

Nodding Off

Sleep in Children & Young People: Challenges & Solutions

Alice M. Gregory
RHUL, University of London



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Summary



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Why consider sleep?

Why consider sleep in youth?

Why should educators care about sleep in youth?

Why consider sleep in relation to youth mental health?

Interventions

Final thoughts



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We sleep a lot



Age	Sleep recommendations
0-3 months	-
4-12 months	12 to 16 hours
1-2 years	11 to 14 hours
3-5 years	10 to 13 hours
6-12 years	9 to 12 hours
13-18 years	8 to 10 hours
18-25 years*	7 to 9 hours
26-64 years*	7 to 9 hours
65+ years*	7 to 8 hours

Paruthi et al (2016). American Academy of Sleep Medicine. J Clin Sleep Med, 12, 785+

**Hirshokowitz et al (2015). National Sleep Foundation. Sleep Health, 1, 40+*

It's important



Some theories...	
Restorative theory	Sleep allows brain and body growth/repair
Information/ memory processing	New brain circuits laid down when sensory input is minimal; unnecessary connections pruned
Emotional recalibration	REM helps us recalibrate emotional functions

It's important



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'If sleep doesn't serve an absolutely vital function, then it is the greatest mistake the evolutionary process ever made'

- Allan Rechtschaffen

It can go wrong



Category	Brief Description
Insomnia	Persistent sleep difficulty
Sleep Related Breathing Disorder	Abnormal respiration during sleep
Central Disorders of Hypersomnolence	Excessive sleepiness
Circadian Rhythm Sleep-Wake Disorders	Misalignment of sleep-wake propensity and environment
Parasomnias	Physical events/ experiences related to sleep
Sleep Related Movement Disorder	Movements that prevent/ disrupt sleep

Six main categories of sleep disorders (See ICSD-3 , AASM, 2014)

NB// In this presentation, different definitions of sleep difficulties are considered reflecting the wider literature

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Early in development we need more sleep



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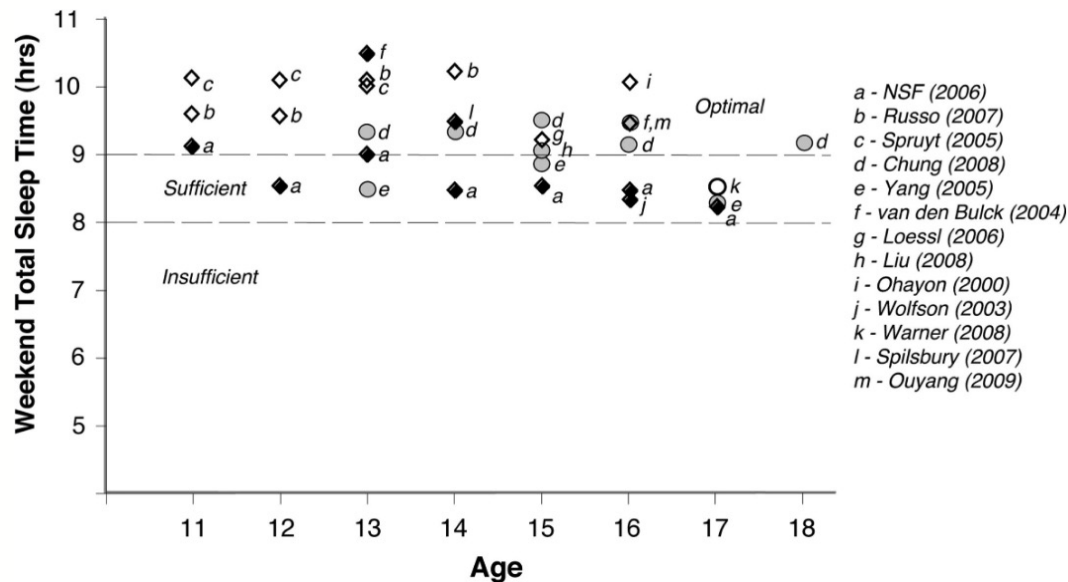
Paruthi et al (2016). American Academy of Sleep Medicine. J Clin Sleep Med, 12, 785+

**Hirshokowitz et al (2015). National Sleep Foundation. Sleep Health, 1, 40+*

But, young people can miss out on sleep...



Gradisar and colleagues (2011) looked at worldwide sleep patterns and problems during adolescence (review and meta-analysis)



Weekends

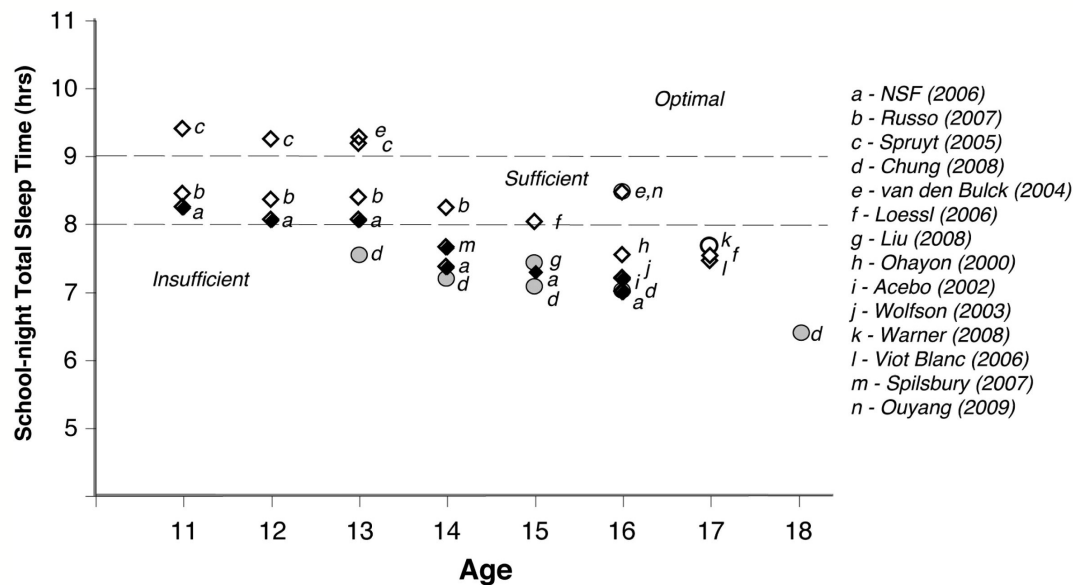
North American =
black diamond;
European = white
diamond; Asian =
grey circle;
Australasian =
white circle

Young people can miss out on sleep...



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Gradisar and colleagues (2011) looked at worldwide sleep patterns and problems during adolescence



School Nights

North American =
black diamond;
European = white
diamond; Asian =
grey circle;
Australasian =
white circle

Sleep quality matters too



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There have been recommendations about indicators of 'good sleep quality'.
These focus on sleep continuity, sleep architecture and napping.
These recommendations come from a panel of sleep experts reviewing the literature and discussion.

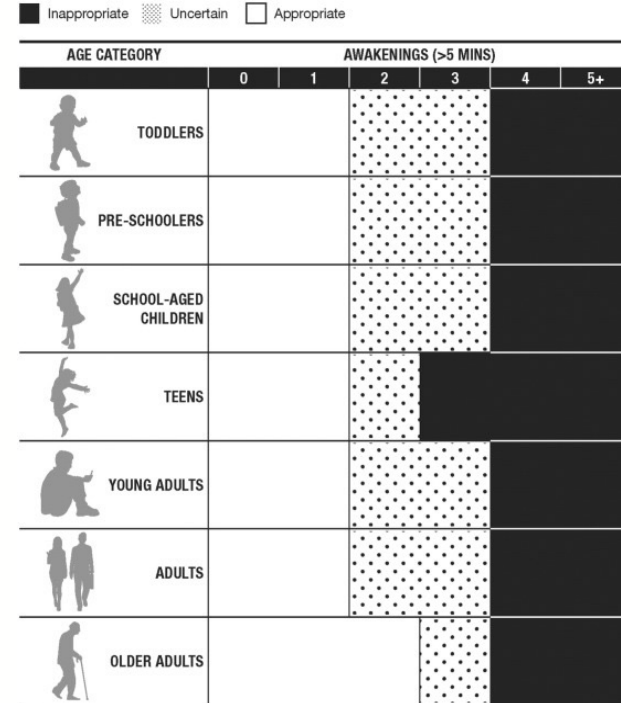
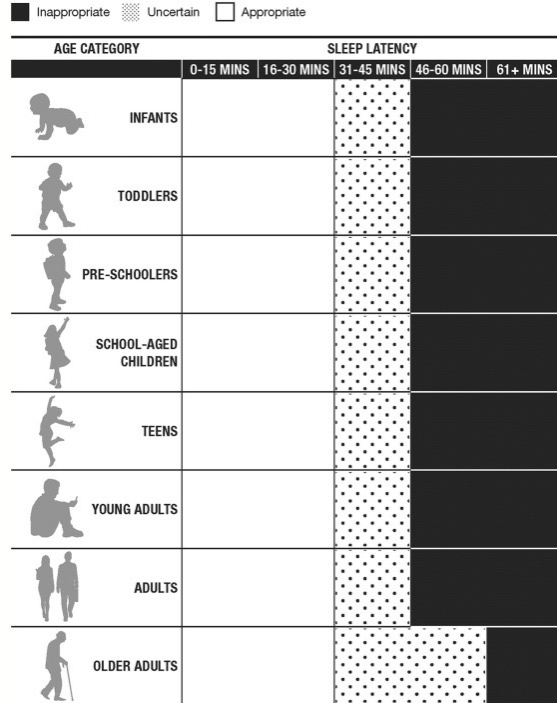


NATIONAL SLEEP
FOUNDATION

Sleep quality matters too



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Poor sleep quality is common in young people



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Gradisar and colleagues (2011) looked at worldwide sleep patterns and problems during adolescence

Sleep problems

"Daytime sleepiness is a reasonably significant and prevalent problem in adolescents"

"7-36% of adolescents report difficulty initiating sleep, and 20-26% of adolescents report sleep onset latency greater than 30 mins."

"The prevalence of delayed sleep phase disorder is...7-16% and more common in young adults and adolescents"

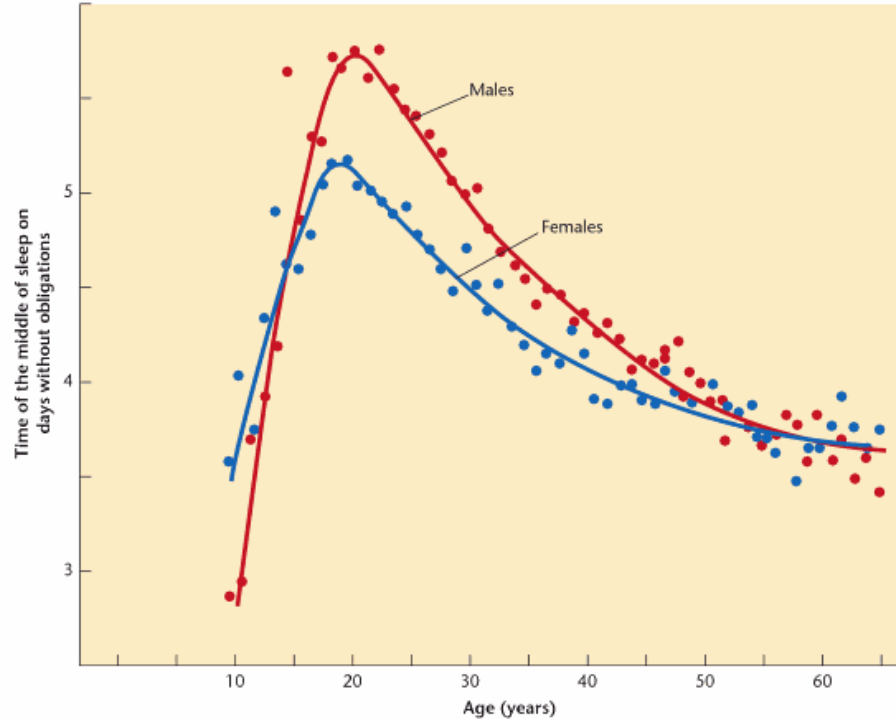


Sleep timing changes across the lifespan

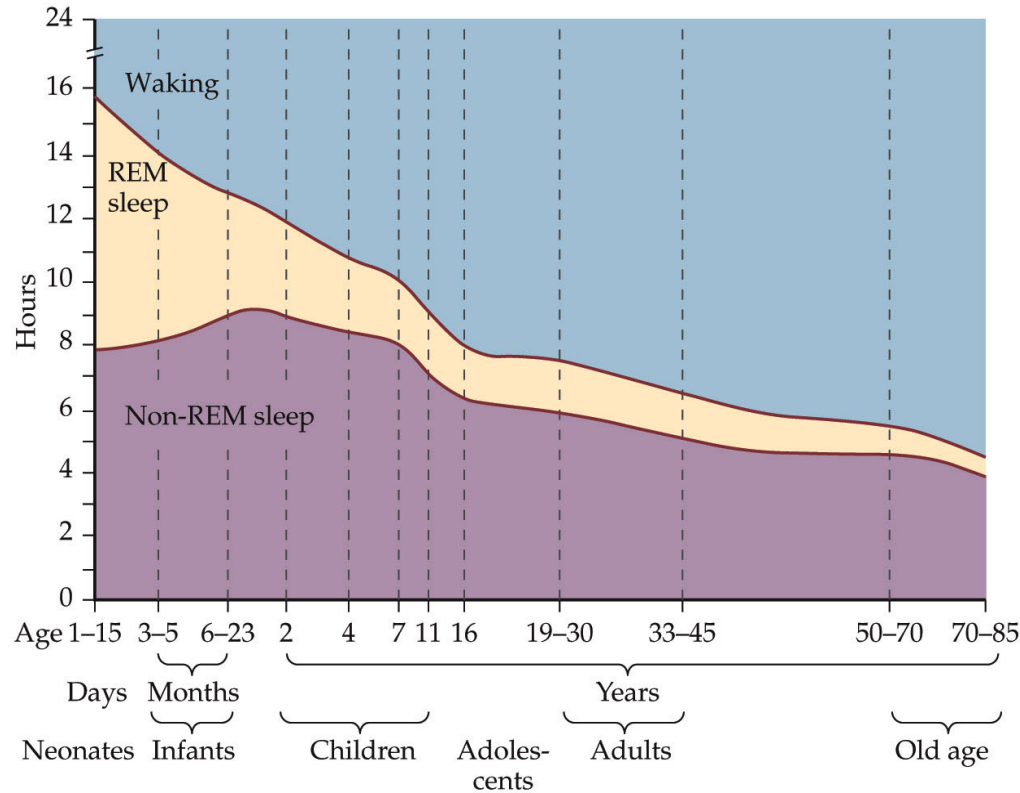


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Teenagers are not simply choosing to stay up late - their biological clocks are shifted later



Sleep Architecture Changes Across the Lifespan



Biological Psychology 5e, Figure 14.18

Why do we see sleep challenges in youth?

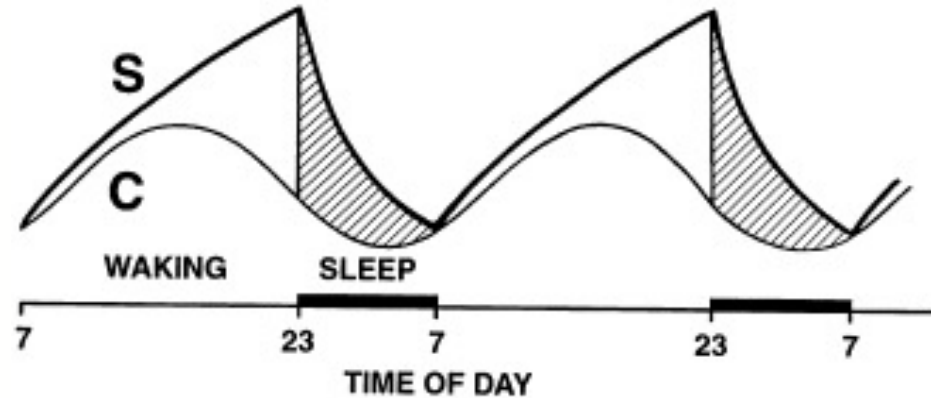


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Two drives for sleep

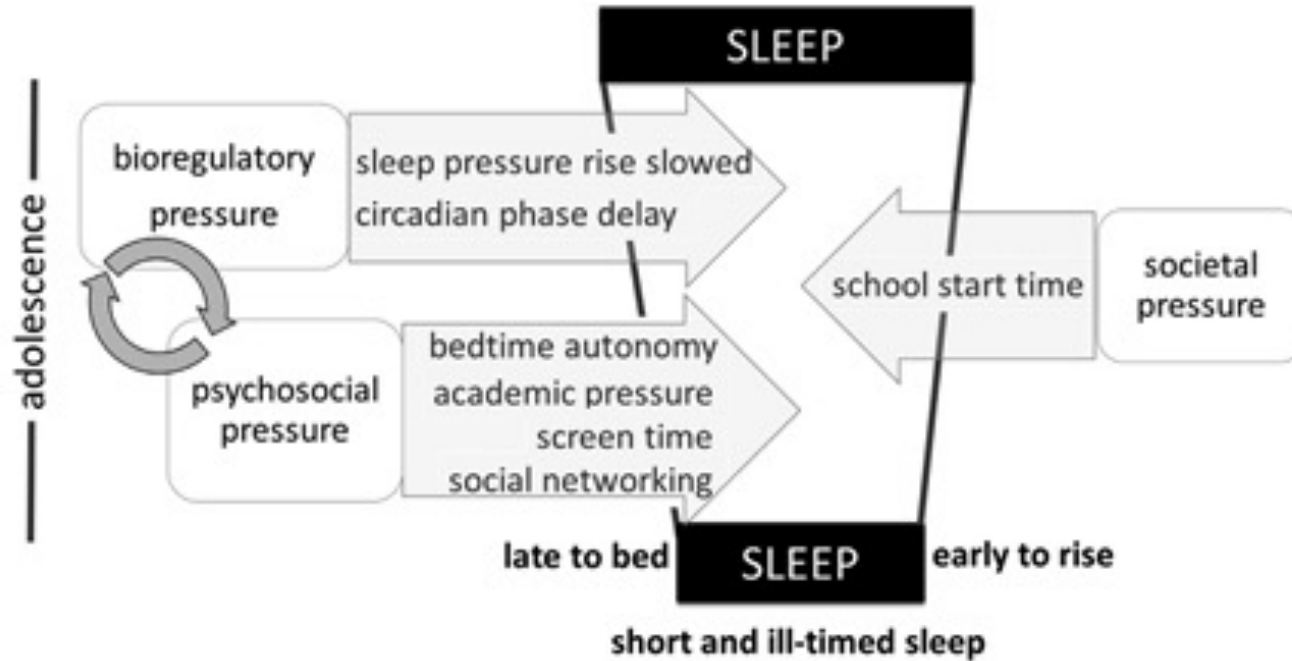
Homeostatic (process 'S')

Circadian (C)



Homeostatic influence results from accumulation of “some substance (S)” during prolonged wakefulness

Why do we see sleep challenges in youth?



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Those who miss out on sleep, miss out on school



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Study	Population based, in Norway
N	8347
Age	16-19 years
Measures	Self-report, various sleep variables (e.g. sleep duration, sleepiness etc); attendance (absence in days/ hours)



Hysing et al., (2015). Scandinavian J Public Health, 43, 2-9.

Those who miss out on sleep, miss out on school



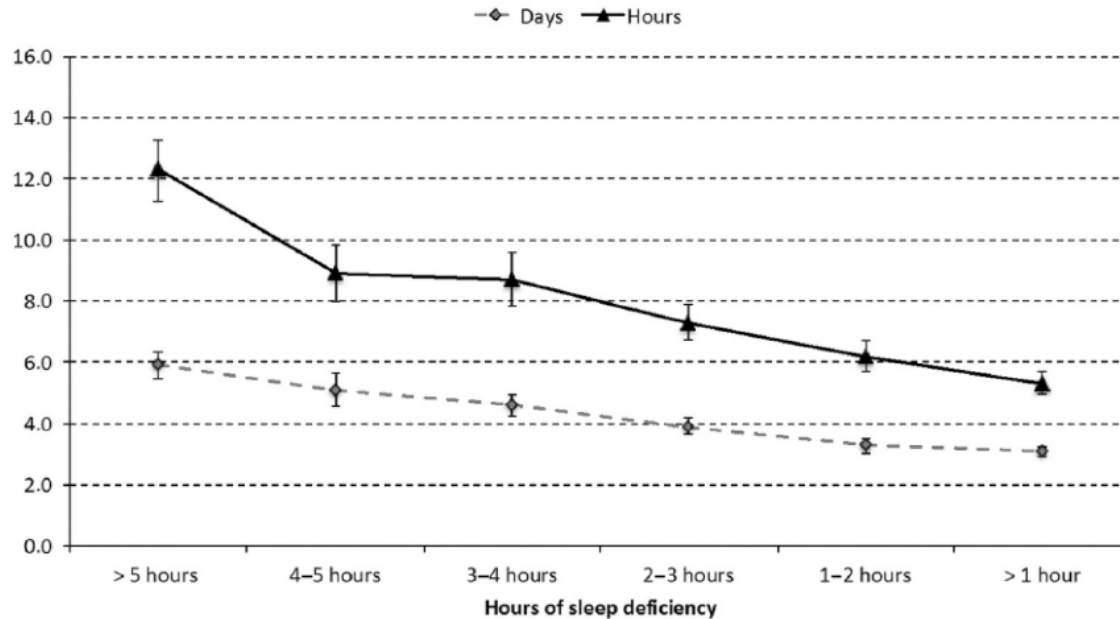
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Hysing et al., (2015). Scandinavian J Public Health, 43, 2-9.

Those who miss out on sleep, miss out on school



Register-based school absence last 6 months



Sleep deficiency: defined as difference between a participant's perceived sleep requirement and the actual amount of sleep they report.

How is sleep linked to grades?



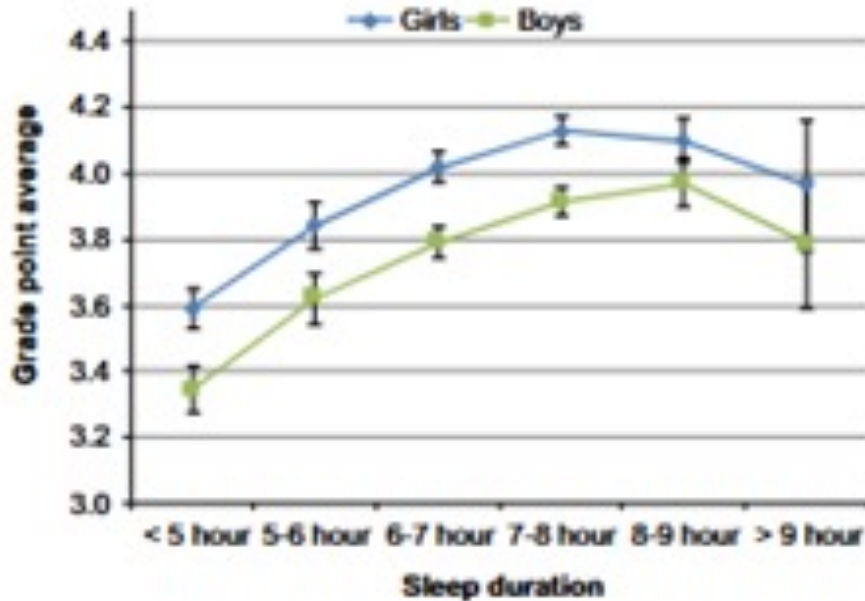
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Those who miss out on sleep get poorer grades



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Norwegian adolescents (N = 7798)
Ages 16-19 years
Sleep self report + object school
outcomes

Same pattern for sleep quality, bedtime, regularity...

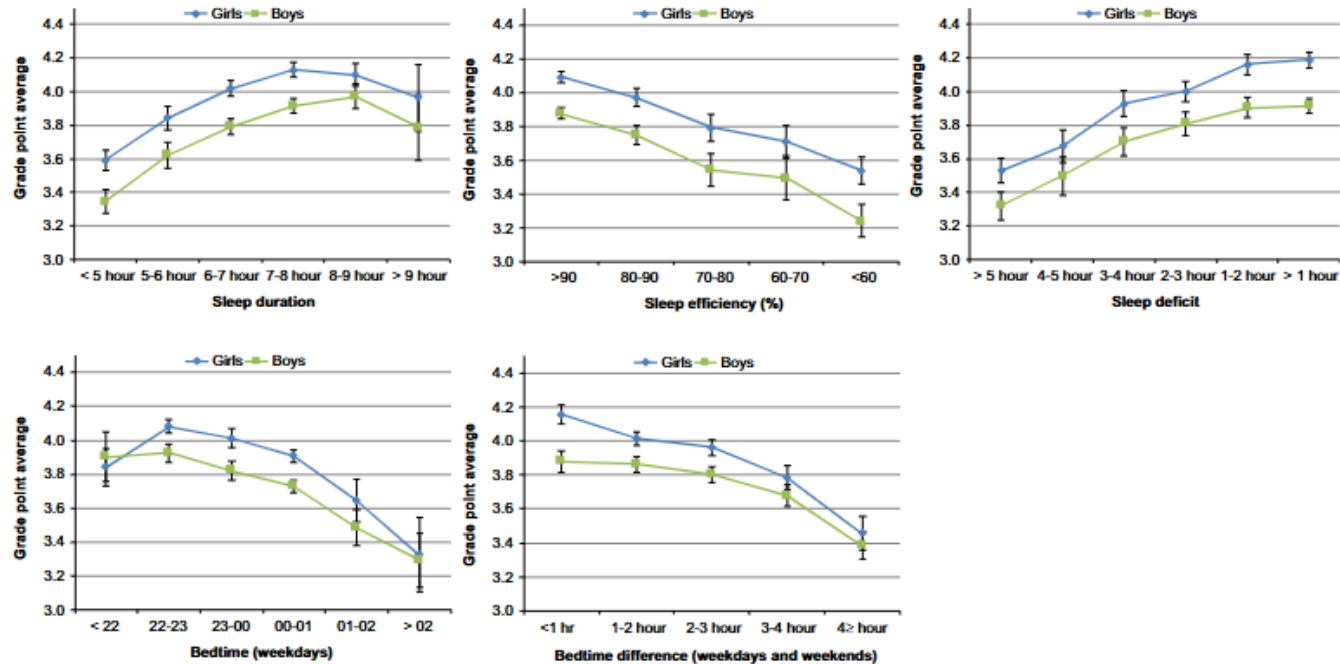


Figure 1. Estimated marginal means (EMM) of grade point average for boys and girls, by sleep characteristics. EMM are adjusted for age, parental education and perceived family affluence. Errors bars represent 95% confidence intervals.

Why might sleep help learning?



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Learning/ memorising is 'metabolically expensive'

Sleep provides a low interference period for the brain

During sleep, memories are strengthened and reorganised.

This helps us remember what we learned.

There's a lot we still don't know...



Sleep and bullying



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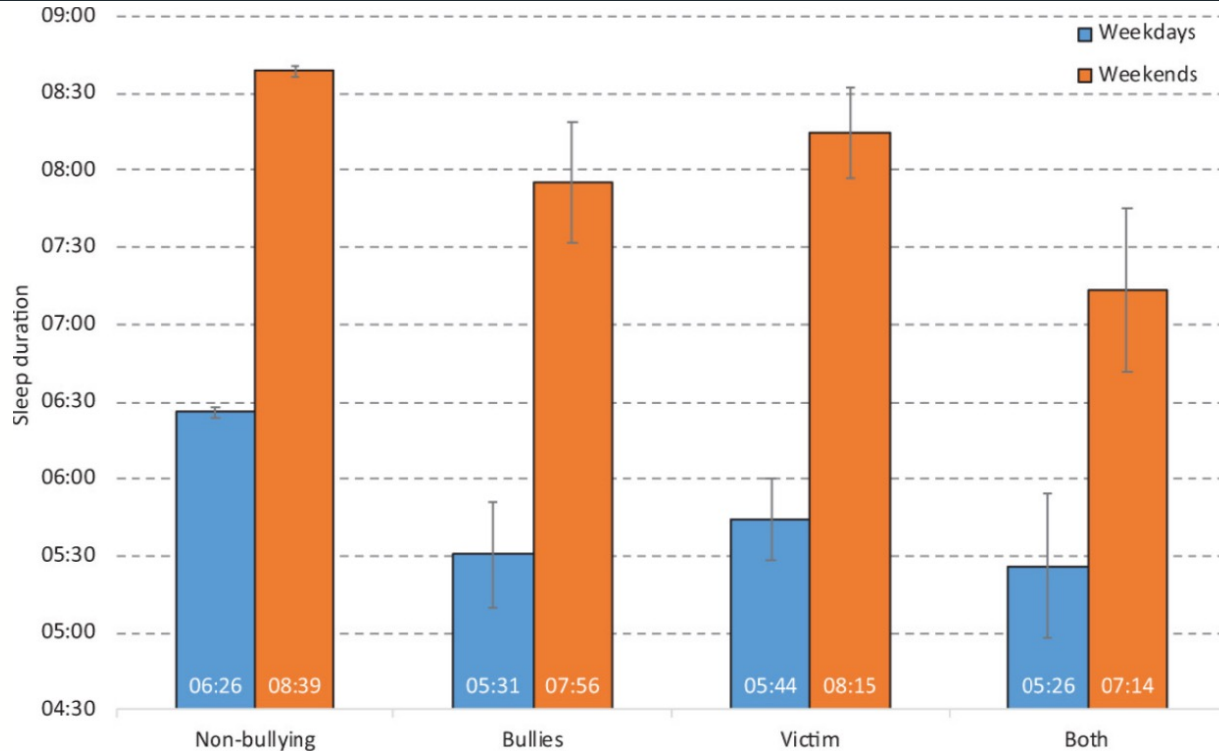


Hysing et al. (2021). J Interpersonal Violence, 36 (17-18), NP8992-NP9014.; See also lecture on education and bullying

Bullies and bully victims get less sleep



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All bullying groups reported:

- Shorter sleep
- More insomnia

Norwegian adolescents (N = 10,220)
Ages 16-19 years
Sleep self report + bullying

Hysing et al. (2021). J Interpersonal Violence, 36 (17-18), NP8992-NP9014.

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Mental health problems are common



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- Data from adolescent supplement of the National Comorbidity Survey Replication
- Over 10,000 participants
- Aged 13-19 years
- Asked face-to-face about lifetime prevalence of psychiatric disorders

Mental health problems are common



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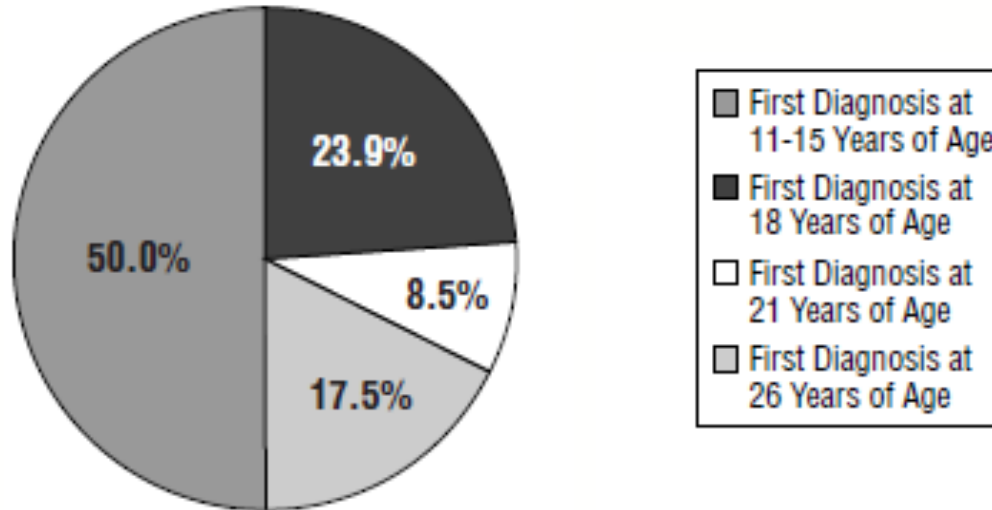
“...Approximately one in every four to five youth in the U.S. meets criteria for mental disorder with severe impairment across their lifetime...”

Mental health problems appear early



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Age at first diagnosis of any disorder among persons meeting criteria for 17 DSM-IV mental disorders at 26 years of age



Kim-Cohen et al., (2003).
Archives of General Psychiatry, 60, 709+

Sleep and mental health go hand in hand



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THE JOURNAL OF CHILD
PSYCHOLOGY AND PSYCHIATRY

ACAMH THE ASSOCIATION FOR
CHILD AND ADOLESCENT
MENTAL HEALTH

Journal of Child Psychology and Psychiatry 57:3 (2016), pp 296–317

doi:10.1111/jcpp.12469

Annual Research Review: Sleep problems in childhood psychiatric disorders – a review of the latest science

Alice M. Gregory,¹ and Avi Sadeh²

¹Department of Psychology, Goldsmiths, University of London, New Cross, London, UK; ²School of Psychological Sciences, Tel Aviv University, Ramat Aviv, Tel Aviv, Israel

Background: Hippocrates flagged the value of sleep for good health. Nonetheless, historically, researchers with an interest in developmental psychopathology have largely ignored a possible role for atypical sleep. Recently, however, there has been a surge of interest in this area, perhaps reflecting increased evidence that disturbed or insufficient sleep can result in poor functioning in numerous domains. This review outlines what is known about sleep in the psychiatric diagnoses most relevant to children and for which associations with sleep are beginning to be understood. While based on a comprehensive survey of the literature, the focus of the current review is on the latest science (largely from 2010). There is a description of both concurrent and longitudinal links as well as possible mechanisms underlying associations. Preliminary treatment research is also considered which suggests that treating sleep difficulties may result in improvements in behavioural areas beyond sleep quality. **Findings:** To maximise progress in this field, there now needs to be: (a) greater attention to the assessment of sleep in children; (b) sleep research on a wider range of psychiatric disorders; (c) a greater focus on and examination of mechanisms underlying associations; (d) a clearer consideration of developmental questions and (e) large-scale well-designed treatment studies. **Conclusions:** While sleep problems may sometimes be missed by parents and healthcare providers; hence constituting a hidden risk for other psychopathologies – knowing about these difficulties creates unique opportunities. The current excitement in this field from experts in diverse areas including developmental psychology, clinical psychology, genetics and neuropsychology should make these opportunities a reality. **Keywords:** Sleep; psychopathology; child; adolescent; review.

See Also: Morales-Muñoz & Gregory, *Sleep Med Clin*, 2023

Sleep and mental health hand in hand



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Journal of Child Psychology and Psychiatry

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MENTAL HEALTH

doi:10.1111/jcpp.12469

Almost all mental
health conditions
are associated with
atypical sleep
patterns/ problems

Background: Hippocratic interest in developmental sleep, there has been a surge in interest in sleep and mental health. Sleep can result in poor psychiatric diagnoses. While based on a century of research (largely from 2010), the underlying associations and difficulties may remain unclear. In this field, there is a need for a wider range of perspectives. **Conclusions:** Constituting a review of the field, this paper highlights other psychopathologies – knowing the opportunities for excitement in this field from experts in diverse areas. **Keywords:** Sleep; clinical psychology; child; adolescent; review.

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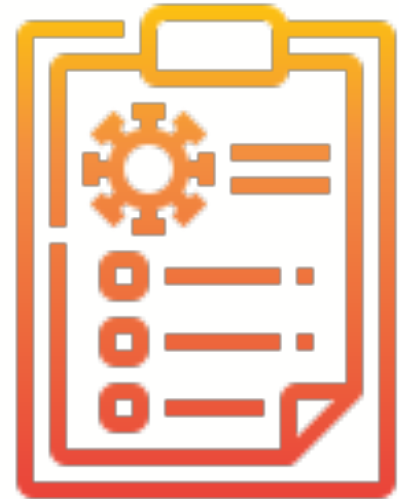
See Also: Morales-Muñoz & Gregory, Sleep Med Clin, 2023

Sleep and mental health go hand in hand



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- Sleep problems appear in the diagnostic criteria for both anxiety and depression!
- Among depressed adolescents
 - 92% reported sleep disturbance
 - 84% reported depressed mood





Do sleep
problems
constitute a red
flag for the
development of
later disorders?

Longitudinal



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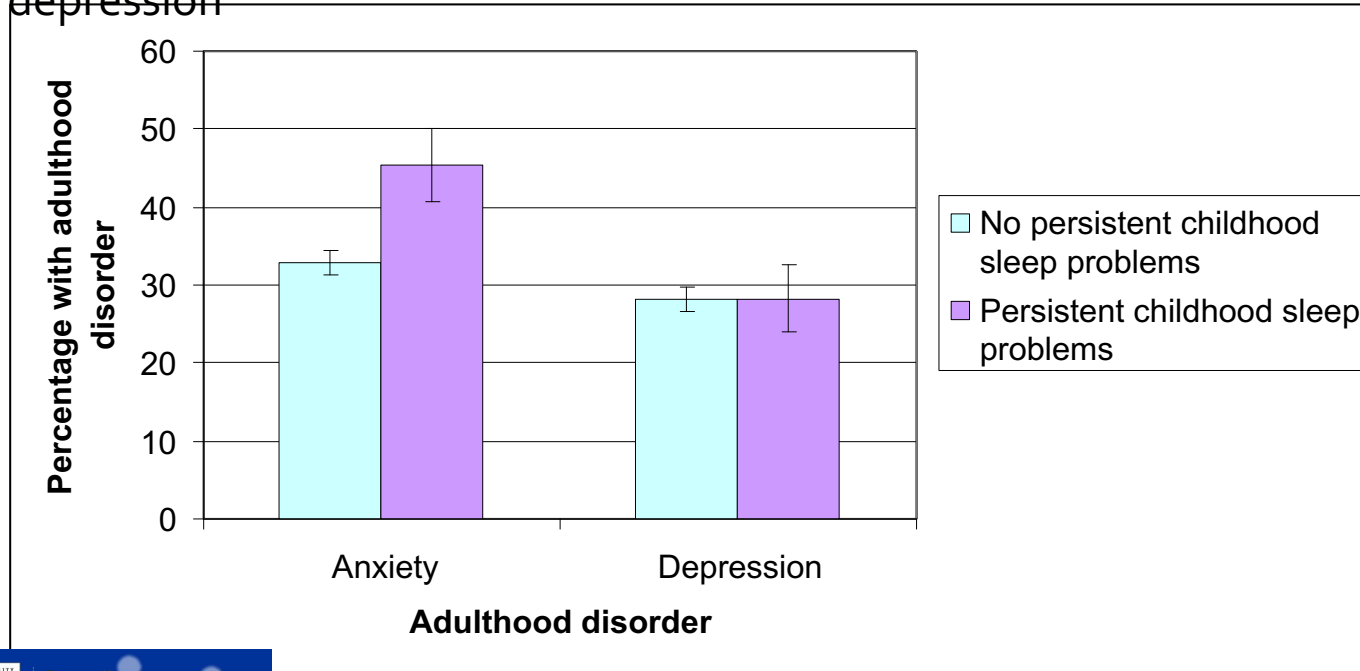
Study	Dunedin Multidisciplinary Study of Health and Development
N	1037 (912 provided relevant information in childhood and adulthood)
Age	Longitudinal (5, 7, 9 years; 21, 26 years)
Measures	Sleep problems (signs of sleep problems at 9 years and at one other assessment as assessed by questionnaire items)
	Anxiety & Depression (Diagnostic Interview Schedule)

Gregory et al., (2005) J Ab Child Psychol

Longitudinal



- Childhood sleep problems predict adult anxiety BUT not adult depression



Longitudinal: Summary



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Sleep difficulties predict later anxiety and depression

Sleep difficulties may also predict other things (e.g. psychosis; alcohol abuse)

Less evidence for converse direction of effects

Sleep difficulties include insomnia (but other variables such as 'short sleep' appear to be predictive of mental health difficulties)

More longitudinal studies are needed

Why is sleep linked to mental health?



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Why is sleep linked to mental health?



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Why is sleep linked to mental health?



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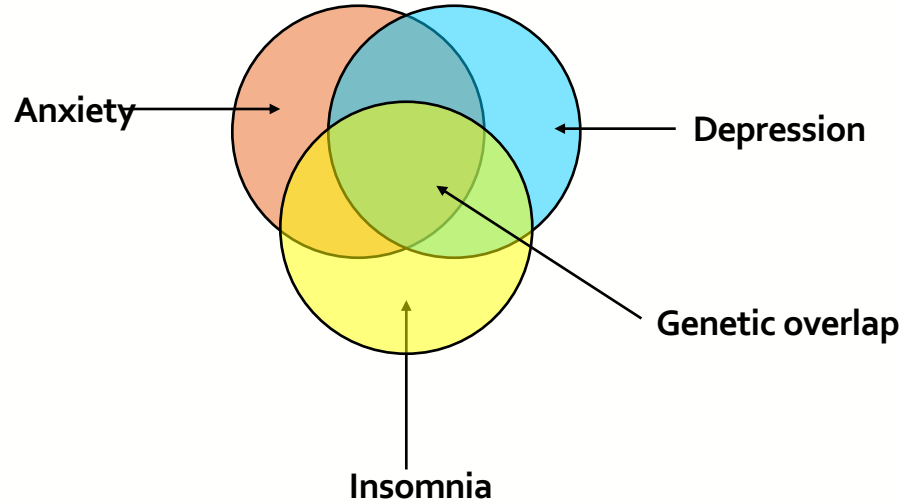


Genetic overlap



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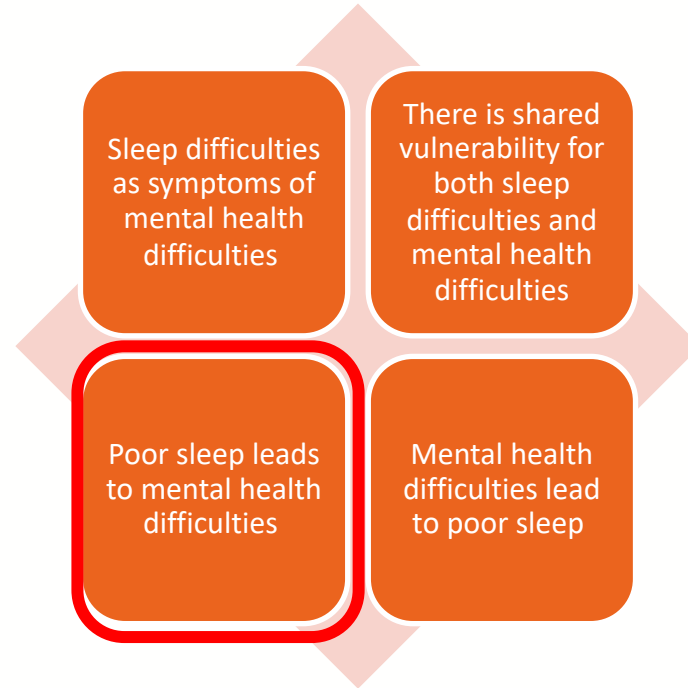
Co-occurrence of disorders: **Sleep problems** are part of the same cluster as anxiety and depression



Explanations for these links include....



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Poor sleep leads to mental health difficulties



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Multiple pathways!

Examples....

Brain response

Inflammation

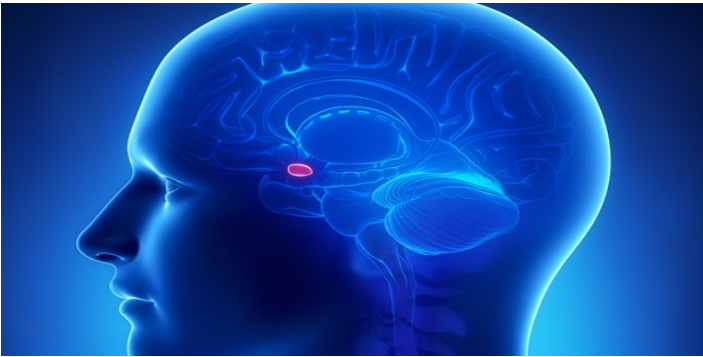
Microbiome



Brain Response



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**The human
emotional brain
without sleep
— a prefrontal
amygdala
disconnect**

Seung-Schik Yoo¹, Ninad Gujar²,
Peter Hu², Ferenc A. Jolesz¹ and
Matthew P. Walker^{2,*}

Sleep deprivation (35 hours)



↑ amygdala response to emotional
stimuli



↓ functional connectivity between the
medial prefrontal cortex and the
amygdala

Inflammation



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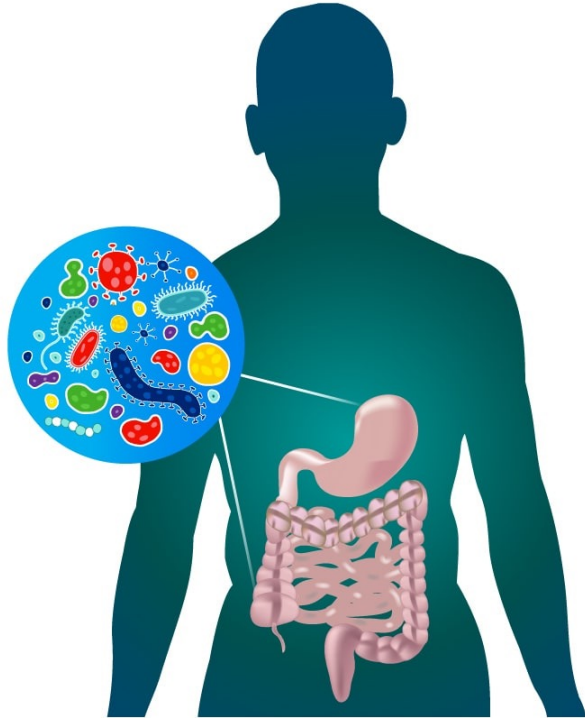
- Insufficient/ poor quality sleep is associated with systemic inflammation
- Inflammation has been linked to mental health difficulties
- Longitudinal study found that persistent shorter sleep across childhood is linked to higher depression in adolescence/ early adulthood
- Inflammation may be one of several biological mechanisms that can help to explain this association



What is the human microbiome?



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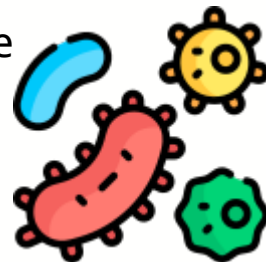


- All the microbiota residing in/ on humans
- Human microbiome includes microorganisms on skin, organs, bodily fluids etc
- Includes bacteria, viruses, fungi etc
- One research focus is the GUT
- Learning about role in health/ mental health

Poor sleep could change the gut microbiome which could impact mental health

Dietary interventions could impact both sleep and mental health

- E.g. 6 week RCT of kefir vs placebo drink
- Mixed results (e.g. no impact on ADHD)
- Kefir had modest improvements on one actigraphy measure
(fewer minutes awake during down period)



Associations are likely to be complex and bidirectional

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Individual/ Family Interventions



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- Excellent interventions can support sleep and associated difficulties.
- Best intervention depends on:
 - Specific sleep concern
 - Developmental stage
 - Comorbidity
 - Specific child/ family
 - A trained expert should advise



School Based Interventions



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Education

Health and Prevention Section of the Statutory Guidance which came into effect September, 2020

Supporting and Training Materials for schools to help train teachers on relationships, sex and health education.

Physical health and mental wellbeing section contains key knowledge on sleep.

<https://www.gov.uk/government/publications/teacher-training-health-and-prevention>



Department
for Education

School Based Interventions



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Generic slides available to teachers provide information about:

Importance of sleep:

- helps the brain consolidate information
- helps the body heal/ grown
- helps regulate emotions

Provide information about how much sleep is required

Explains how lack of sleep impacts health

Tips on how to obtain good quality sleep



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for Education

BUT, does education about sleep translate into behavioural change?

- Attitudes towards sleep that were more positive (but not greater sleep knowledge) predicted better sleep (Peach et al., 2018)
- Education alone does not always result in behavioural changes



Change to school start times

Delay in school start time can lead to:

- greater school attendance
- lower depression symptoms
- less daytime sleepiness
- more sleep
- reduction in teenage driving accidents
- financial benefits for economy

BUT, schools and families are sometimes not keen:

- misalignment with parents/ teachers schedules
- societal changes needed to support this change (school bus times; lighting etc)



Economic consequences



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Topics ▾

Research & Commentary

Experts

About

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Later school start times in the U.S.

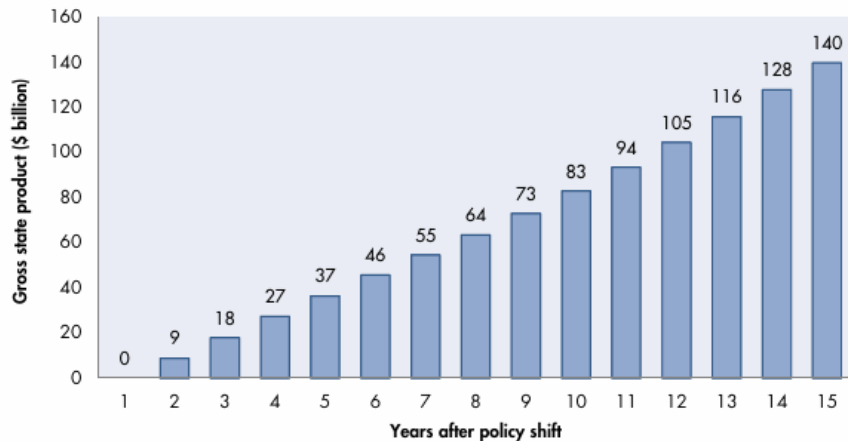
An economic analysis

[Marco Hafner](#), [Martin Stepanek](#), [Wendy M. Troxel](#)

RESEARCH — Published Aug 30, 2017

"...a state-wide universal move to at least 8:30 a.m. could contribute \$83 billion to the U.S. economy within a decade..."

Figure ES1: Predicted cumulative economic gains from delayed SST to 8:30 a.m.



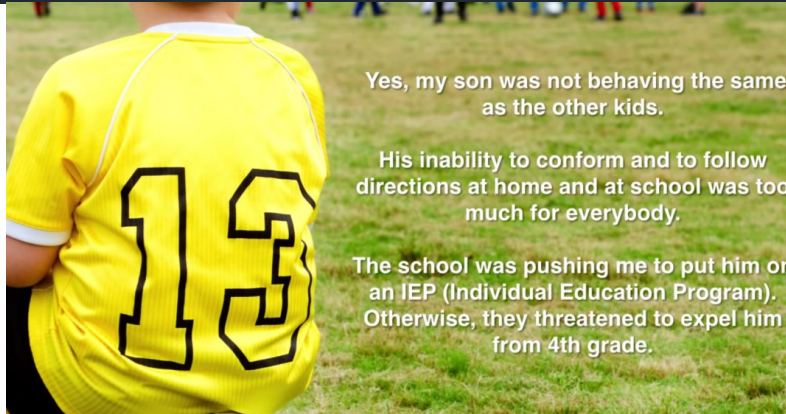
Source: Authors' calculations.

Notes: The figure plots the predicted discounted cumulative gains (2016 \$) of delayed SST to 8:30 a.m. in gross state product (GSP) terms, aggregated across 47 U.S. states. GSP is a measurement of a state's economic output and is the state counterpart to gross domestic product (GDP) at country level.

Improve sleep, improve life?



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Yes, my son was not behaving the same as the other kids.

His inability to conform and to follow directions at home and at school was too much for everybody.

The school was pushing me to put him on an IEP (Individual Education Program). Otherwise, they threatened to expel him from 4th grade.

The only thing “wrong” with Connor was he struggled to breath while sleeping.

My son’s future looks bright. He has traded his D’s and F’s for 3 A’s and 1 B.

He’s not perfect and can make some poor choices at times.

He is still learning how to re-invent himself to get past being “that kid” at school.

Emailed by a mother from Chicago (17/01/2015)

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Final Thoughts



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- Sleep matters
- It's important in young people
- It's linked to their school lives – including their mental health
- There are complex mechanisms underlying associations
- And associations are often bidirectional
- There are useful interventions
- Resolving one problem (e.g. challenging sleep) can help to resolve another

Don't forget 'sleep privilege'



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The Journal of Child
Psychology and Psychiatry



The Association
For Child and Adolescent
Mental Health



Check for updates

Journal of Child Psychology and Psychiatry 66:8 (2025), pp 1101–1104

doi:10.1111/jcpp.70000

Editorial: Sleep privilege – research and clinical recommendations for when sleep cannot be optimal

Final Thoughts



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'If sleep doesn't serve an absolutely vital function, then it is the greatest mistake the evolutionary process ever made'

- Allan Rechtschaffen



The
evolutionary
process didn't
get it wrong!

'If S.
is the gre
made'

en it
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llan Rechtschaffen

Acknowledgements



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Amy Ferguson
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Katie Lewis
JuanJo Madrid-Valero
Terrie E. Moffitt
Isabel Morales-Munoz

Robert Plomin
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Kaili Rimfeld
Avi Sadeh
Fatos Selita
Danny Smith
Jakke Tamminen
Beatriz Venancio
Essi Viding
Kirsty Vant
Malcolm von Schantz
Dawn Watling
And so many more!!!

Images:

Flaticon

Disclosures



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Royalties popular science book: Nodding Off

Royalties Children's Book: The Sleepy Pebble

Royalties Gift Product: The Gift of Sleep

Previous Sleep Editor: JCPP

Consultant: Perrigo (previously)

Previous role: Co-director Sleep Universal

Advisor for a project initially sponsored by Johnson's Baby

Contributor: BBC Focus; Psyche Aeon; others (e.g. Guardian)

Occasional paid talks/ articles (e.g. Neurodiem)

Funding



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The Leverhulme Trust

E · S · R · C
ECONOMIC
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