

Digital CBT (dCBT) for insomnia: a scalable solution to a ubiquitous problem

Prof Colin A. Espie

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University of Glasgow



Big Health

www.bighealth.com



Prof Colin Espie
Co-founder & Chief Medical Officer



The stigma-free way to address mental health

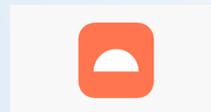
Sleepio engages with sleep, a topic relevant to everyone, and provides entertaining, scientifically proven help for sleep and mental health

A smartphone is shown vertically, displaying the Sleepio app interface. The screen shows a cartoon character in a red suit and glasses standing in a dark landscape with mountains and a moon. The background of the slide is dark blue with a starry night sky.

Sleepio

Digital therapeutic for sleep

Sleepio is a fully automated yet highly personalized digital sleep improvement program instantly accessible via app and web



The approachable new way to address worry and anxiety

Daylight overcomes stigma and access barriers and provides delightful, effective help for worry and anxiety

A smartphone is shown vertically, displaying the Daylight app interface. The screen shows a white silhouette of a person with a sad face, set against a pink background. The text 'Tense & Release' is visible at the top of the screen. The background of the slide is a solid orange color.

Digital therapeutic for worry and anxiety

Daylight is a fully automated yet highly personalized mobile app designed by experts in building emotional connection at scale, using proven behavioral techniques from scientific experts

Conflict of Interest Disclosures



The author wishes to disclose the following potential conflicts of interest related to content in this lecture:

Type of Potential Conflict	Details of Potential Conflict
Grant/Research Support	
Consultant	
Speakers' Bureaus	
Financial support	I am co-founder of and a shareholder in Big Health, the company that developed Sleepio
Other	

This talk presents material that is related to one or more of these potential conflicts, and the following objective references are provided as support for this lecture:

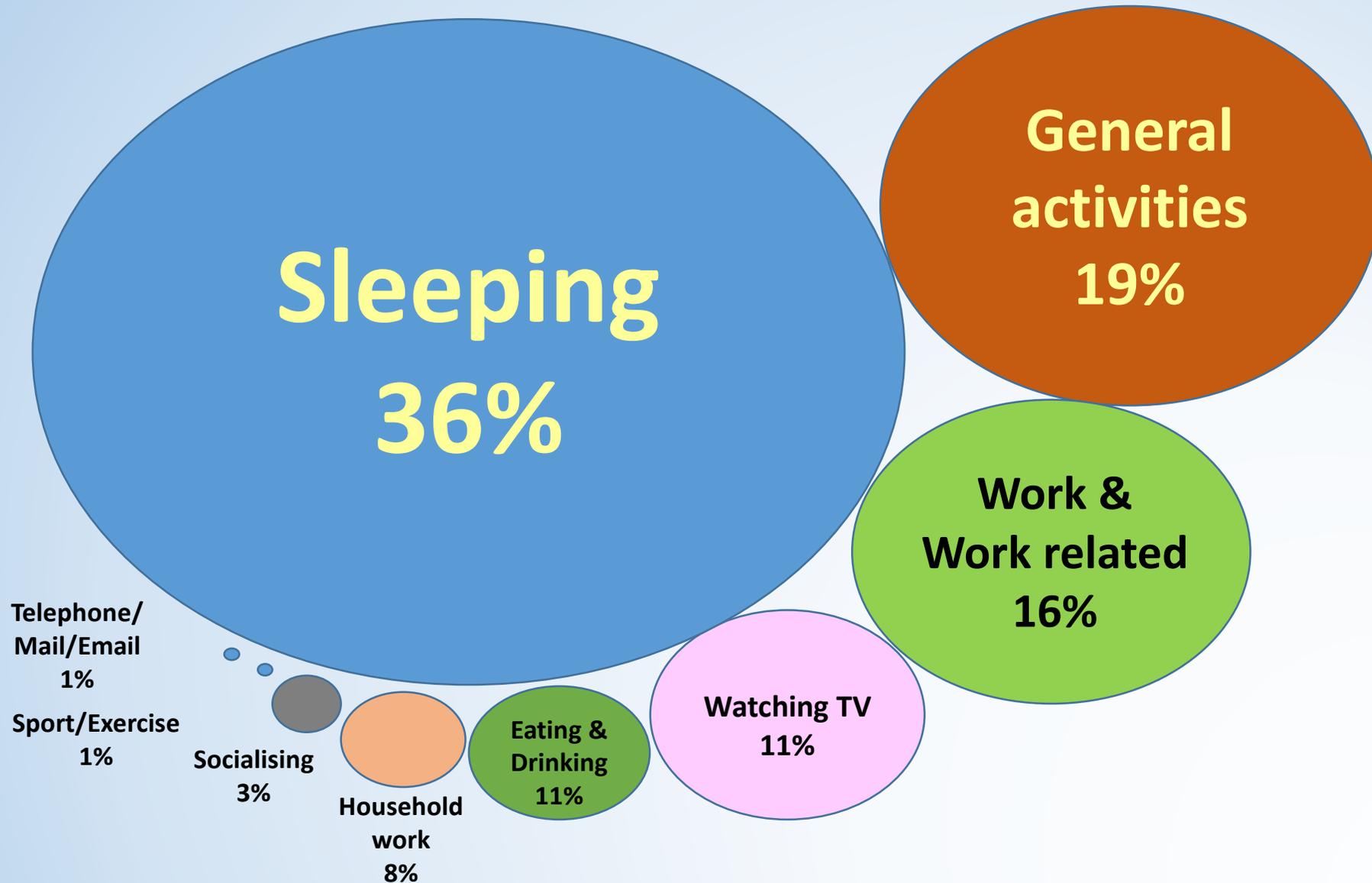
1. Riemann et al. *JOSR*, 2017

2. Qaseem et al. *Annals of Internal Medicine* 2016

3. Zachariae et al. *Sleep Medicine Reviews* 2016

- **I will refer to broader literature**
- **I will illustrate findings also from other 'products'**
- **I will focus on the potential of the methodology (dCBT) to treat insomnia at scale**

Lifetime Behaviour

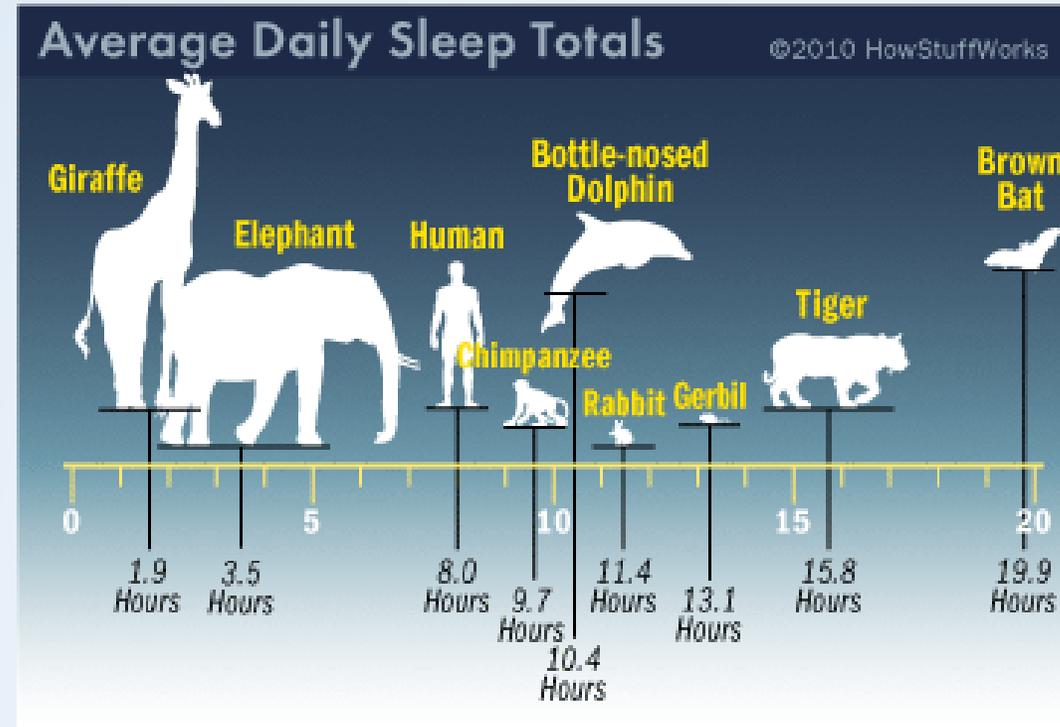




Cirelli & Tononi, 2000; Zie at al, 2013; Siegel, 2008; Imeri & Opp, 2009; Cappuccio et al, 2010; Kahn et al, 2013; Stickgold, 2005; Diekelmann et al, 2009

Sleep is essential: not a “nice to have”

- For all creatures
- Total amounts and timing of sleep vary by species
- Experimental animals die in 11-32 days if deprived of sleep



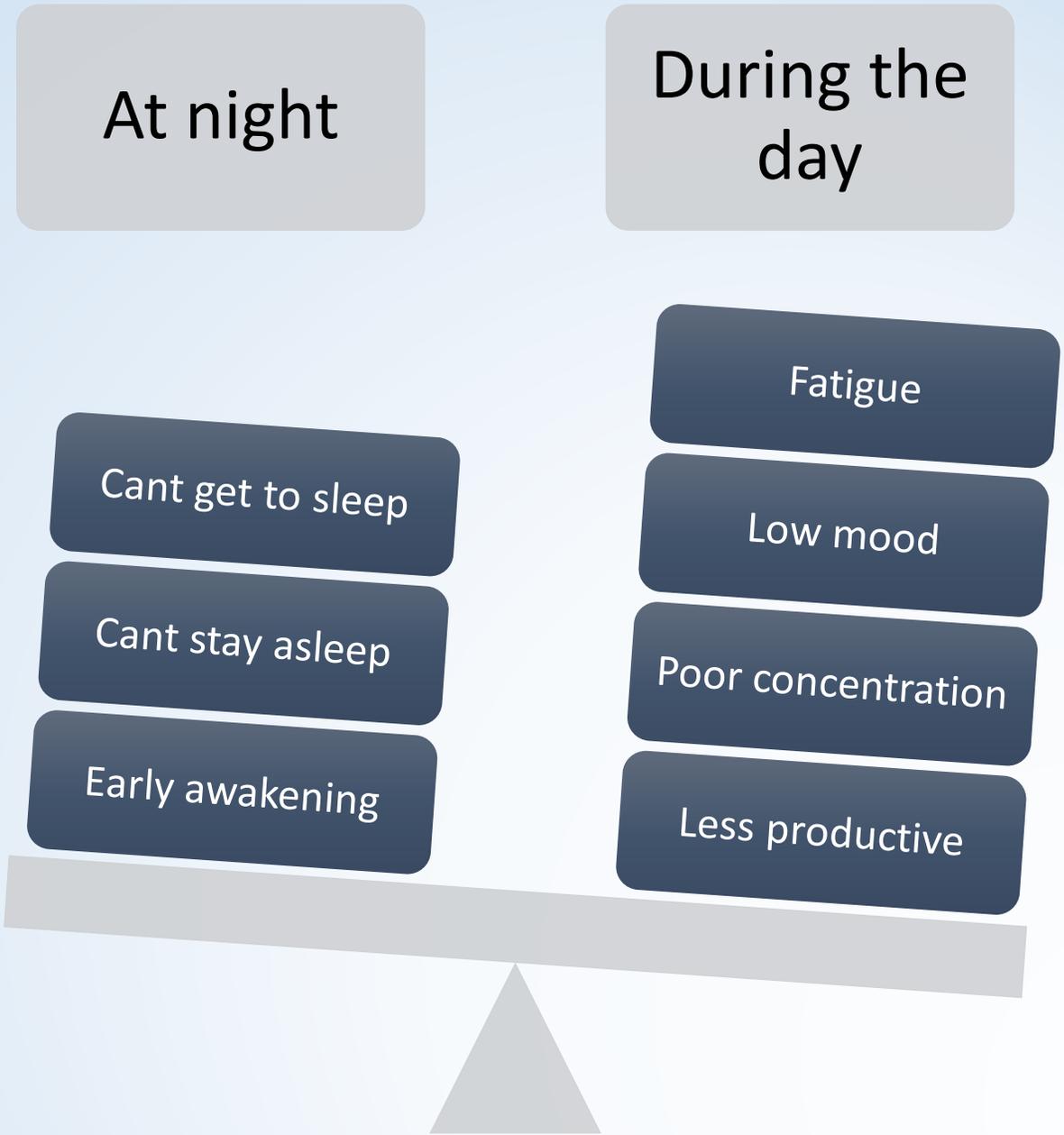
Sleep deprivation and circadian misalignment confer significant risk

Physical	Mental	Behavioural	Performance
Risk of cancer	Risk of depression	Risk of sleepiness	Impaired attention and concentration
Cardiovascular disease and stroke	Psychiatric relapse	Road traffic accidents	Decreased memory
Disorders of the HPA	Mood fluctuation	Falls and fractures	Reduced multi-tasking
Metabolic abnormalities	Delirium	Repeat prescribing	Impaired decision-making
Weight gain and obesity	Impulsivity	Alcohol and drug dependency	Reduced creativity
Reduced immunity	Anger and frustration	Increased sedative and stimulant use	Reduced communication
Bodily sensations of pain	Higher risk of suicide	Less likely to attend appointments	Reduced socialisation
Thermoregulatory problems	Anxiety and hyperarousal	Longer stay in hospital	Less likely to be employed
Vulnerable seizure threshold	Chronic fatigue	Earlier admission to long-term care	More likely to be on benefits

International Classification of Sleep Disorders (ICSD-3)

Sleep Related Breathing Disorders	Obstructive sleep apnoea (OSA), Central sleep apnoea, Sleep-related hypoventilation disorder, Sleep-related hypoxemia disorder
Sleep Related Movement Disorders	Restless legs syndrome, Periodic limb movement disorder, Sleep-related leg cramps, Sleep-related bruxism, Sleep-related rhythmic movement disorder
Central disorders of Hypersomnolence	Narcolepsy type I, Narcolepsy type II, Idiopathic hypersomnia, Kleine-Levin syndrome
Parasomnias	NREM-related parasomnias (Confusional arousals, Sleepwalking, Night terrors), REM-related parasomnias (REM sleep behavior disorder, Nightmare disorder)
Insomnias	Chronic insomnia disorder, Short-term insomnia disorder, Other insomnia disorder, Isolated insomnia symptoms
Circadian Rhythm Sleep-Wake Disorders	Delayed sleep-wake phase disorder, Advanced sleep-wake phase disorder, Irregular sleep-wake rhythm, Non-24-hour sleep-wake rhythm disorder, Shift work disorder, Jet lag disorder

30% of the population has insomnia symptoms



'Insomnia Disorder' affects 10-12% of the population on a chronic basis

Ohayon, 2002; Lichstein, 2004, Morphy et al, 20017

The Sleep Condition Indicator
Espie, C.A., et al.
BMJ Open 2014; JOSR, 2017

Appendix: The Sleep Condition Indicator

Item	Score DSM-5				
	4	3	2	1	0
Thinking about a typical night in the last month ...					
1) ... how long does it take you to fall asleep?	0 – 15 min	16 – 30 min	31 – 45 min	46 – 60 min	≥ 61 min
2) ... if you then wake up during the night ... how long are you awake for in total? (add all the awakenings up)	0 – 15 min	16 – 30 min	31 – 45 min	46 – 60 min	≥ 61 min
3) ... how many nights a week do you have a problem with your sleep?	0 - 1	2	3	4	5 - 7
4) ... how would you rate your sleep quality?	Very good	Good	Average	Poor	Very poor
Thinking about the past month, to what extent has poor sleep ...					
5) ... affected your mood, energy, or relationships?	Not at all	A little	Somewhat	Much	Very much
6) ... affected your concentration, productivity, or ability to stay awake	Not at all	A little	Somewhat	Much	Very much
7) ... troubled you in general	Not at all	A little	Somewhat	Much	Very much
Finally ...					
8) ... how long have you had a problem with your sleep?	I don't have a problem / < 1 mo	1 – 2 mo	3 – 6 mo	7 – 12 mo	> 1 yr

REVIEW OF SLEEP DISTURBANCES, ANXIETY AND DEPRESSION

<http://dx.doi.org/10.5665/sleep.2810>

A Systematic Review Assessing Bidirectionality between Sleep Disturbances, Anxiety, and Depression

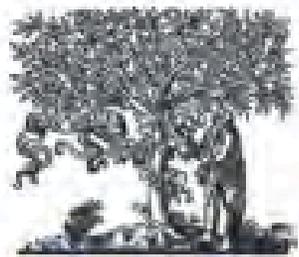
Pasquale K. Alvaro, B Psych (Honors)¹; Rachel M. Roberts, BA (Hons), MPsych (Clinical), PhD¹; Jodie K. Harris, BPsych (Hons), PhD (Clin Psych)^{2,3,4}

¹School of Psychology, University of Adelaide, South Australia; ²Flinders University of South Australia; ³Centre for Treatment of Anxiety and Depression (CTAD), Adelaide Health Service; ⁴University of Adelaide, South Australia

SLEEP 2013;36:1059-1068

Insomnia Disorder is a risk factor for depression

Journal of Affective Disorders 135 (2011) 10–19



ELSEVIER

Contents lists available at ScienceDirect

Journal of Affective Disorders

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



Review

Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies

Chiara Baglioni ^{a,*}, Gemma Battagliese ^b, Bernd Feige ^a, Kai Spiegelhalder ^a, Christoph Nissen ^a, Ulrich Voderholzer ^{a,c}, Caterina Lombardo ^b, Dieter Riemann ^a

Insomnia Disorder leads to a 2x risk for developing depression

Insomnia Disorder has been poorly managed in practice

THE LANCET

SEMINAR | [VOLUME 379, ISSUE 9821, P1129-1141, MARCH 24, 2012](#)

Chronic insomnia

[Dr Charles M Morin, PhD](#)   [Ruth Benca, MD](#) 

Published: January 20, 2012 • DOI: [https://doi.org/10.1016/S0140-6736\(12\)1129-1](https://doi.org/10.1016/S0140-6736(12)1129-1)

Journal of
Evaluation in Clinical Practice
International Journal of Public Health Policy and Health Services Research



General practitioners' preferences for managing insomnia and opportunities for reducing hypnotic prescribing

A. Niroshan Siriwardena MMedSci PhD FRCGP , Tanefa Apekey BSc MPhil, Michelle Tilling, Jane V. Dyas BSc MEd PhD PGDipHP, ... [See all authors](#) 

First published: 13 July 2010 | <https://doi.org/10.1111/j.1365-2753.2009.01186.x>
| Cited by: 20

Insomnia treatment guidelines



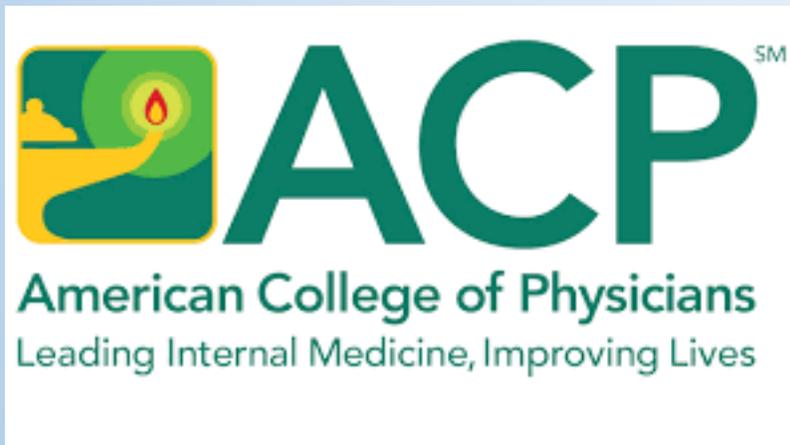
1999
2006



2005



2010
2019



2016



2017

Management of Chronic Insomnia Disorder in Adults: A Clinical Practice Guideline From the American College of Physicians

Amir Qaseem, MD, PhD, MHA; Devan Kansagara, MD, MCR; Mary Ann Forciea, MD; Molly Cooke, MD; and Thomas D. Denberg, MD, PhD, for the Clinical Guidelines Committee of the American College of Physicians*

Management of Chronic Insomnia Disorder in Adults: A Clinical Practice Guideline From the American College of Physicians

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Recommendation 1: *ACP recommends that all adult patients receive cognitive behavioral therapy for insomnia (CBT-I) as the initial treatment for chronic insomnia disorder. (Grade: strong recommendation, moderate-quality evidence)*

Management of Chronic Insomnia Disorder in Adults: A Clinical Practice Guideline From the American College of Physicians

Recommendation 1: *ACP recommends that all adult patients receive cognitive behavioral therapy for insomnia (CBT-I) as the initial treatment for chronic insomnia disorder. (Grade: strong recommendation, moderate-quality evidence)*

Recommendation 2: *ACP recommends that clinicians use a shared decision-making approach, including a discussion of the benefits, harms, and costs of short-term use of medications, to decide whether to add pharmacological therapy in adults with chronic insomnia disorder in whom cognitive behavioral therapy for insomnia (CBT-I) alone was unsuccessful. (Grade: weak recommendation, low-quality evidence)*

European Insomnia Guideline

2017



- ◆ CBT is recommended as **first-line treatment** for chronic insomnia in **adults of any age** (strong recommendation, high-quality evidence).
- ◆ A pharmacological intervention can be offered if CBT is not effective **or not available**

Why is CBT relevant to insomnia?

Relevance?

1. **Psychology confers little advantage to sleep quantity or quality**
2. **Sleep is not regulated through personal agency or personal choice**
3. **Psychology mostly confers disadvantage**

So why CBT?

1. **↓ arousal, worry, threat monitoring**
2. **↑ adaptive conditioning, sleep pressure and timing**
3. **Clears the way for a personal demonstration of sleep biology**

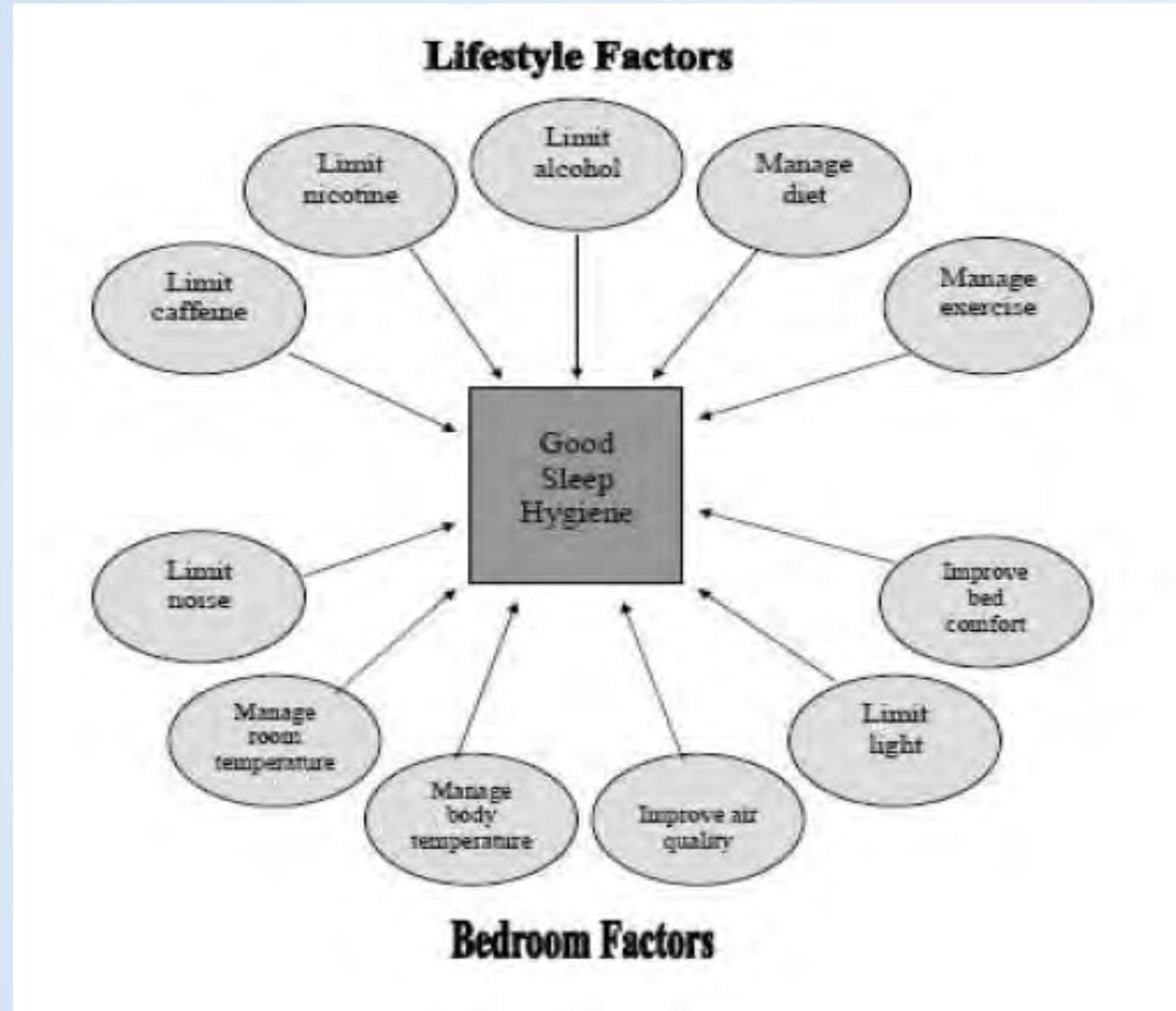
Why is CBT relevant to insomnia?



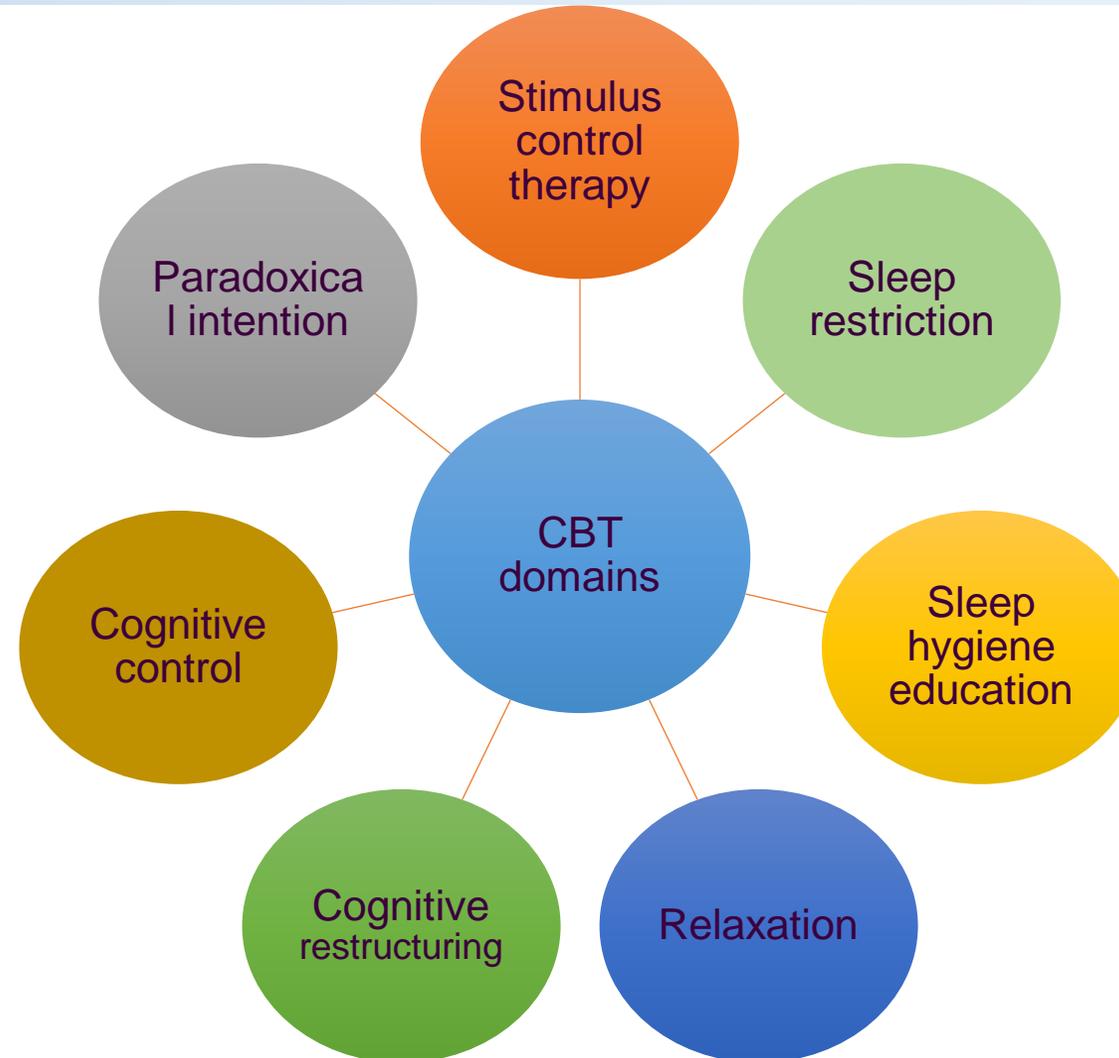
“Sleep (is like) a dove which has landed near one’s hand and stays there as long as one does not pay any attention to it; if one attempts to grab it, it quickly flies away”

[Viktor E. Frankl (1965, p. 253)]
Espie, 2002; Espie et al, 2006

CBT is not Sleep Hygiene



CBT for insomnia – a system of therapies



Based on Espie & Kyle (2012)

Chapter 12: Cognitive Behavioral and Psychological Therapies for Chronic Insomnia; Therapy in Sleep Medicine *ed. Barkoukis et al.*



Simon Kyle

MA (First Class Hons.), PhD

ASSOCIATE PROFESSOR

- Programme Director, The Oxford Online Programme in Sleep Medicine

I have specific research interests in the etiology and management of sleep disturbance and the interaction between sleep disturbance and mental health. I serve as Associate Editor of the journal, *Behavioral Sleep*

RECENT PUBLICATIONS

Biological and clinical insights from genetics of insomnia symptoms.

[Journal article](#)

Lane JM, et al. (2019), *Nat Genet*, 51, 387 - 393

Genome-wide association study identifies genetic loci for self-reported habitual sleep duration supported by accelerometer-derived estimates

[Journal article](#)

Dashfi H, et al. (2019), *Nature Communications*

CaHRU

Community and Health Research Unit



A pragmatic, multicentre, randomised controlled trial comparing nurse-delivered sleep restriction therapy for insomnia disorder to sleep hygiene in primary care (HABIT trial)

PROJECT TITLE	A PRAGMATIC, MULTICENTRE, RANDOMISED CONTROLLED TRIAL COMPARING NURSE-DELIVERED SLEEP RESTRICTION THERAPY FOR INSOMNIA DISORDER TO SLEEP HYGIENE IN PRIMARY CARE (HABIT TRIAL)
Funding body	NIHR Health Technology Assessment Programme
Total funding	£1823976

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ISRCTN registry

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Result 6 of 2135 results found for within Condition Category: Mental and Behavioural Disorders

[Previous Trial](#) [Back to results](#) [Next Trial](#)

ISRCTN42499563 <https://doi.org/10.1186/ISRCTN42499563>



Health professional Administered Brief Insomnia Therapy (HABIT) trial



Historically there has been only one 'scalable' solution for Insomnia Disorder



DRUGS

=

SCALABLE

+

AFFORDABLE

+

EVIDENCE-BASED

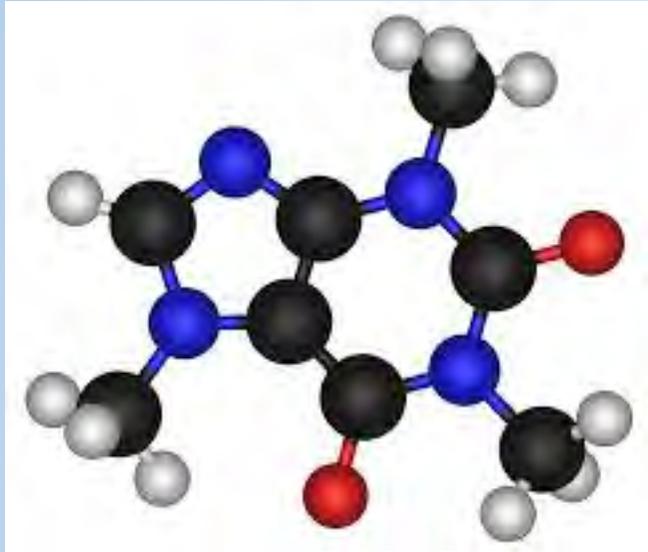
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STANDARDISED

Psychologists are not 'scalable' ...

... however, psychology is

The constructs, concepts and procedures associated with psychological theory and practice are not intrinsically limited to in-person communication



molecule

=

A blurred image of computer code on a screen. The code is in a light blue color on a dark blue background. The visible code includes:

```
a.length; c++) {  
& b.push(a[c]);  
function h() {  
#User_logged".a(), a =  
place(/+(?=)/g, ""), a  
b = [], c = 0; c < a.le  
(a[c], b) && b  
i = a.
```

algorithm

DIGITAL MEDICINE (dCBT)

=

SCALABLE

+

AFFORDABLE

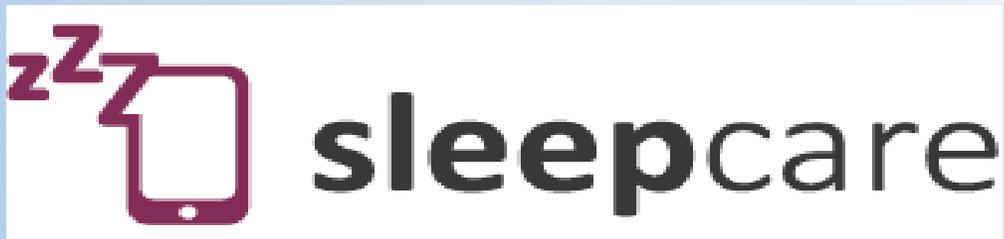
+

EVIDENCE-BASED

+

STANDARDISED

Examples of evidence-based digital CBT



Meta-analyses

Van Straten & Cuijpers. *Sleep Medicine Reviews* 2009

Cheng & Dizon. *Psychotherapy and Psychosomatics*, 2012

Seyffert et al. *PloS ONE* 2016

Zachariae et al. *Sleep Medicine Reviews* 2016

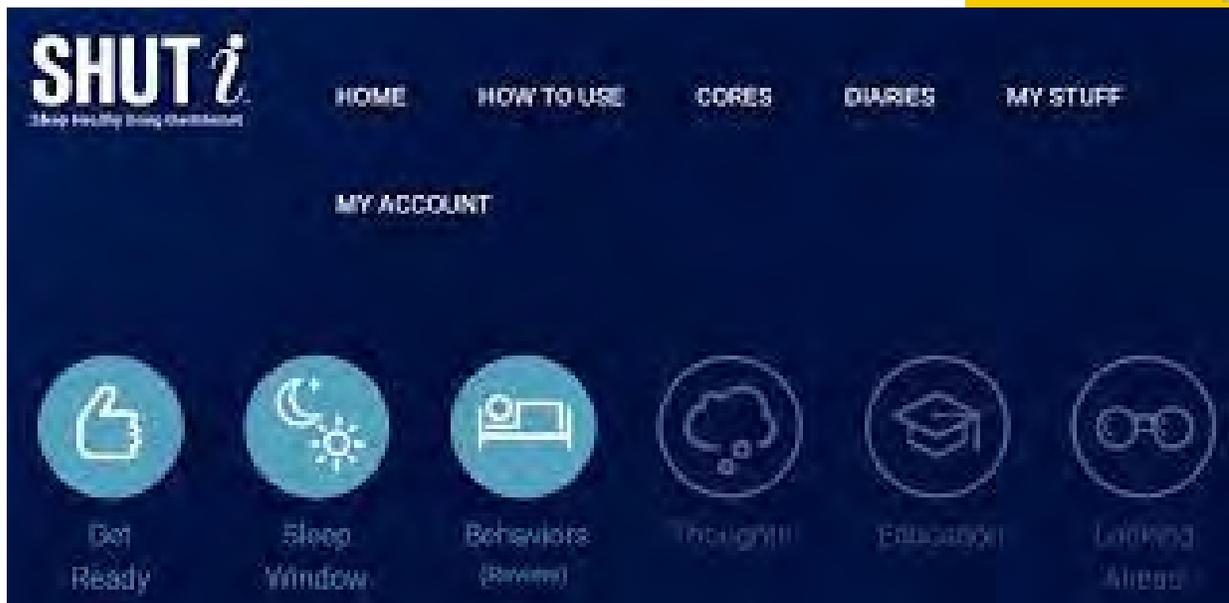
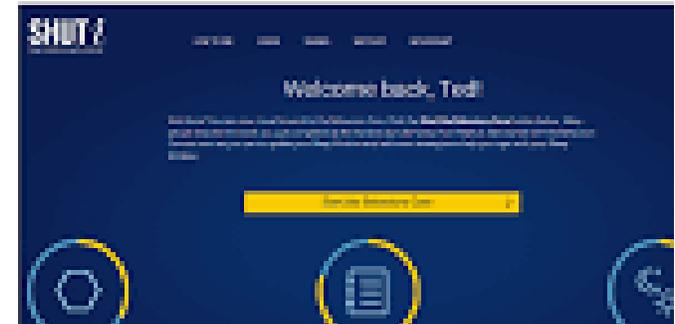
SHUT *i*

Sleep Healthy Using the Internet

6 Weeks.
6 Lessons.
A lifetime of healthy sleep.

SHUT is a CBT-I leader, with the most extensive research in online Cognitive Behavioral Therapy for insomnia.

Get started today at www.myshuti.com



How Sleepio works

You tell us about your sleep.

Our sleep questionnaire takes just 5 minutes but gives us everything we need to tailor the programme to you.



You visit The Prof, your virtual sleep expert.

The Prof is your guide through the 6-week programme, using what you need to do day or night.

The Prof teaches you proven sleep improvement techniques.

You learn personalised Cognitive Behavioural Therapy (CBT) techniques to get your sleep schedule, thoughts, lifestyle and bedroom into shape.



A range of tools help you put your techniques into practice.

From the Thought Checker to your Daily Schedule, you have the tools you need to put the techniques into action.



Sleepio

Navigation: Sleep diary | Case file | Library | Community | Moderator | Visit the Prof | Session in progress

Community | My profile | Search Sleepio | Go

You have not yet completed your current session. Continue it now.

Latest News

Author	Content	Action
LseltBa	"Does anyone else find it strange that the program counts all..."	on their profile
Polly Sleep	"I am home from a great ten days in Kefalonia where I..."	on their profile
Galatea	"Hi did anyone find that their sleep problem got temporarily..."	on their profile
Zoe	"Hi HarryBear, That's great news that you had some success with..."	on their profile

Next expert session: Dr Simon Kyle, Thursday 30th May, 7:00 pm | [Vote on topics](#)

Popular topics

Topic	Discussions
General chat	119 discussions
Living with poor sleep	13 discussions
Graduate chat	12 discussions
The weekly quiz	5 discussions
Your lifestyle and sleep	5 discussions

Recently updated

Topic	Comments
Live Discussion with Dr Simon Kyle - 30th May New	7 comments
Graduate Common Room	6687 comments
JawBone Lip	11 comments
Sleep remedies & alternatives to	66 comments
Sessions 4 & 5 General Discussion	300 comments



EVALUATION OF ONLINE CBT FOR CHRONIC INSOMNIA DISORDER

<http://dx.doi.org/10.5665/sleep.1872>

A Randomized, Placebo-Controlled Trial of Online Cognitive Behavioral Therapy for Chronic Insomnia Disorder Delivered via an Automated Media-Rich Web Application

Colin A. Espie, PhD^{1,2,6}; Simon D. Kyle, PhD^{1,2}; Chris Williams, MD³; Jason C. Ong, PhD⁴; Neil J. Douglas, MD, DSc⁵; Peter Hames, MA Oxon⁶; June S.L. Brown, PhD⁷

¹University of Glasgow Sleep Centre, Glasgow, Scotland, UK; ²Institute of Neuroscience & Psychology, University of Glasgow, Glasgow, Scotland, UK;

³Institute of Health & Wellbeing, University of Glasgow, Glasgow, Scotland, UK; ⁴Rush University Medical Center, Chicago, IL; ⁵Department of Sleep Medicine, Edinburgh Royal Infirmary, Edinburgh, UK; ⁶Sleepio Ltd., London, UK; ⁷Institute of Psychiatry, London, UK

SLEEP 2012;35(6):769-781

The logo for Sleepio, featuring the word "Sleepio" in a bold, white, rounded font with a dark blue outline, set against a dark blue background.

- 11 RCTs
- Total of 1460 participants
- Effects comparable to face-to-face CBT
- Maintained at 4-48 wk F-up

“Internet-delivered CBT appears efficacious”

“May be a viable option in the treatment of insomnia”

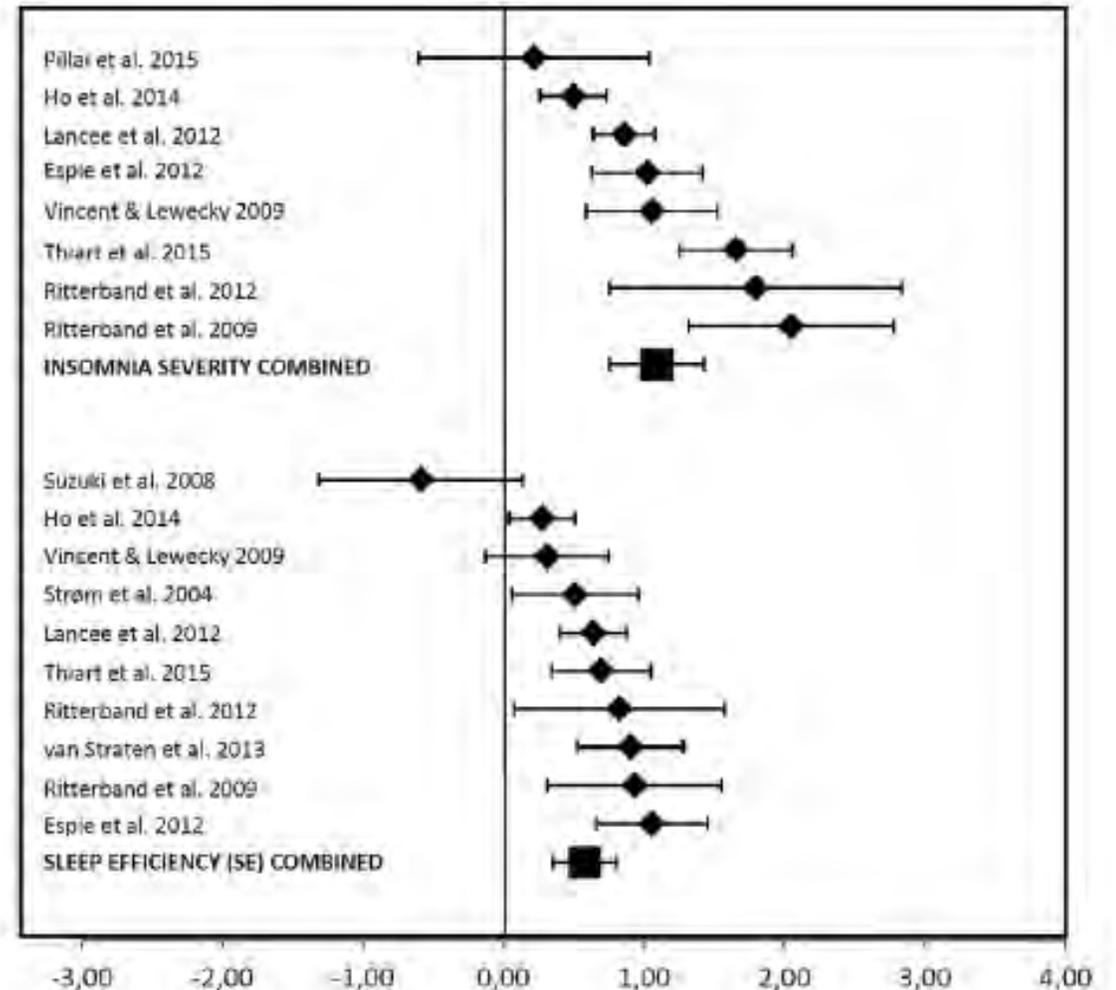


Fig. 2. Forest plot of post-treatment effect sizes for insomnia severity and sleep efficiency (SE).



7 published RCTs + 1 in press



8 published RCTs + 1 in press

Total n > 10,000

THE LANCET Psychiatry

Volume 3, Issue 4, April 2016, Pages 333-341



Articles

Effectiveness of an online insomnia program (SHUTi) for prevention of depressive episodes (the GoodNight Study): a randomised controlled trial

Prof Helen Christensen PhD ^{a, b, †, ✉}, Philip J Batterham PhD ^{c, †}, John A Gosling BSc ^{c, †}, Prof Lee M Ritterband PhD ^d, Prof Kathleen M Griffiths PhD ^e, Frances P Thorndike PhD ^d, Prof Nick Glozier PhD ^e, Bridianne O'Dea PhD ^a, Prof Ian B Hickie MD ^e, Prof Andrew J Mackinnon PhD ^f

Christensen et al (2016): Goodnight study



- SHUTi (n = 574) v HealthWatch (n = 575)
- SHUTi significantly lowered depressive symptoms on PHQ-9 at 6 weeks and 6 months
- Major Depressive Disorder: small numbers of cases at 6 months (in both groups)
- *“Online cognitive behaviour therapy for insomnia treatment is a practical and effective way to reduce depression symptoms and could be capable of reducing depression at the population level by use of a fully automatised system with the potential for wide dissemination”*

The effects of improving sleep on mental health (OASIS): a randomised controlled trial with mediation analysis

Daniel Freeman, Bryony Sheaves, Guy M Goodwin, Ly-Mee Yu, Alecia Nickless, Paul J Harrison, Richard Emsley, Annemarie I Luik, Russell G Foster, Vanashree Wadekar, Christopher Hinds, Andrew Gumley, Ray Jones, Stafford Lightman, Steve Jones, Richard Bentall, Peter Kinderman, Georgina Rowse, Traolach Brugha, Mark Blagrove, Alice M Gregory, Leanne Fleming, Elaine Walklet, Cris Glazebrook, E Bethan Davies, Chris Hallis, Gillian Haddock, Bev John, Mark Coulson, David Fowler, Katherine Pugh, John Cape, Peter Moseley, Gary Brown, Claire Hughes, Marc Obonsawin, Sian Coker, Edward Watkins, Matthias Schwannauer, Kenneth MacMahon, A Niroshan Siriwardena, Colin A Espie

Summary

Background Sleep difficulties might be a contributory causal factor in the occurrence of mental health problems. If this is true, improving sleep should benefit psychological health. We aimed to determine whether treating insomnia leads to a reduction in paranoia and hallucinations.

Methods We did this single-blind, randomised controlled trial (OASIS) at 26 UK universities. University students with insomnia were randomly assigned (1:1) with simple randomisation to receive digital cognitive behavioural therapy (CBT) for insomnia or usual care, and the research team were masked to the treatment. Online assessments took place at weeks 0, 3, 10 (end of therapy), and 22. The primary outcome measures were for insomnia, paranoia, and hallucinatory experiences. We did intention-to-treat analyses. The trial is registered with the ISRCTN registry, number ISRCTN61272251.

Findings Between March 5, 2015, and Feb 17, 2016, we randomly assigned 3755 participants to receive digital CBT for insomnia (n=1891) or usual practice (n=1864). Compared with usual practice, the sleep intervention at 10 weeks reduced insomnia (adjusted difference 4.78, 95% CI 4.29 to 5.26, Cohen's d=1.11; p<0.0001), paranoia (-2.22, -2.98 to -1.45, Cohen's d=0.19; p<0.0001), and hallucinations (-1.58, -1.98 to -1.18, Cohen's d=0.24; p<0.0001). Insomnia was a mediator of change in paranoia and hallucinations. No adverse events were reported.

Interpretation To our knowledge, this is the largest randomised controlled trial of a psychological intervention for a mental health problem. It provides strong evidence that insomnia is a causal factor in the occurrence of psychotic experiences and other mental health problems. Whether the results generalise beyond a student population requires testing. The treatment of disrupted sleep might require a higher priority in mental health provision.

Funding Wellcome Trust.

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Lancet Psychiatry 2017

Published Online
September 6, 2017
[http://dx.doi.org/10.1016/S2215-0366\(17\)30328-0](http://dx.doi.org/10.1016/S2215-0366(17)30328-0)

See Online/Comment
[http://dx.doi.org/10.1016/S2215-0366\(17\)30360-7](http://dx.doi.org/10.1016/S2215-0366(17)30360-7)

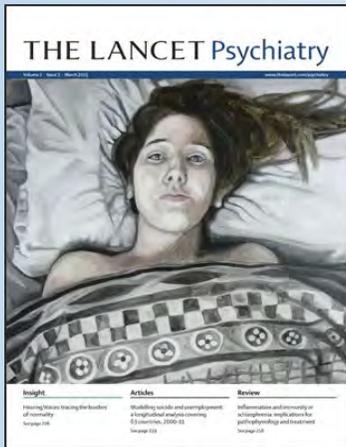
Department of Psychiatry, University of Oxford, Warneford Hospital, Oxford, UK (Prof D Freeman PhD, B Sheaves D Clin Psy, Prof G M Goodwin FMedSci, Prof P J Harrison DM Oxon, V Wadekar MSc, C Hinds DPhil); Oxford Health National Health Service (NHS) Foundation Trust, Oxford, UK (Prof D Freeman, B Sheaves, Prof G M Goodwin, Prof P J Harrison); Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK (L M Yu DPhil, A Nickless MSc); Centre for Biostatistics, Institute of Population Health, Manchester University, Manchester Academic Health Centre, Manchester, UK



Oxford
Access for
Students
Improving
Sleep



Largest ever RCT of a psychological intervention (for any condition) – dCBT for insomnia improved sleep and mental health

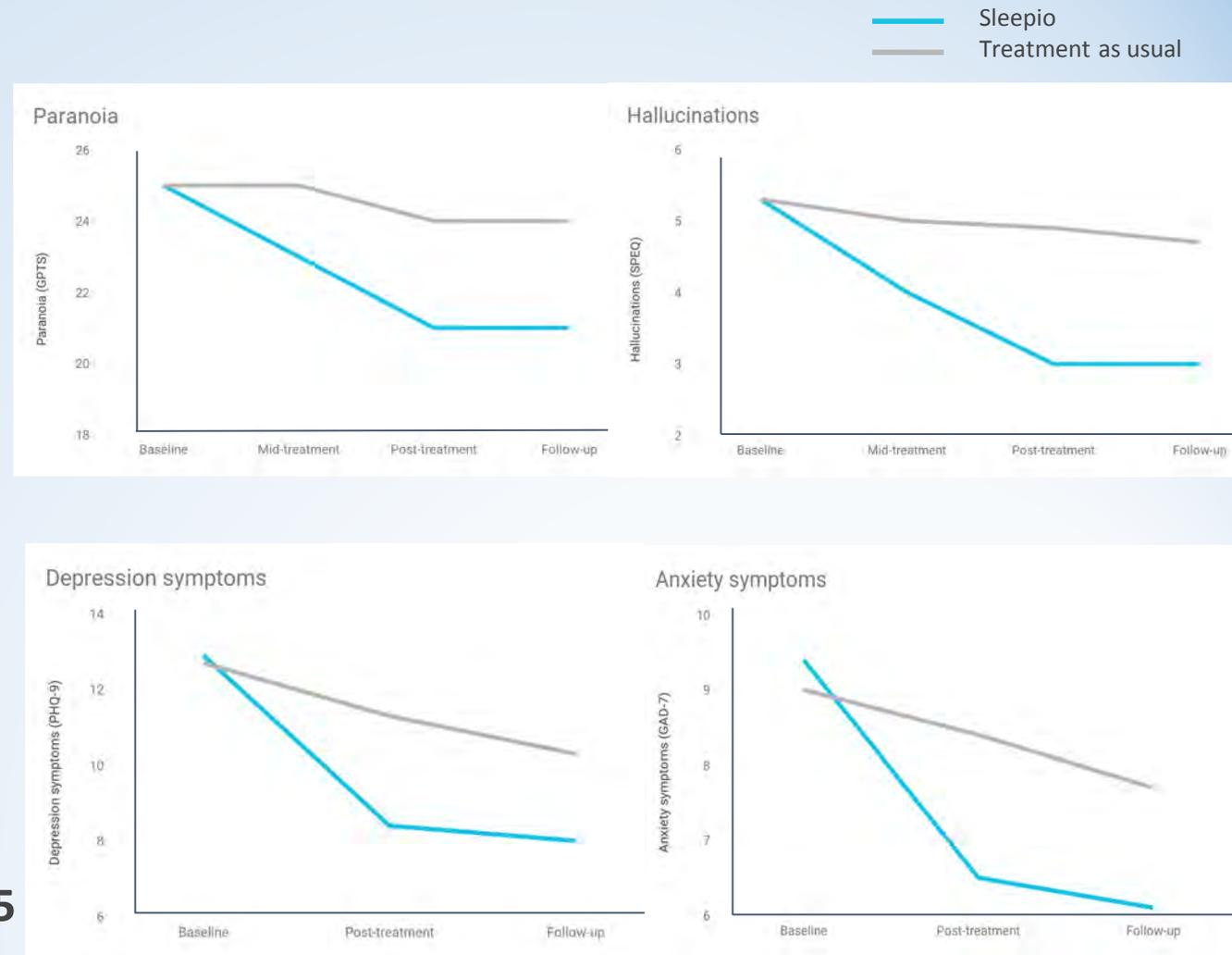


“[Sleepio] gave added benefits. Depression in particular, but also anxiety, psychological wellbeing, perceived functioning all improved.”

n = 3,755

Interventionist-causal relationships

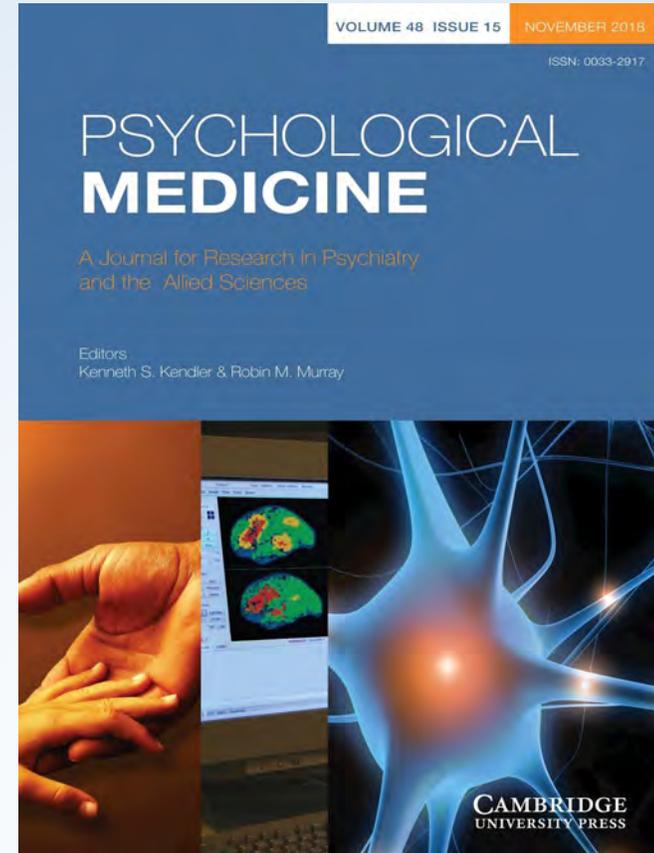
Reference: Freeman et al., 2017. *The Lancet Psychiatry*.



dCBT effective in improving sleep and mood across a range of groups (age, gender, race, SES)

“Overall, the effect size for improvements in depression was 0.64 (medium effect size), which is higher than the average effect size documented for a range of antidepressants”

n = 1,385



Reference: Cheng et al., 2018. *Psychological Medicine*.



Research

JAMA Psychiatry | [Original Investigation](#)

Effect of Digital Cognitive Behavioral Therapy for Insomnia on Health, Psychological Well-being, and Sleep-Related Quality of Life

A Randomized Clinical Trial

Colin A. Espie, PhD; Richard Emsley, PhD; Simon D. Kyle, PhD; Christopher Gordon, PhD; Christopher L. Drake, PhD; A. Niroshan Siriwardena, PhD; John Cape, PhD; Jason C. Ong, PhD; Bryony Sheaves, DClinPsy; Russell Foster, PhD; Daniel Freeman, PhD; Joan Costa-Font, PhD; Antonia Marsden, PhD; Annemarie I. Luik, PhD


National Institute for
Health Research

Oxford
Biomedical
Research
Centre



Sleepio

TRIAL REGISTRATION [isrctn.org identifier: ISRCTN60530898](https://www.isrctn.com/identifiers/ISRCTN60530898)
JAMA Psychiatry. 2019;76(1):1-10. doi:10.1001/jamapsychiatry.2018.2745
Published online September 25, 2018.

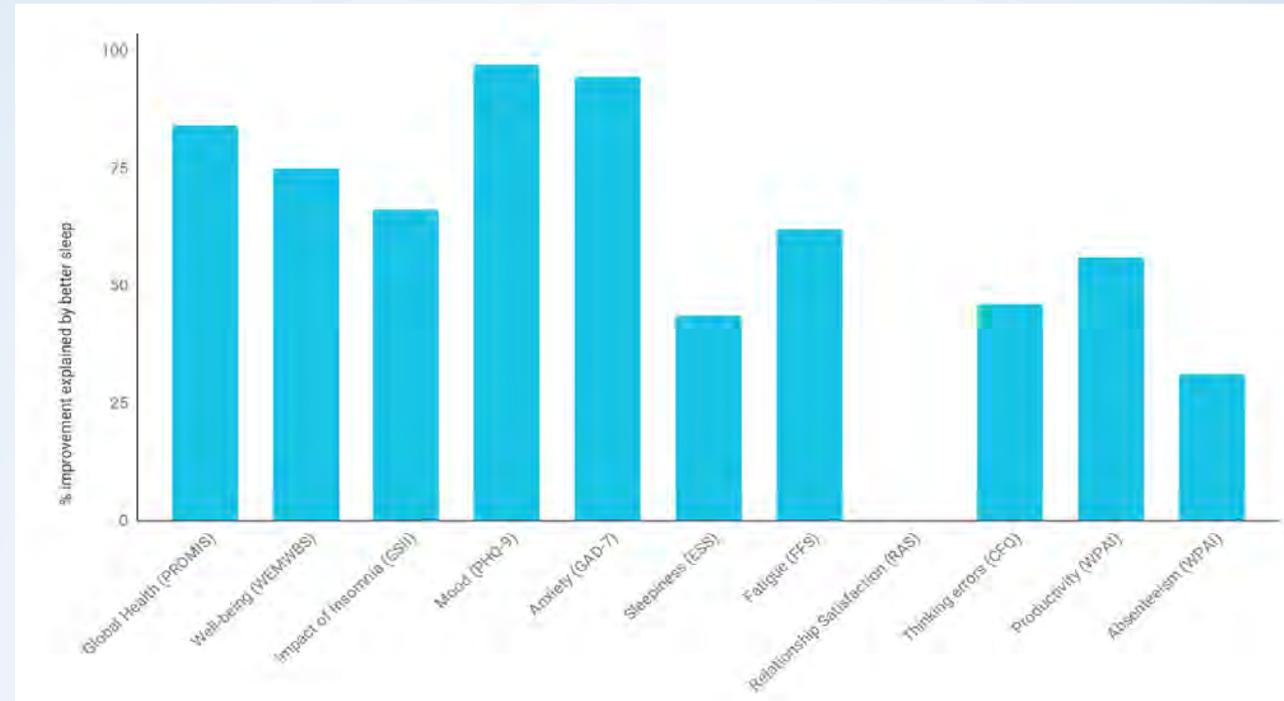
Sleepio improved health, wellbeing, quality of life and other daytime outcomes in a 2018 RCT

Improvements in sleep explained a large proportion of broader benefits at 6-month follow-up

n=1,771

Reference: Espie et al., 2018. JAMA Psychiatry.

Mediation analysis



Interventionist-causal relationships



Innovate UK



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Home > Our Work > Sleepio Project

<https://www.sleepio.com/nhs>

Sleepio Project

SIGN UP FOR SLEEPIO HERE >

Sleepio is an online programme to address insomnia which affects one in ten adults. It aims to improve sleep without sleeping tablets through a fully automated, interactive web-based tool.

Innovate UK has funded a project which will provide free direct access to Sleepio to all 2.7 million adults living in the Thames Valley (Berkshire, Buckinghamshire, Milton Keynes and Oxfordshire) from October 2018 until autumn 2019. This is the first large-scale NHS rollout of direct access digital medicine. This means people can access the programme without needing a GP referral or prescription.

This initiative is being led by the Oxford Academic Health Science Network (Oxford AHSN) in partnership with Big Health, the company behind Sleepio. It is supported by NHS England and the NHS Innovation Accelerator.



OUR WORK

Patient safety and clinical improvement

Clinical Innovation Adoption

Strategic and Industry Partnerships

Research and Development

Patient and Public Involvement, Engagement and Experience

Sleepio Project

National programmes

Workforce Development

I am, or I know someone who is feeling: [Anxious](#) [Sleep Deprived](#) [Stressed](#) [Sad or Low](#)

[Self Assessment](#) [Urgent Support](#)

⬅ [Back to results](#)



Online help to improve your sleep

Sleepio teaches you proven techniques to fall asleep faster, and stay asleep all night

Free for NHS patients in London

Discover your sleep score and how to improve it

[Start now](#)

Before browsing our site, please accept our [cookies policy](#)

[Accept and Close](#)

Digital CBT (dCBT) for insomnia: a scalable solution to a ubiquitous problem

Prof Colin A. Espie

PhD, DSc, FBPSS

Professor of Sleep Medicine
Fellow, Somerville College
HSRF, Dept of Psychiatry
University of Oxford

Emeritus Professor of Clinical Psychology
University of Glasgow





Experimental & Clinical Sleep Medicine

Prof Colin Espie
Dr Simon Kyle
Dr Chris Harvey
Dr Nicola Barclay
Dr Ximena Omlin
Dr Rachel Sharman
Dr Gaby Illingworth
Dr Sumathi Sekaran
Matt Reid
Leonie Maurer
Amender Juss
Laura Mitchell
Madeleine Hurry

Dr Dimitri Gavriloff
Dr Chris Miller
Dr Alasdair Henry
Dr Richard Stott
Jenny Gu
Donna Littlewood
Heather Condon
Dr Claire Sexton

Honorary
Prof Dieter Riemann
Dr Phil Gehrman
Dr Annemarie Luik

wellcometrust



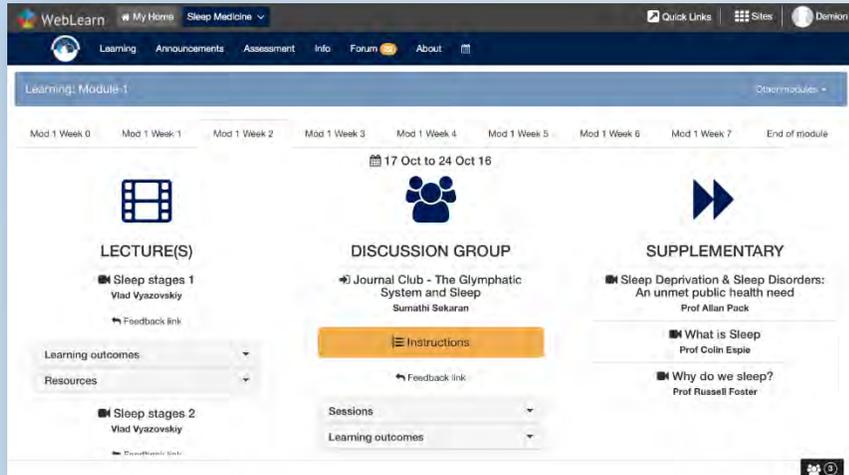
Dr Mortimer and Theresa Sackler Foundation





The Oxford Online Programme in Sleep Medicine

Simon Kyle, Christopher-James Harvey, Sumathi Sekaran,
Nicola Barclay, Colin Espie, Marion Greenleaves



- Leads to a MSc, PGDip or CPD
- 8 Sleep Medicine Modules (+2 research skills)
- Recorded lectures & live online seminars
- Started Oct 2016
- Health professionals from 16 countries



The Ascending Reticular Activating System - ARAS (Reticular Formation)

Neurons of the ARAS produce neurotransmitters

- Acetylcholine (ACh)
- Norepinephrine (NE)
- Dopamine (DA)
- Serotonin (5-HT)
- Histamine (HA)
- Orexin/hypocretin

Excitatory effects on target neurons throughout the cortex promote arousal

- γ -aminobutyric acid (GABA)

Inhibitory effects on target neurons

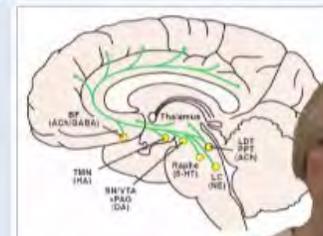
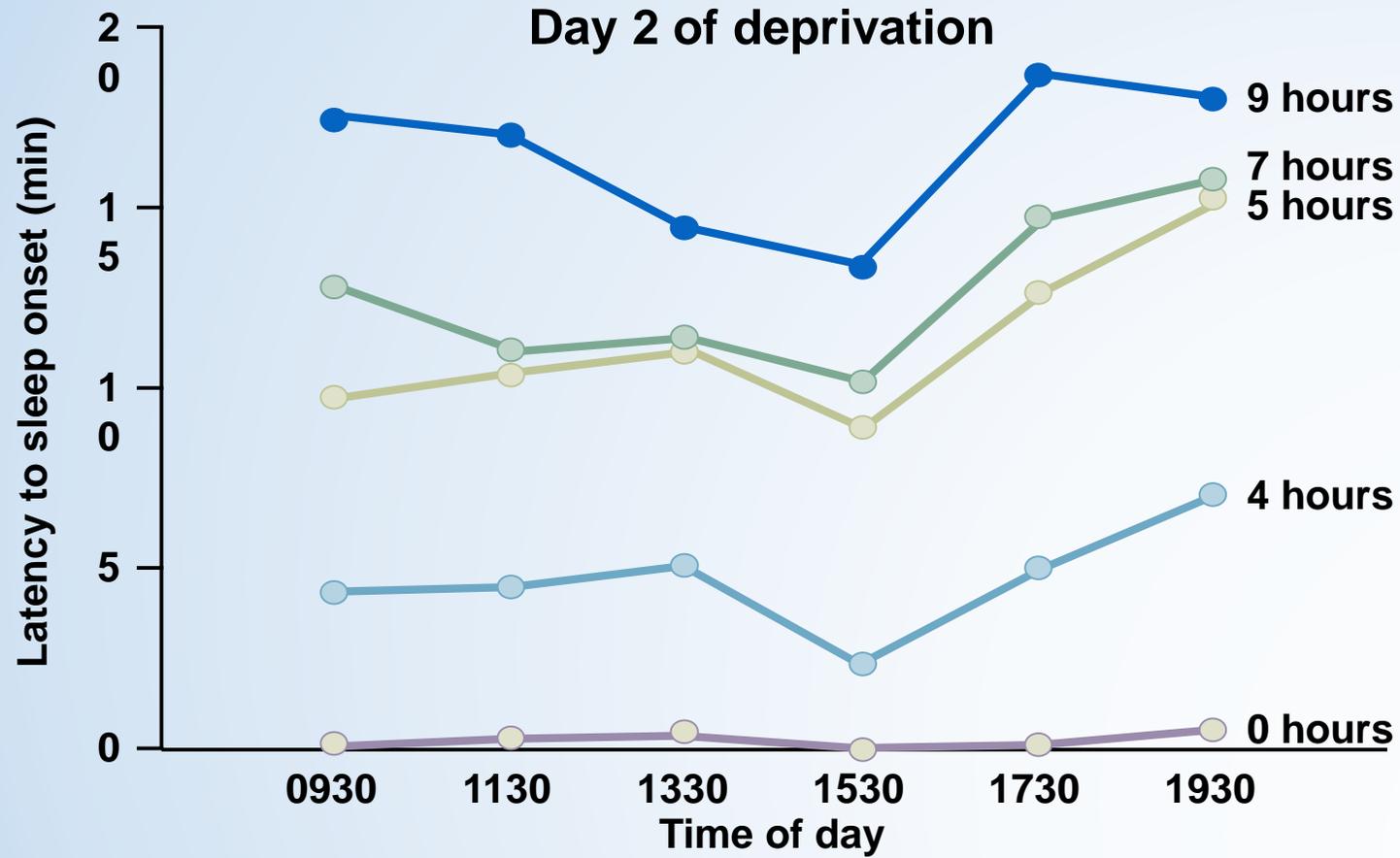


Figure 1—A variety of neurochemical systems project to the forebrain. Cortical and subcortical neurons are activated by neurotransmitters originating in the locus coeruleus (LC), serotonergic (5-HT) raphe nuclei, histamine (HA) from the tuberomammillary nucleus, dopamine (DA) from the substantia nigra and ventral tegmental area, and acetylcholine (ACh) from the basal forebrain (BF). These neurotransmitters activate and modulate cortical neurons and subcortical structures such as the thalamus, hypothalamus, and



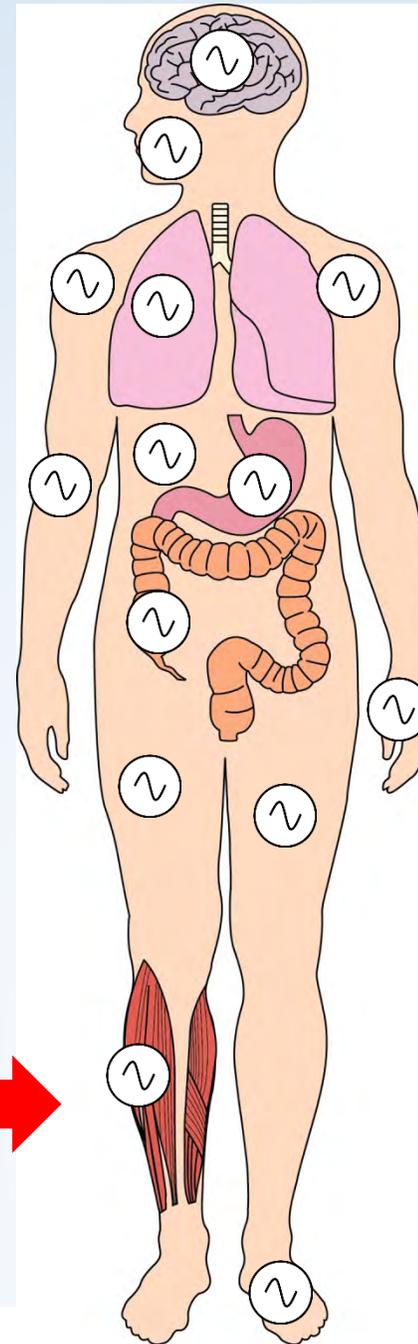
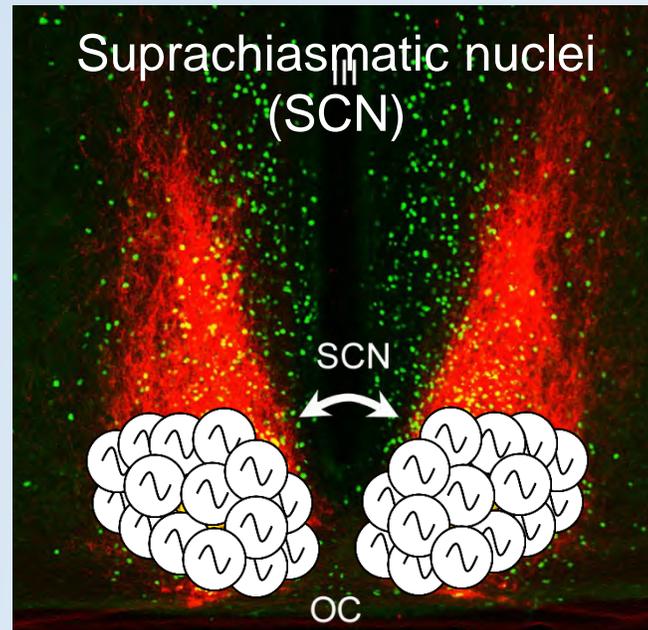
Sleep is regulated homeostatically



Young adults on the 2nd day of various nocturnal sleep time conditions. Subjects per condition: 9 hrs, n=20; 7 hrs, n=14; 5 hrs, n=10; 4 hrs, n=13; 0 hrs, n=6

Roth, Roehrs, Carskadon & Dement, 1989

... and by circadian drives



Electroencephalogram (EEG) showing typical brain waves of sleep and wakefulness

wakefulness (relaxed state)



stage 1

theta waves (4–7 Hz)



stage 2

sleep spindle (11–15 Hz)

K-complex

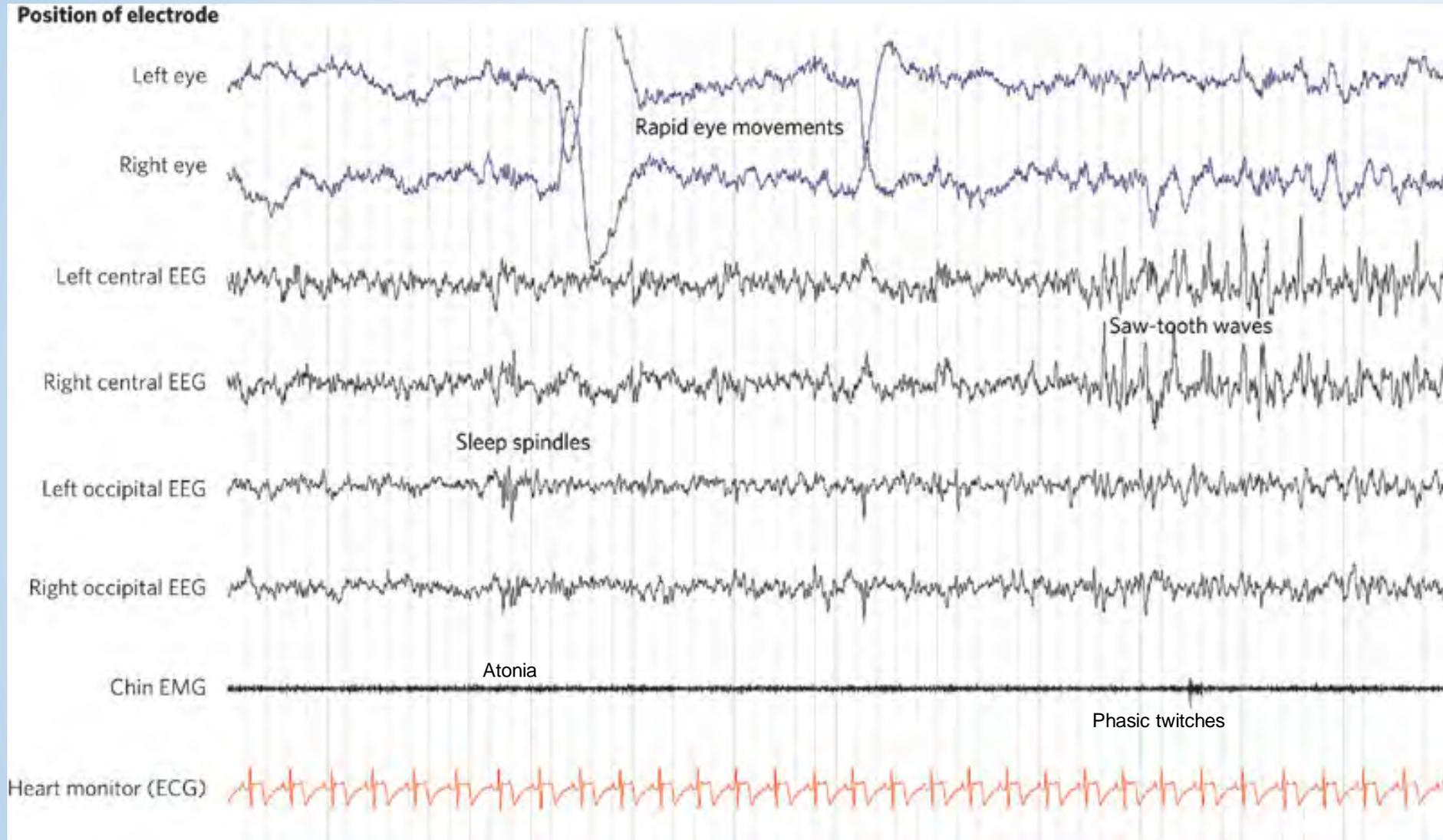


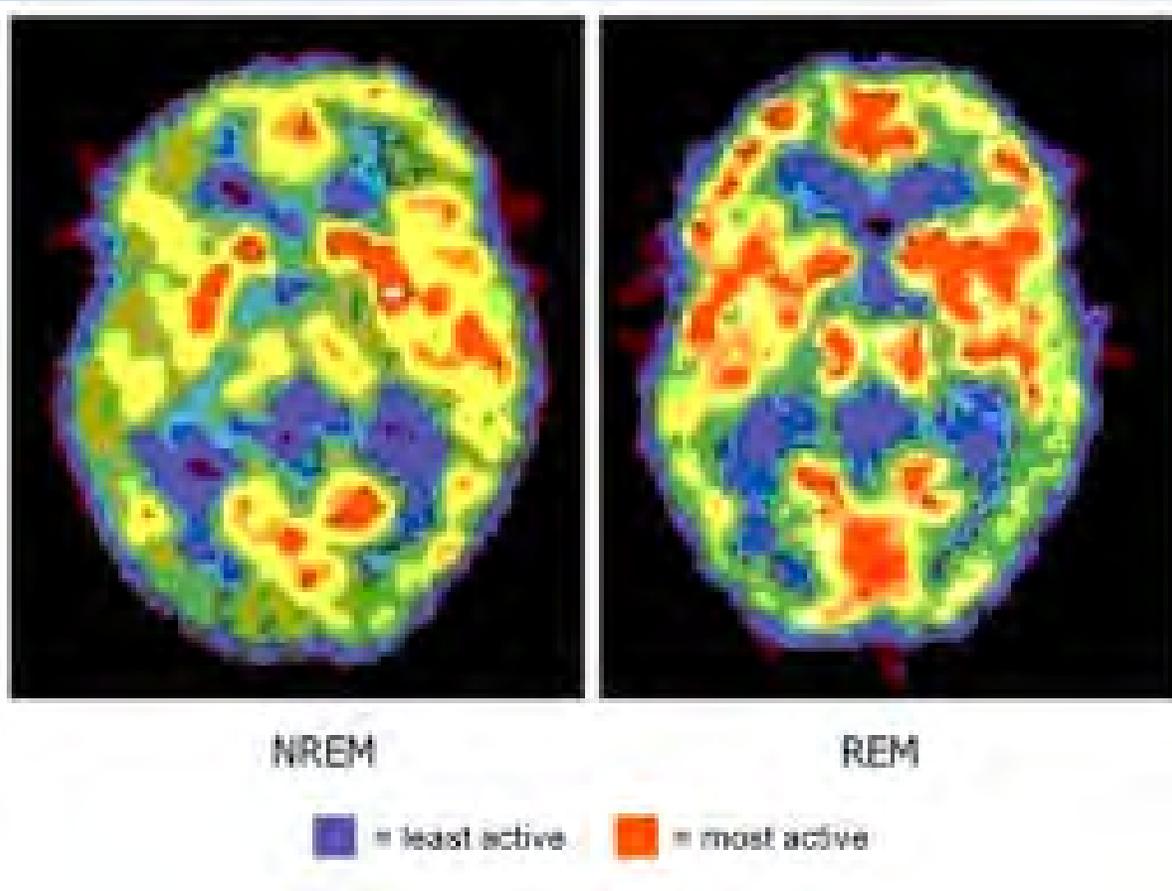
stage 3 (slow-wave sleep)

slow waves (0.5–2.0 Hz)

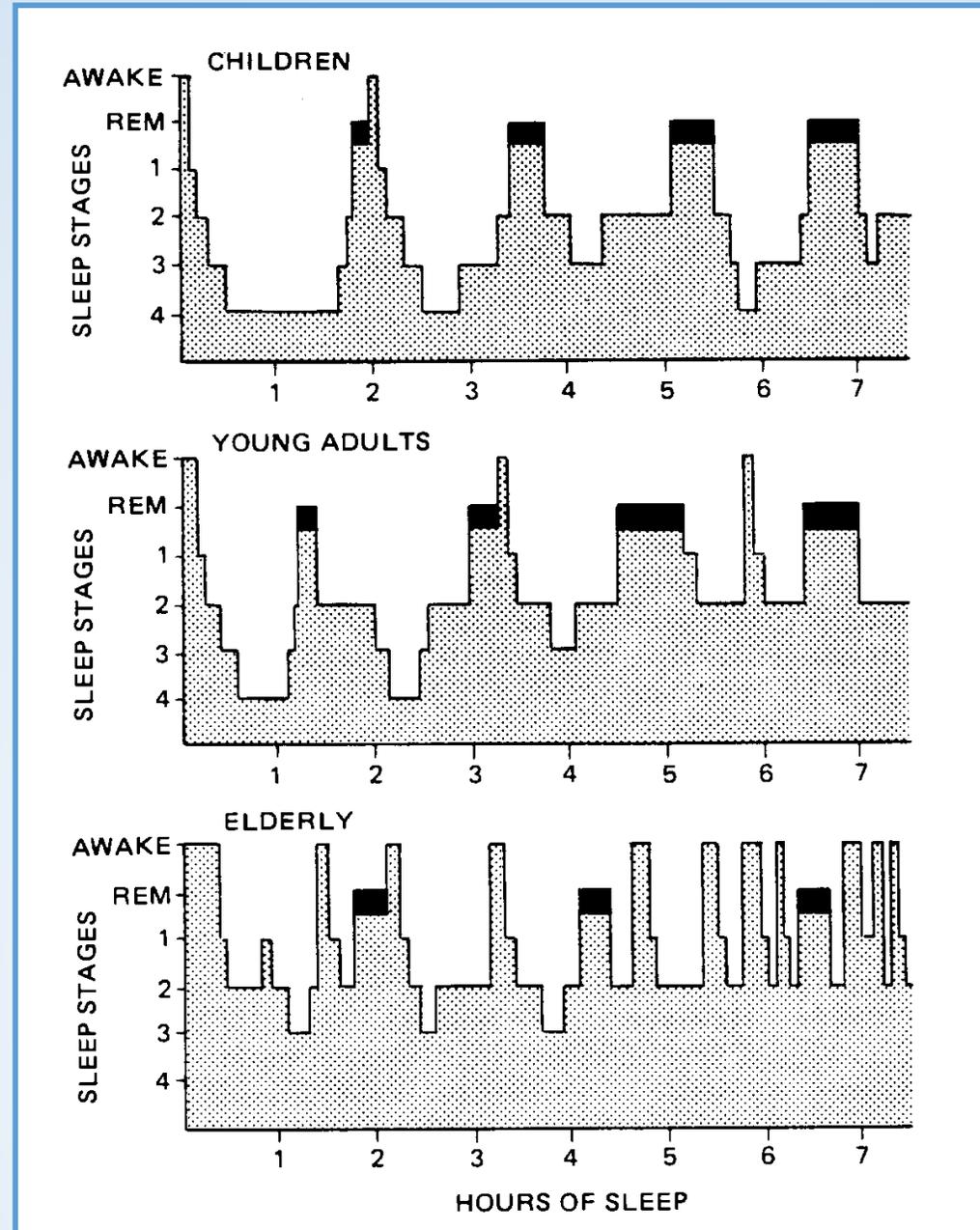


REM sleep: EEG, EMG, and EOG characteristics

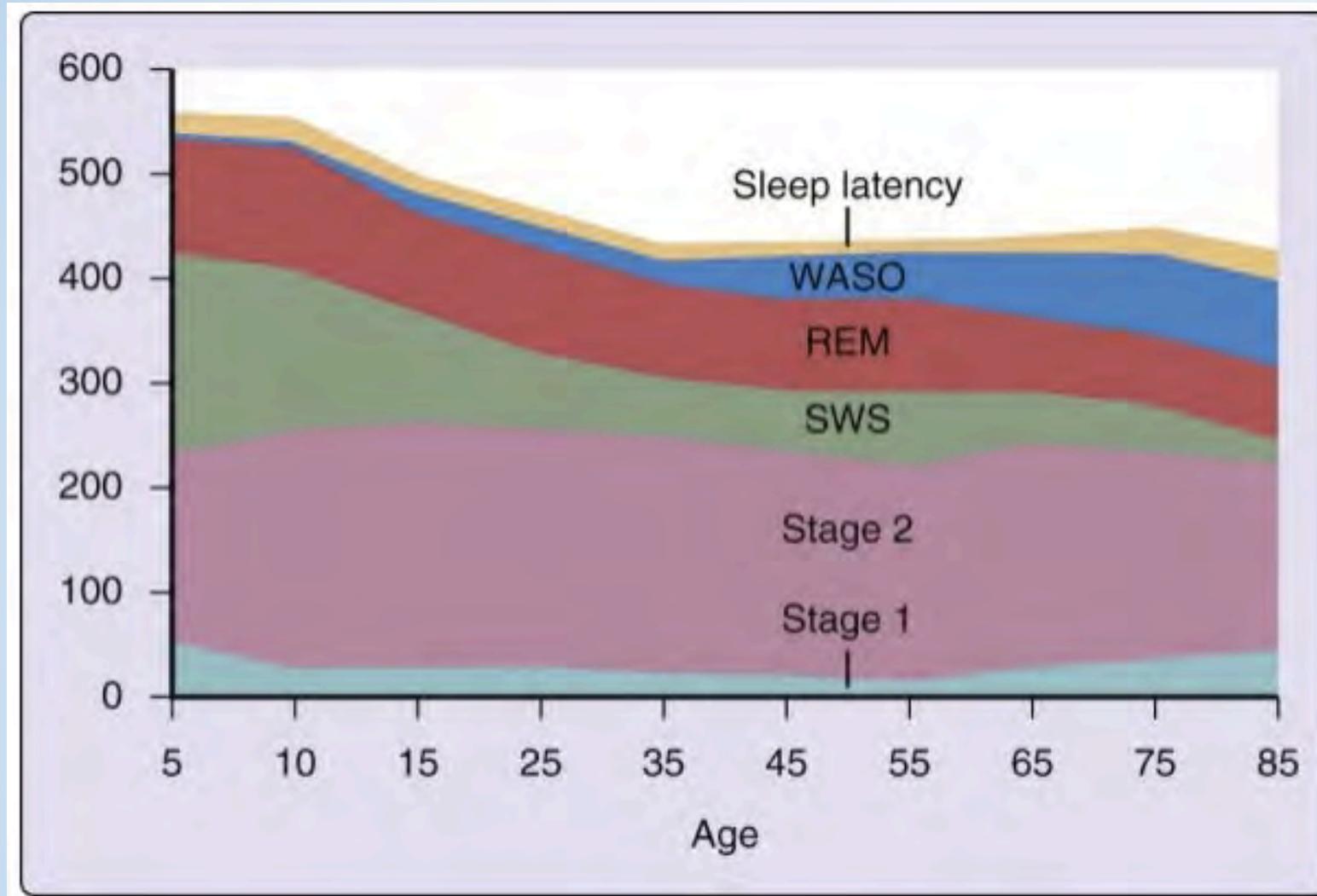




‘Sleep architecture’:
hypnograms of sleep
across the life cycle



Sleep architecture changes over the lifecourse



Ohayon M, Carskadon MA, Guilleminault C, et al. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: developing normative sleep values across the human lifespan. *Sleep* 2004;27:1255-1273.

Why sleep matters

The economic costs of insufficient sleep

Sleep is considered to be essential for our health and wellbeing. Insufficient sleep is associated with a higher mortality risk and a loss of productivity at work. These micro-level consequences of insufficient sleep snowball into societal-level effects on public health, productivity and, ultimately, the economic performance of nations. Improving individual sleeping habits has huge implications. Small increases in how much we sleep can make big differences to our national economies.

The aim of RAND Europe's novel study was to quantify the economic and social costs of insufficient sleep among the global workforce. As



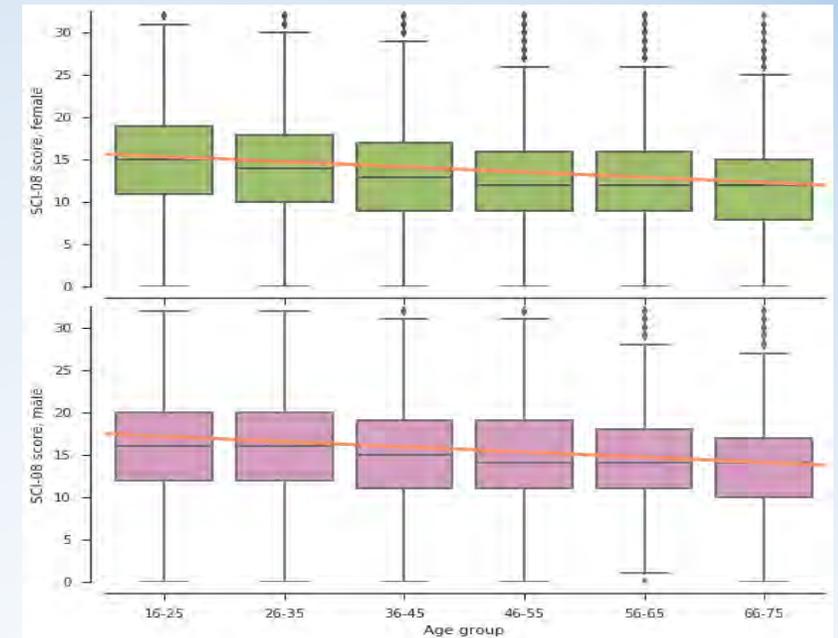
Insomnia

The Sleep Condition Indicator: reference values derived from a sample of 200 000 adults

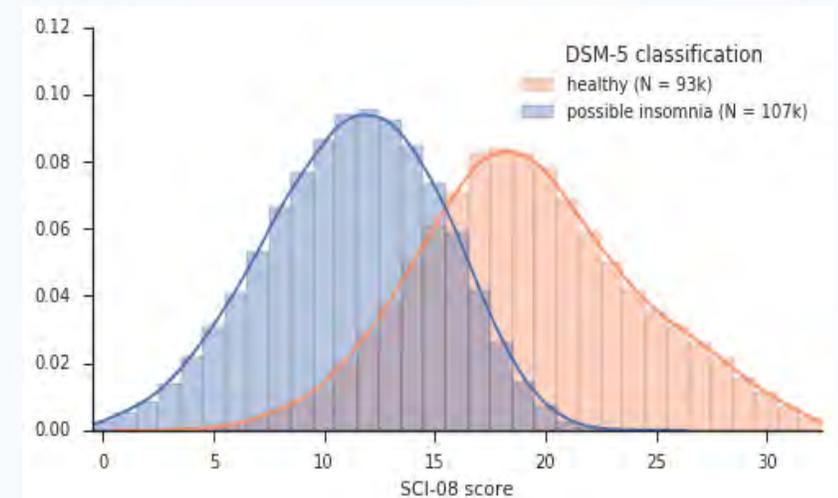
Colin A. Espie ✉, Pedro Farias Machado, Jenna R. Carl, Simon D. Kyle, John Cape, A. Niroshan Siriwardena, Annemarie I. Luik

First published: 29 November 2017 | <https://doi.org/10.1111/jsr.12643> | Cited by: 1

- Reference data and indices of reliable change for men and women across the age deciles 16–25, 26–35, 36–45, 46–55, 56–65 and 66–75 years
- SCI cut-off = 16
- Reliable Change Index established at 7 scale points

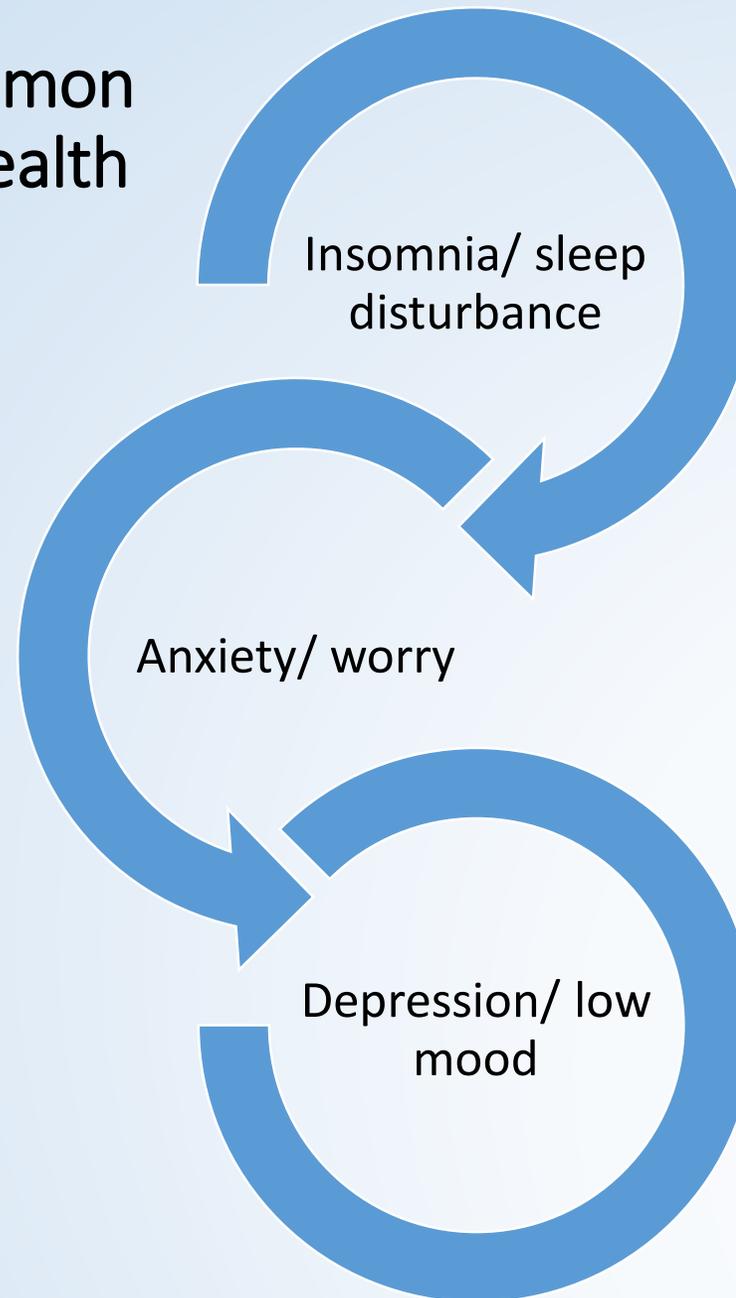
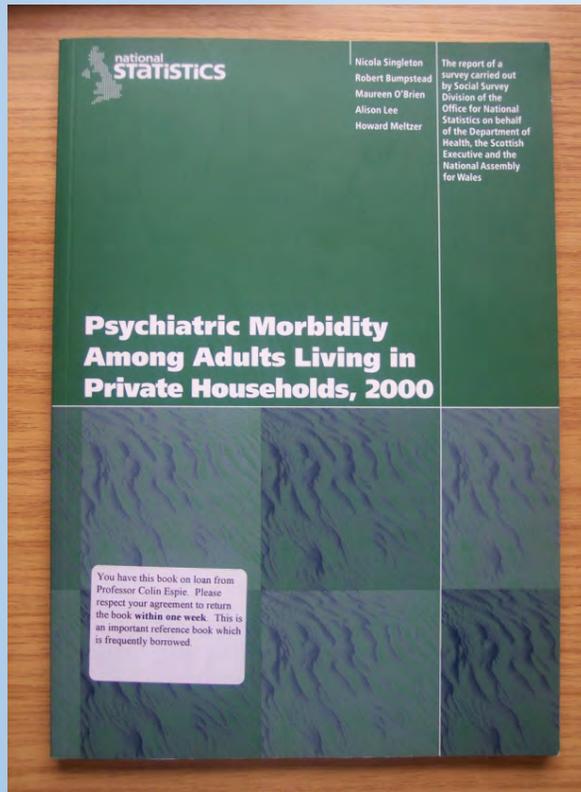


Age and sex-related reference values



Validation of SC1 = 16 as cut-off

Insomnia is the most common expression of mental ill health



In men and women, of all ages, of all ethnic groups, across all demographics and in all regions of the UK



Digital Therapeutics Alliance

Improving healthcare quality, outcomes, and value through optimizing the use and integration of digital therapeutic solutions