h), 7 nights of sleep opportunity manipulation (TIB = 5 h for the SR and 9 h for the control groups), and 3 nights of recovery sleep (TIB = 9 h)

Lo, JC., et al., 2016, sleep

RESULTS

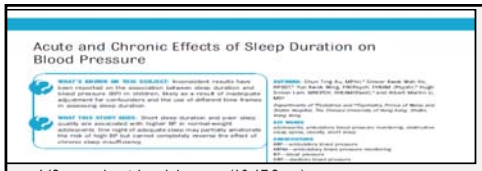






SR group demonstrated incremental deterioration in sustained attention, executive function, and increase in subjective sleepiness

Lo, JC., et al., 2016, sleep

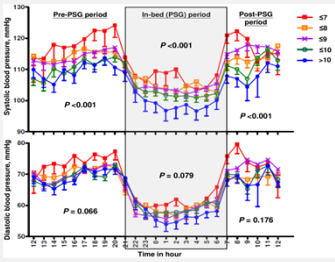


Pediatrics, 2014

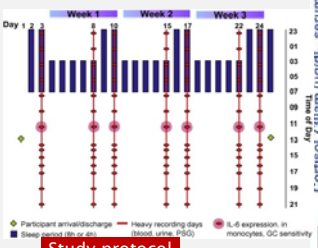
- 143 normal weight adolescents (10-17.9 yrs)
- One night PSG

Short sleep duration (<7hrs) was associated with higher BP in normal weight adolescents.

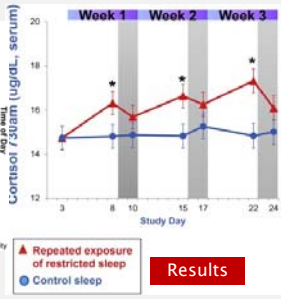
One night of compensatory sleep may partially ameliorate the risk of high BP, but may not completely reverse the effect of long-term sleep insufficiency.



DOES SLEEP RECOVERY REVERSES HPA AXIS



Study protocol

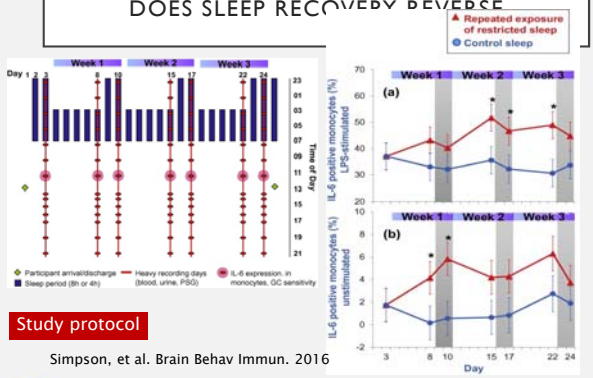


Results

Limited recovery sleep did not restore these physiological stress responses to baseline

Simpson, et al. Brain Behav Immun. 2016

DOES SLEEP RECOVERY REVERSE



Study protocol

Simpson, et al. Brain Behav Immun. 2016

Limited recovery sleep did not restore these inflammatory markers to baseline

LATE BEDTIME IN ADOLESCENCE

A nationally representative sample of US youth
Wave 2: Mean age 16 years, 52.1% female
Wave 3: Mean age 21.8 years

Late Bedtime *predicts* negative outcomes (N = 3843)

	OR(95% CI)	*p*
Emotional Distress	1.23 (1.02 – 1.49)	.033
Suicidality	1.24 (0.95 – 1.62)	.107
Criminal Activity	1.33 (1.09 – 1.63)	.005
Violent Activity	1.25 (0.97 – 1.62)	.087
Cigarette Use	1.21 (1.01 – 1.46)	.041
Alcohol Abuse	1.31 (1.01 – 1.68)	.038
Illicit Drug Use	1.61 (1.36 – 1.91)	<.001

McGlinchey & Harvey, *J Youth Adolesc* 2015

Late bedtime in adolescence as a risk factor for *risk behavior & negative health outcomes* in young adulthood

SLEEP INTERVENTION WHAT CAN WE DO?

SLEEP EDUCATION

WHAT ARE THE MAJOR ELEMENTS IN SLEEP EDUCATION ?

CURRENT SLEEP EDUCATION PROGRAMME

Sleep Education for School

comprehensive educational resource for K-12 grade administrators and teachers (Developed by AASM)

Australian Centre for Education in Sleep ™

Helping young people be the best they can

founded in 2006 to address the need to increase awareness in the community about the importance of sleep

THE UNIVERSITY OF ARIZONA

Sleep education program to improve STEM Education in Elementary school (Supported by National Science Foundation)

SLEEP FOR KIDS

Teaching Kids The Importance of Sleep

provide easily readable information about the sleep to children ages 7 to 10, their parents, and their teachers.(Developed by NSF)

MAJOR FINDINGS

- Majority showed significant increase in knowledge after programme
- Only one study demonstrated significant increase in weekend sleep duration
- Some found improvement in sleep quality (e.g., decreased sleep latency)

Limitations

- Lack of control group
- Small sample size
- Programme content varied significantly (leaflet vs 12 daily lesson)
- No study involved parents and teachers who directly or indirectly affect adolescent sleep

Recently published in Pediatric, 2015

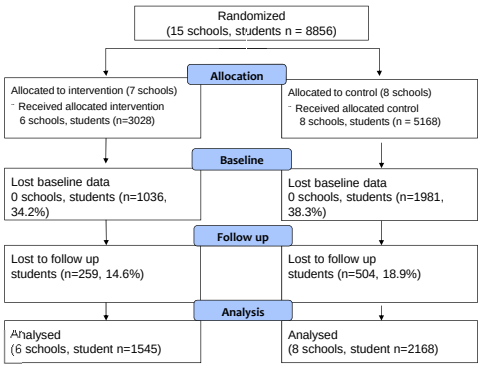
A School-Based Sleep Education Program for Adolescents: A Cluster Randomized Trial

Sponsored by Public Policy Research (Ref: CUHK4012-PPR-11)

香港中文大學醫學院兒科、內科及藥物治療學系及精神科學系合辦

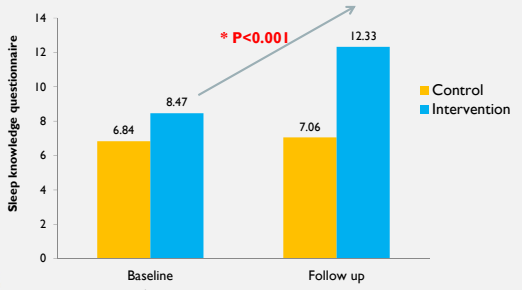
Collaborated by Departments of Paediatrics, Medicine & Therapeutics and Psychiatry, The Chinese University of Hong Kong

Flow chart of schools and subjects recruitment process



Wing et al., 2015 pediatrics

SLEEP KNOWLEDGE SCORE FROM BASELINE TO FOLLOW-UP



*P<0.001 Intervention vs Control;
Sleep Knowledge Questionnaire: Gallasch J, Gradisar M. 2007;5:63-73.
Adjustment for age and sex in GEE model

Wing et al., 2015 pediatrics

CHANGES IN SLEEP PATTERNS FROM BASELINE TO FOLLOW-UP

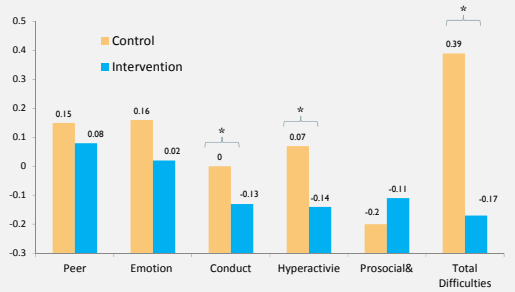
	Baseline		Follow-up		Pre and post Differences		P value for pre-post
	Control	Intervention	Control	Intervention	Control	Intervention	
Weekdays							
Bedtime	23:19(0:16)	23:18(0:16)	23:26(0:27)	23:23(0:26)	0:07(0:15)	0:05(0:15)	0.02*
Wakeup time	6:50(0:12)	6:40(0:12)[a]	6:49(0:13)	6:41(0:13)	0:01(0:04)	0:00(0:04)	0.12
Sleep Duration	7:31(0:18)	7:22(0:19)	7:23(0:25)	7:17(0:27)	-0:08(0:17)	-0:05(0:17)	0.03*
Weekends							
Bedtime	24:09(0:34)	24:06(0:35)	24:13(0:30)	24:09(0:30)	0:03(0:18)	0:02(0:19)	0.82
Wakeup time	10:05(0:40)	10:10(0:41)	9:50(0:40)	9:54(0:42)	-0:15(0:27)	-0:15(0:25)	0.99
Sleep Duration	9:56(0:16)	10:03(0:18)	9:36(0:25)	9:44(0:25)	-0:19(0:21)	-0:18(0:19)	0.85

The significant change in weekday bedtime and sleep duration disappeared after intention-to-treat analysis

*P<0.05 Intervention vs Control; a –sig diff in baseline data
Adjustment for age and sex in GEE model

Wing et al., 2015 pediatrics

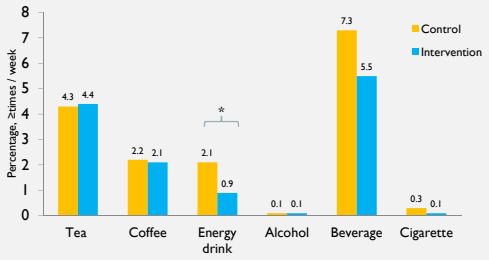
CHANGES IN SDQ SCORES FROM BASELINE TO FOLLOW-UP



* p<0.05 comparing intervention and control
* Higher score indicating better function
SDQ: Strengths and Difficulties questionnaire; Goodman R 1997;
Adjustment for age and sex in GEE model

Wing et al., 2015 pediatrics

INCIDENCE OF POOR LIFESTYLE FROM BASELINE TO FOLLOW-UP

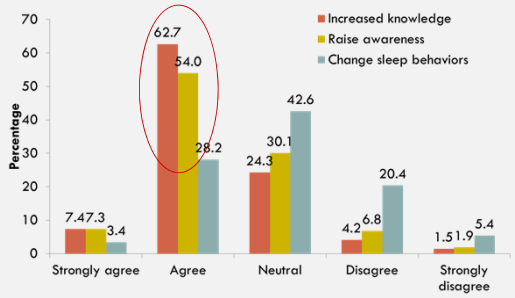


No differences were found in persistence of these lifestyle practices

*p<0.05 comparing intervention and control
≥3 times/week was considered as abnormal;

Wing et al., 2015 pediatrics

FEEDBACK FROM INTERVENTION GROUP



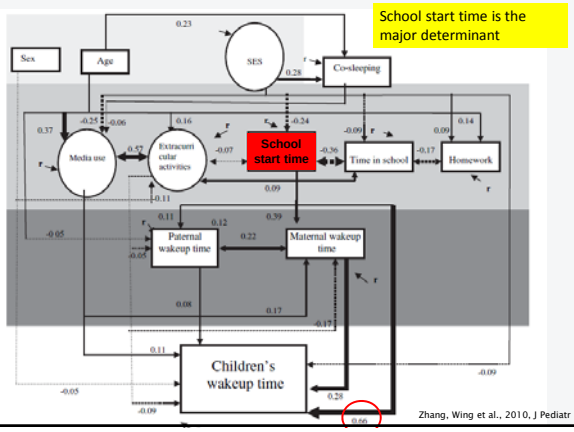
IMPLICATION

- Enhancing knowledge per se was insufficient in changing sleep behaviors
- Develop programme using Cognitive-behavioral approach
  - Dysfunctional belief (sleep is "OPTIONAL")
  - Increase motivation to change (goal setting)
  - Subjective norm (parents, teachers and friends)
  - Increase self-efficacy (develop action plan, believe "I can do that")
  - Maintenance of the behavior (continuous feedback/reinforcement)
- Target on high risk groups
  - Shorter sleep duration (≤6 hrs)
  - More irregular weekend/weekday sleep pattern
  - Delayed sleep phase

Sleep intervention 2

DELAY SCHOOL START TIME

School start time is the major determinant



Zhang, Wing et al., 2010, J Pediatr

Changing Times: Findings From the First Longitudinal Study of Later High School Start Times

Kyla Wahlstrom

NASSP Bulletin, 2002

- First long-term study investigated the impact of later school start time (1996-2001)
- Edina, suburban district and Minneapolis Public School
- 7:15 a.m. → 8:40 am
- 12000 secondary students

Study Findings:

- Get an hour's more sleep
- Improved attendance rate
- Reduction in dropout rate
- Improved academic performance

Later school start time…

- Increased standardized tests scores in Math, English, Science and Social Studies
- Improved attendance rates
- Reduced tardiness
- Less caffeine consumption
- 70% reduction of teen car crashes

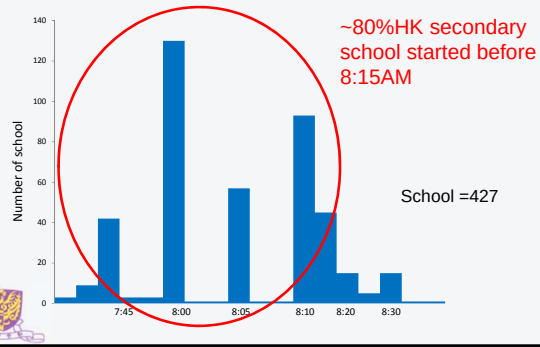
- There is no relationship between participation in sports and letter grades when practice occurs after school or on the weekend.

Walhstrom, 2014

Our Sleep Project II

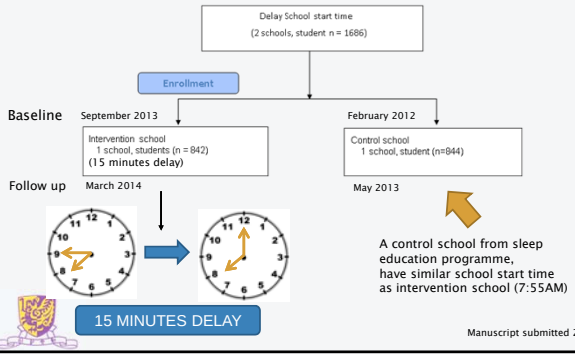
Delay school start time

Informal telephone survey - Hong Kong Secondary School Start Time (2012)



Methods

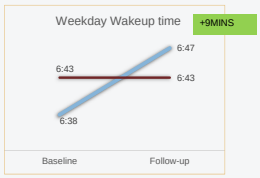
- A quasi experiment design

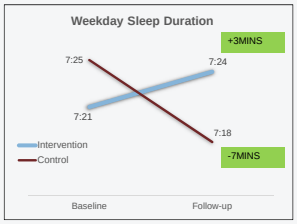


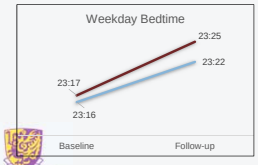
A control school from sleep education programme, have similar school start time as intervention school (7:55AM)

Manuscript submitted 2015

Result -- Sleep Wake Patterns





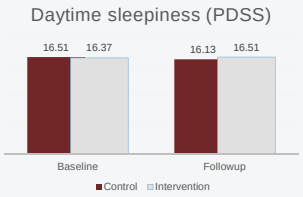


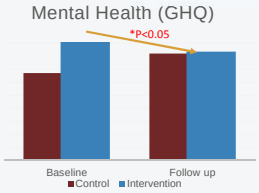
Intervention school had *later wakeup time and longer sleep duration* compared to control group

NOTE: Adjusted for age, gender and family income in the model

Manuscript submitted 2015

PDSS and GHQ



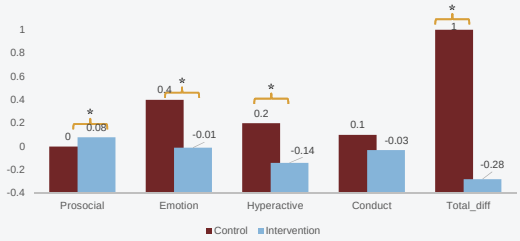


Intervention school had *better mental health* after delay school start time
No difference was observed in daytime sleepiness

NOTE: Adjusted for age, gender and family income in the model

Manuscript submitted 2015

Strengths and Difficulties Score



Significant improvement was observed in *Prosocial, Emotion, Hyperactive and Total difficulties aspects.*

NOTE: Adjusted for age, gender and family income in the model

Manuscript submitted 2015

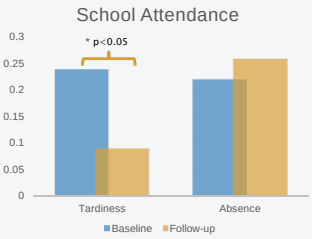
Actigraph vs self-reported data

	Weekday (N=75)	Weekend (N=59)
Total In Bed	0.39**	0.43**
Bedtime	0.48**	0.37**
Wakeup time	0.32**	0.42**
Sleep diary and questionnaire (N=590)		
Total time in bed	0.74**	0.40*
Bedtime	0.74**	0.58**
Wakeup time	0.75**	0.46**

Note: Different total number in actiwatch data due to the missing data

** p<0.001 * p<0.05

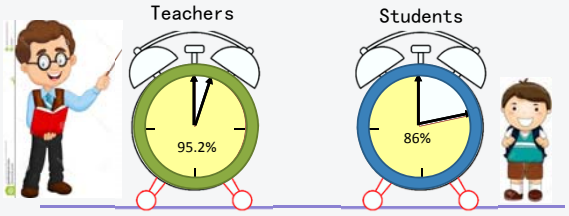
Correlations between prospective sleep data and actiwatch were moderate to high (all P<0.05)



Mean days of tardiness was significantly lower in the follow up when compared with baseline data

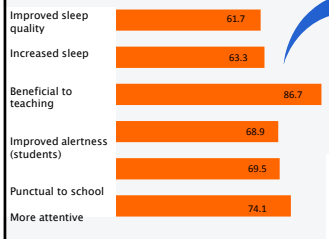
Manuscript submitted 2015

Do you support the delay school start time?



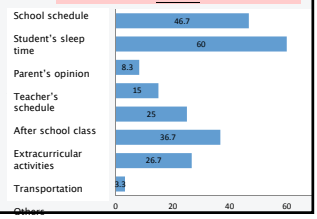
Majority of teachers and students appreciated the later school start time

Teacher feedback



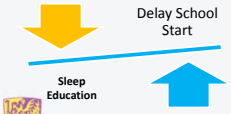
Majority of the teachers agreed that delayed school start time had positive effect to teaching and student performance

Factors that need to consider in changing school schedule



Summary

- Only *a 15 minutes delay* can already result in positive outcomes
- Students improved sleep, mood and behavior after delay school start time
- Most of the teachers and students welcomed the new school schedule



It seems that for adolescents, delay school start time is the most powerful , feasible and cost effective intervention

Contents lists available at ScienceDirect

Sleep Medicine Reviews 2015

journal homepage: www.elsevier.com/locate/smrv

CLINICAL REVIEW

Delayed school start times and adolescent sleep: A systematic review of the experimental evidence

Karl E. Minges*, Nancy S. Redeker

Yale University, USA

Conclusion

These findings suggest that delayed school start times can increase sleep duration in adolescence with corresponding effects on markers of improved health and classroom engagement and behavior.

American Academy of Pediatrics

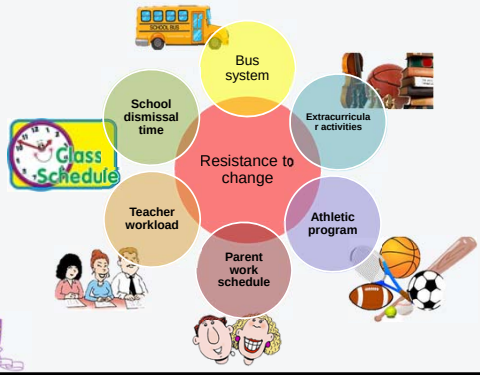
POLICY STATEMENT

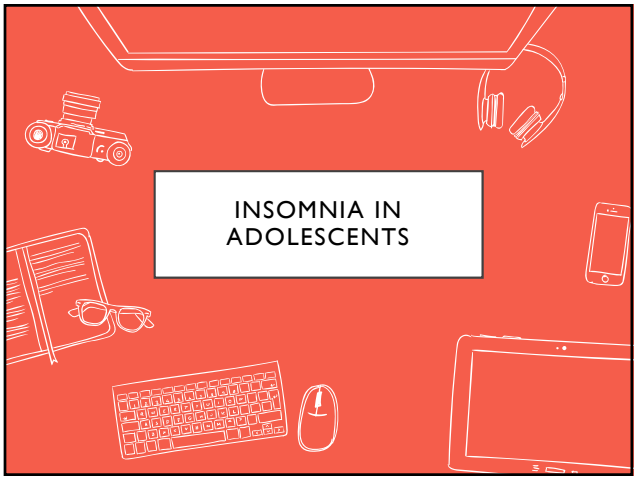
School Start Times for Adolescents

Policy statement 2014

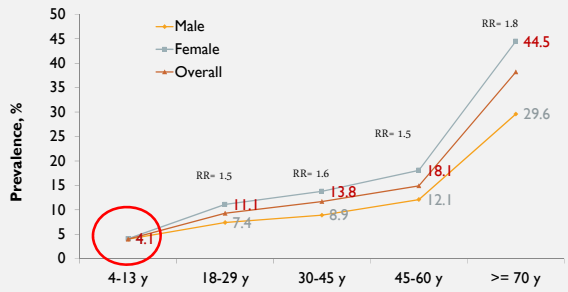
Aim for 8-10 hr of sleep
Middle and high school should not start earlier than

Why reluctant to CHANGE?





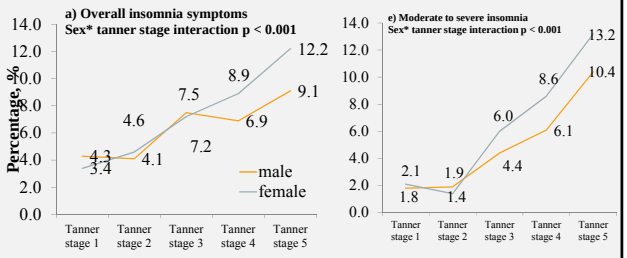
Age-specific sex differences in prevalence of insomnia in Hong Kong Chinese



Chiu et al 1999
Li & Wing et al 2002
Zhang et al 2009

Puberty seems to be a crucial phase for development of insomnia. But when is the exact time?

PUBERTY AND SEX DIFFERENCES IN OVERALL INSOMNIA SYMPTOMS



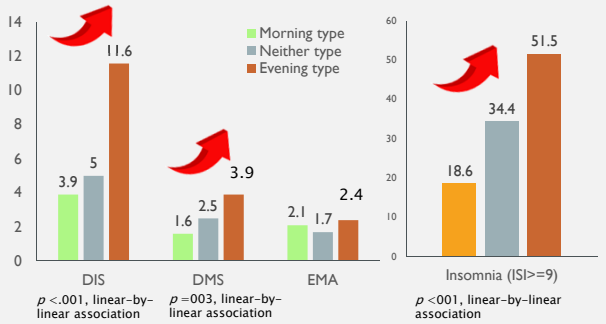
The prevalence of insomnia had near 4 times increase for females but only 2 times increase for males

Moderate to severe insomnia was defined as a ISI total score > 14

Insomnia was defined as difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS), and/or early morning awakening (EMA) ≥ 3 times/week in the past month

Zhang et al., Sleep 2016

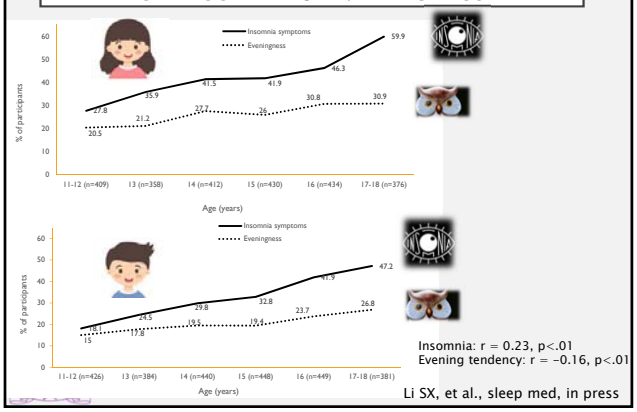
INSOMNIA & EVENINGNESS



Evening type is associated with insomnia, particularly DIS & DMS.

Li SX, et al., sleep med, in press

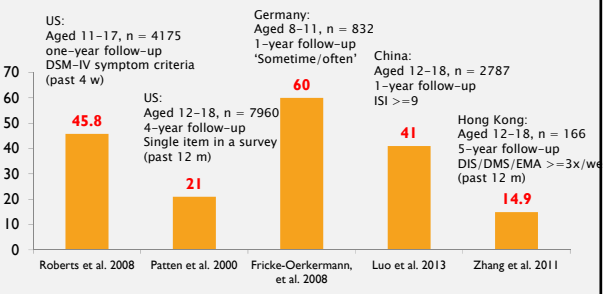
AGE-RELATED CHANGES IN THE PREVALENCE OF INSOMNIA & EVENINGNESS



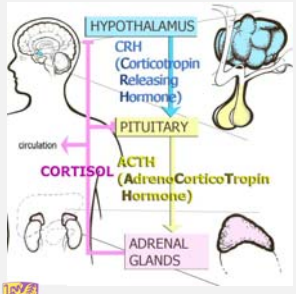
Insomnia: r = 0.23, p<.01
Evening tendency: r = −0.16, p<.01

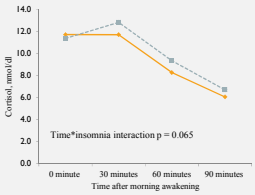
Li SX, et al., sleep med, in press

PERSISTENCE RATE OF INSOMNIA IN CHILDREN & ADOLESCENTS



MECHANISMS UNDERLYING INSOMNIA DYSFUNCTION OF HPA AXIS

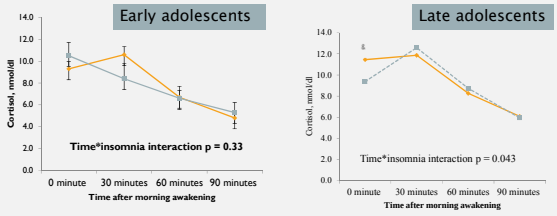




HK Family insomnia study:
Adults with insomnia had higher CARi than non-insomnia cases

Zhang et al, JCEM 2014

ASSOCIATION OF INSOMNIA WITH HPA AXIS FUNCTION IN ADOLESCENTS



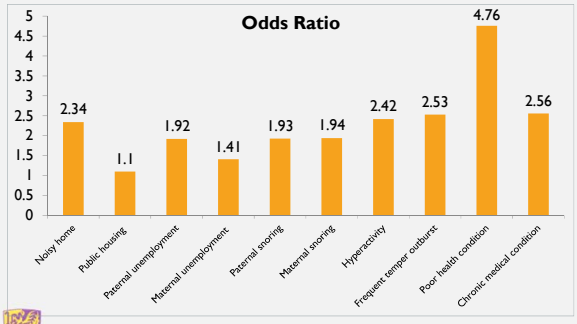
- Insomnia cases had higher CARi than non-insomnia cases in late adolescents only
- Puberty played a role in this association;
- Implications for hyperarousal concept in insomnia

Zhang et al, JCEM 2014

Major Factors Contributing to Insomnia in Children & Adolescents

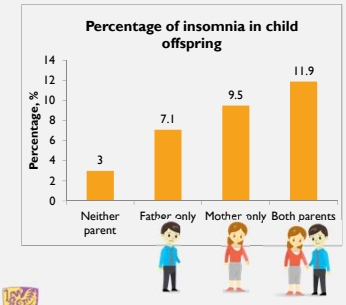
Reid et al. Child Adolesc Psychiatric Clin N AM, 2009

RISK FACTOR FOR INSOMNIA IN HK CHILDREN



Zhang et al. Sleep Med, 2009

ROBUST FAMILIAL AGGREGATIN OF INSOMNIA



- Local study of >5000 families
- Findings:
  - Strong familial aggregation of insomnia
  - Dosing effect
  - Maternal > paternal influence

Zhang & Wing et al. 2009

Circadian rhythms dysregulation in the unaffected adolescent offspring of *parents with bipolar I disorder*

We aim to

1) investigate the variances in circadian rhythms at several levels between unaffected adolescent offspring of patients with BD-I and that of healthy parents.
2) determine whether these circadian indicators correlate with psychopathological symptoms as measured by the psychometric measurements.

Early identification → **Early intervention**

INSOMNIA IN ADOLESCENTS

Common & persistent, but is often overlooked and under-treated with a constellation of *negative outcomes in adolescents*:

- *Somatic health problems*
- *Psychological problems*
- *Interpersonal difficulties*
- *Self-harm*
- *Suicidality*

Brandy, et al., 2008; Liu, 2004; Hysing et al., 2015; Roberts et al., 2002, 2008; Zhang et al. 2011

Sleep intervention 3

Cognitive Behavioral Therapy for Insomnia

Use of Pharmacotherapy for Insomnia in Children & Adolescents

- Little data/controlled trials about the safety & efficacy
- No medication specifically approved for use as hypnotics in children under age 18 by the US Food and Drug Administration (FDA)
- Leaving children & adolescents to take off-label sleep medication dosed for adults

Non-pharmacological approach

Evidence For CBT-I in Adolescents

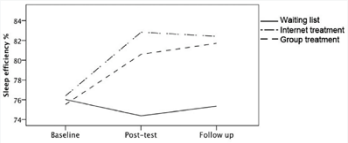
Small but promising, with a diversity of choices and formats:

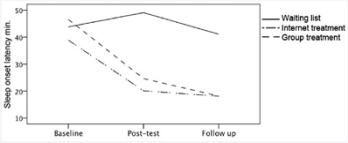
- Combining CBTI with:
  - Mindfulness (Bootzin & Stevens, 2005)
  - Bright light (Gradisar et al., 2011)
- With an emphasis on motivational interviewing (Cassoff et al., 2013)
- Internet-based or in a group (de Bruin et al., 2014)
- Classroom setting (Cassoff, et al., 2013)
- Involving parents in the treatment (Schlarb et al., 2010)

RANDOMIZED CONTROLLED TRIAL OF CBT FOR INSOMNIA IN ADOLESCENTS

Efficacy of Cognitive Behavioral Therapy for Insomnia in Adolescents: A Randomized Controlled Trial with Internet Therapy, Group Therapy and A Waiting List Condition

- CBT-I of 6 weekly sessions: Group therapy (GT) vs. Guided internet therapy (IT)
- Adolescents in **both GT & IT**, compared to waiting list, **improved significantly** on sleep efficiency, SOL, WASO, and total sleep time at post-test.
- **Effect size – medium to large**
- Improvements were **maintained at follow-up**



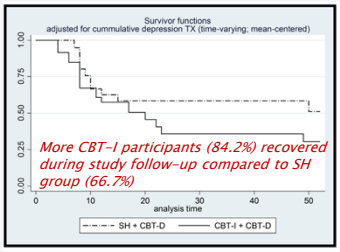


De Bruin, et al. *Sleep* 2015

Cognitive-behavioral treatment of insomnia and depression in adolescents: A pilot randomized trial

Clarke, et al. *Behaviour Research and Therapy* 2015

- Age 10-20 years (N=41)
- 10 weekly group sessions of CBT-D + CBT-I vs. CBT-D + sleep hygiene control
- 26 weeks of follow-up
- **Trends with medium-large effects favouring CBT-I group** on several but not all sleep & depression outcomes
- **Total sleep time improved by 99 min** from baseline to week 12 in the CBT-I group, but not in the SH arm



Survival curves by condition for recovery from baseline to depression diagnosis

Effects of group cognitive behavioural therapy on comorbid *insomnia and depression in youth*: a randomised, assessor blind, parallel group trial

Objective: to examine the efficacy of CBT-I vs. CBT-D for comorbid insomnia and depression in youth

Improve sleep and mood in adolecents

SUMMARY

- Sleep Problem is a WORLDWIDE Problem with multiple adverse consequences.
- Cultural factor is an important influence in sleep duration
  - The problem is more prominent in Asian culture
- There is a claim of decline in sleep duration in the past decade
- Effective sleep education/intervention is timely needed to
  - Recognize the importance of sleep
  - Establish health sleep culture
  - Improve sleep habits

NATIONAL HEALTHY SLEEP AWARENESS PROJECT

SLEEP DEPRIVATION:
IT IS NOT JUST YOUNG STUDENTS PROBLEM, BUT ALSO FAMILY, SCHOOL AND A CULTURAL ISSUE!

It also becomes a GLOBAL issue!
ACTION is needed!

Contact us

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