How to Treat Sleep Problems in ADHD

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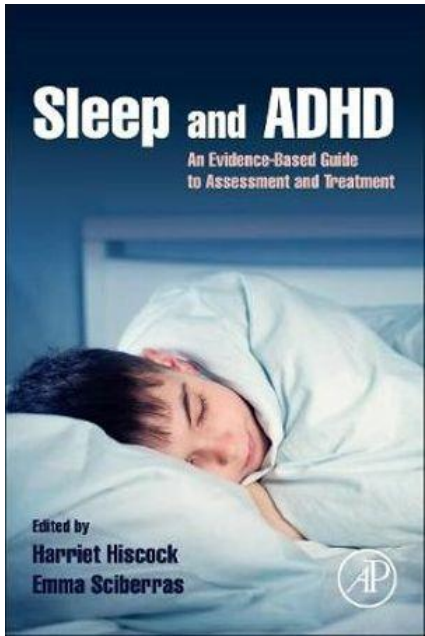
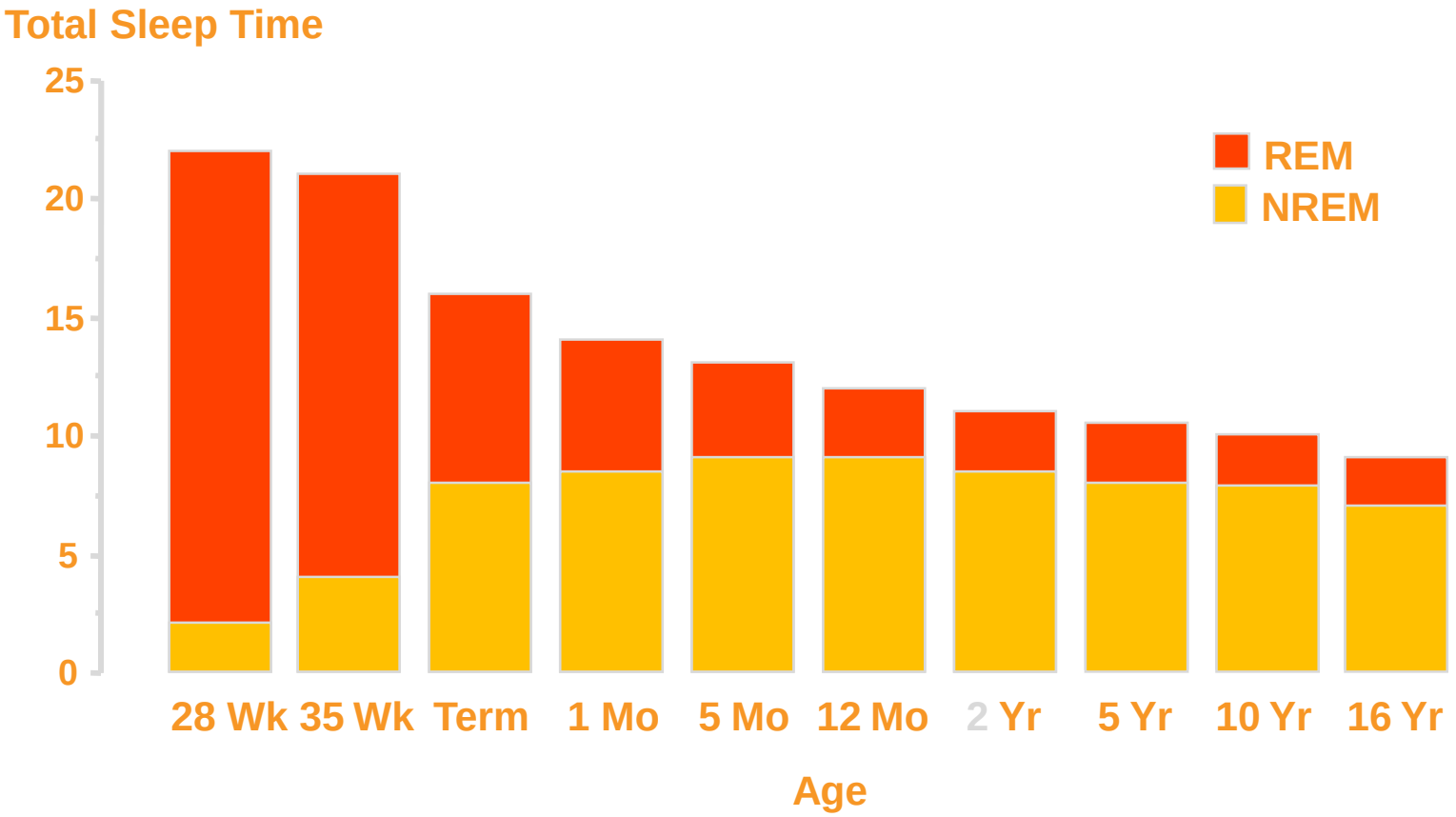


Normal sleep

Architecture of sleep

- 2 distinct stages:
  - Light or Rapid Eye Movement (REM) sleep
  - Deep or Non Rapid Eye Movement (NREM) sleep – Stages 1-3 sleep
- We all cycle through REM and non-REM sleep
- Cycles last 90 to 110 mins
  - 50 mins in infancy children & lengthening to adult levels by school age

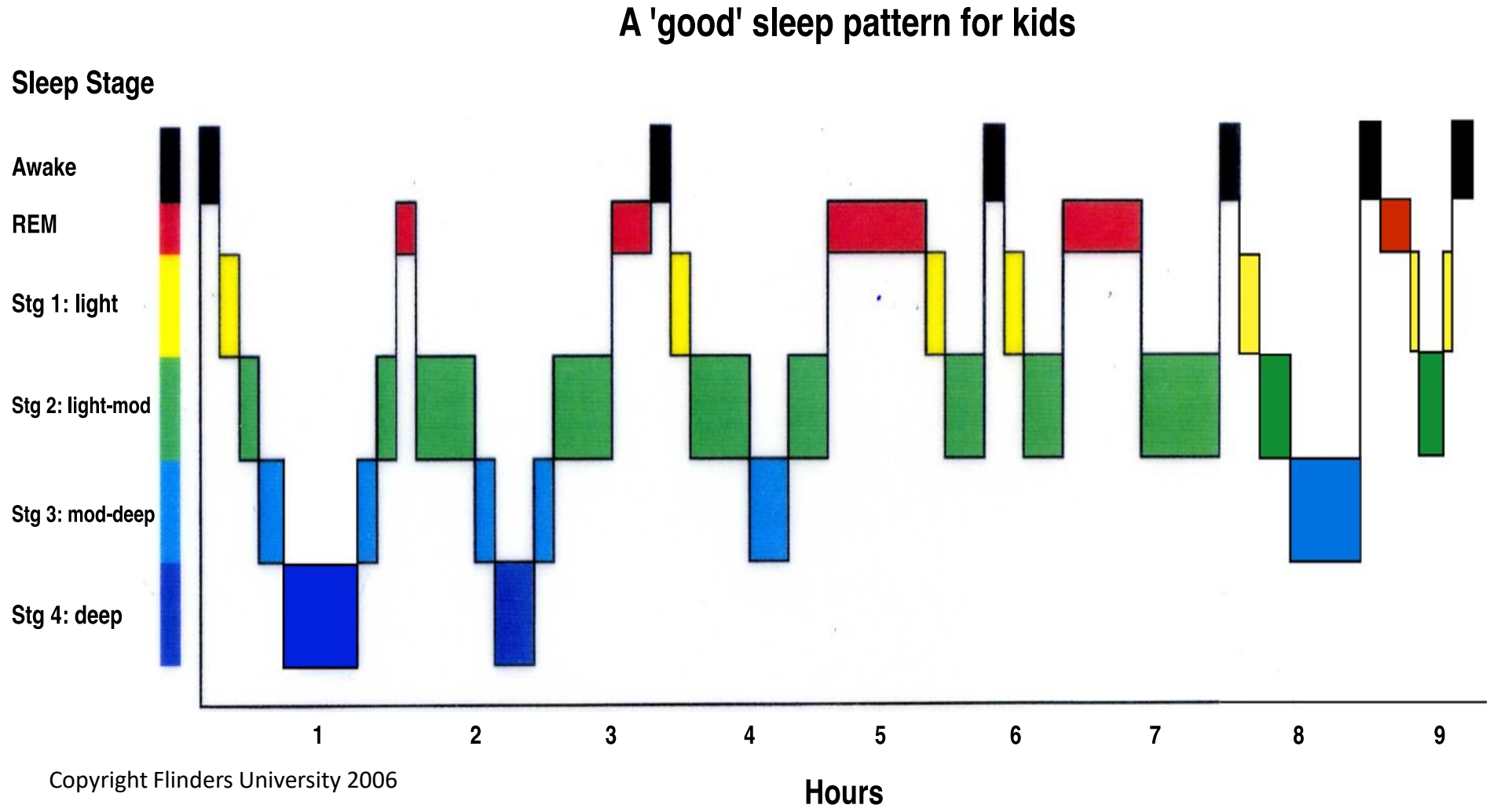
ONTOGENY OF REM AND NREM SLEEP



Sheldon SH, Spire J-P, Levy HB: Pediatric Sleep Medicine. Philadelphia. WB Saunders. 1992,

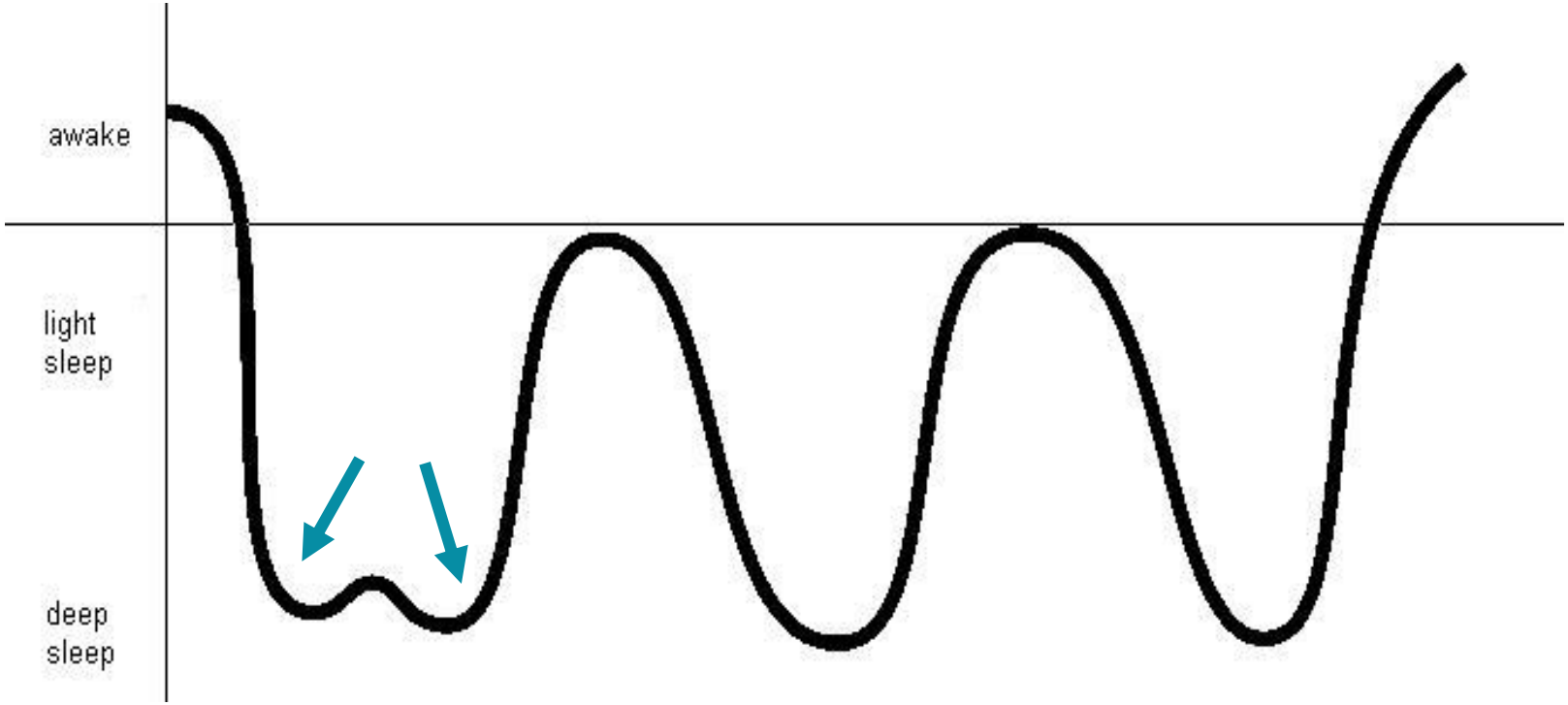
Normal sleep

Sleep architecture



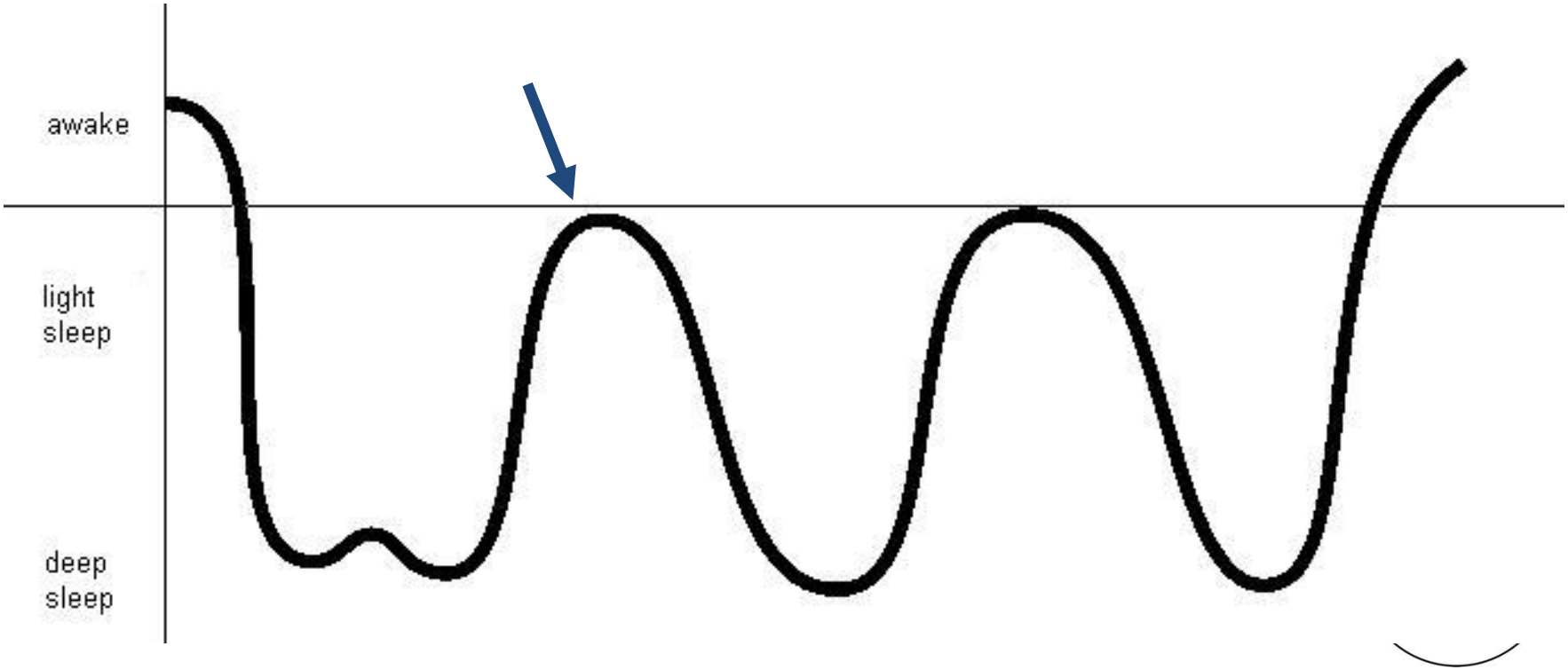
NREM sleep

- Mostly in the first half of the night
- Can move around (eg sleep walking)
- Most difficult to awaken
- Low level brain activity



REM sleep

- Mostly in later half of night
- High level brain activity
- Dreaming
- Muscles paralysed (so we don't act out our dreams)



Sleep cues

- The way we fall asleep at the start of the night is the way we expect to return to sleep when we wake overnight from REM sleep

- So if the last thing a child remembers is falling asleep on the couch, in parent's arms etc....then that is the way they want to return to sleep if they wake overnight.

What regulates our sleep?

- **Homeostatic regulation**
  - "Drive to go to sleep"
  - If you have poor quality sleep or not enough of it → feel tired → drive to get to sleep

- **Circadian regulation**

Circadian rhythm

Rhythm maintained by environmental cues:

- Light / dark – melatonin released when it is dark
- Timing of meals
- Scheduled activities eg getting to school
- Body temperature – drops at night to help us go to sleep

Circadian troughs

- Late afternoon
- Middle of the night
- This is when we often feel the most sleepy!

National sleep foundation (USA)

- < 1 year: 14 -15 hours
- 1-1.5 years: 14 -15 hours
- 1.5-3 years: 12-14 hours
- 3-5 years: 11-13 hours
- 5-12 years: 10-11 hours
- Teens: 8.5-9.5 hours

….but we know most children in westernized countries are sleeping less….

Sleep problems in children & adolescents

Sleep problems in children & adolescents

Behavioural or medical problems:

- Behavioural problems most common and include:
  - problems going to sleep (dyssomnias)
  - problems waking over night (parasomnias)
  - early morning waking

- Medical problems - sleep disordered breathing, obstructive sleep apnoea, restless legs syndrome, chronic otitis media, nocturnal seizures, eczema, asthma

Common sleep problems

Insomnia

Child is unable to fall asleep even if they go to bed at a later time

Sleep onset association

Child associated falling asleep with a certain object

Bedtime resistance

Child refuses to go to bed and parent finds it difficult to set bedtime limits

Anxiety

Child lies in bed worrying and may display anxiety in other areas

Delayed Sleep Phase

Child falls asleep late and wakes late in the morning

ADHD & sleep problems

- Up to 70% of parents report sleep problems in their child with ADHD (Sung et al., 2008)
- Common sleep problems include sleep latency, decreased sleep efficiency, bedtime resistance.
- Sleep problems persistent in children with ADHD (Lycett et al., 2014)

What causes sleep problems in children with ADHD?

Biological - similar neurobiological pathways involved in the regulation of sleep, attention & arousal.

Comorbidity – Internalising and externalising comorbidities are strong predictors of sleep problems.

Medication – Medication seems increased risk of sleep problems but unmedicated children with ADHD still have elevated sleep problems.

Other environmental factors – Parenting, parent mental health, family environment.

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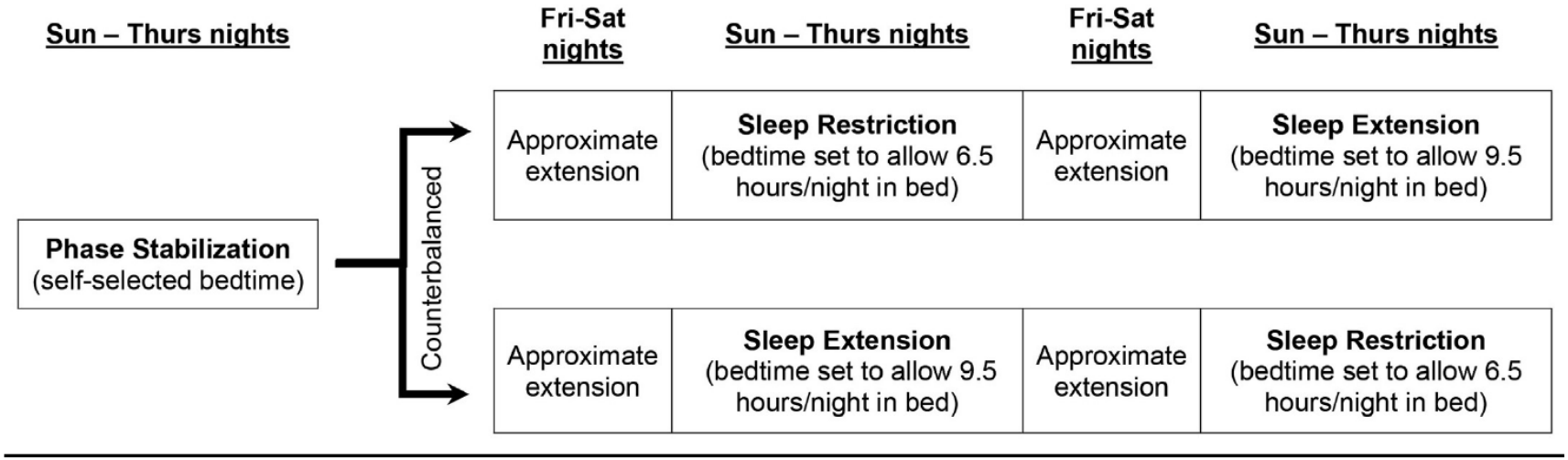
Impact of sleep problems

Sleep in Adolescence

- Changes in sleep architecture – reductions in slow wave & REM sleep
- Homeostatic pressure decreases to levels lower than those seen in adulthood
- Circadian rhythm changes to have a preference for ‘eveningness’
- Biological changes e.g. puberty
- Environmental changes – high school transition, part-time work

Sleep and functioning in adolescents with ADHD - Becker et al., 2019 JAACAP

FIGURE 1 Sleep Restriction/Extension Protocol Using a Within-Person Counterbalanced Design



- **SR associated with (1.6 hours difference between conditions):**
  - Greater parent-reported inattention & oppositional behaviour
  - Less adolescent-reported hyperactivity-impulsivity
  - Increased parent & adolescent reported SCT symptoms

Assessment & treatment of sleep problems in children & adolescents

Assessment tools

- Clinical interview – caregiver & child report
- Structured questionnaires e.g. Children's Sleep Habits Questionnaire – **review of measures:** Spruyt & Gozal, 2011
- Sleep diaries – also useful during intervention phase
- Actigraphy, polysomnography

Sleeping Sound with ADHD

Sleep Diary

Sleep Diary Key

- ↓ When your child is placed in the bed
- ↑ When your child gets out of bed
- ■ When your child is asleep
- □ When your child is awake

Name: _____

			AM												PM												
			MN	1	2	3	4	5	6	7	8	9	10	11	MD	1	2	3	4	5	6	7	8	9	10	11	MN
Day	**Date**	**Events Medications**																									
Wed	15/7		■	■	■	□	■	■	■	■	↑	□	□	↓	■	↑	□	□	□	□	□	□	↓	■	■	■	■
Thurs	16/7		■	■	■	■	■	■	■	↑	□	□	□	□	□	□	□	□	□	□	□	□	↓	■	■	■	■

Clinical history

- What time does the child usually go to bed at night and wake in the morning?
- What is the child's usual bedtime routine?
- Does the child have the same bedtime routine on weekends?
- Does the child wake at night?
- Does the child worry a lot about things?
- What are the usual working hours of the parents?
- Does the child share a bedroom with siblings or parents?
- Are there computers /TV/ games consoles in the child's bedroom?
- How does the parent manage sleep difficulties?
- Does the child drink caffeinated drinks or eat chocolate after school?
- Elicit parent & child goals

Treatment options

Melatonin
- Effective for insomnia but not night waking
- Beneficial in short term
- Few, if any, side effects

Surgery
- For obstructive sleep apnoea

Behavioural
- Sleep hygiene – all problems
- Tailored strategies for specific problems

The basics - sleep hygiene

- Set bedtime & wake time – need for consistency!
- Avoid caffeine (drinks, chocolate bars etc) after 3pm
- Ensure bedroom is cool, quiet, and relatively dark
- Calm bedtime routine – **no stimulating activities 1 hour before bed**
- Bedroom a media-free zone – no TV, phones etc
- Avoid napping
- Light snack
- Sunlight exposure to help regulate body clock

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Example visual routine

Take a bath 	Take a shower 	Wash hair 
Put on pajamas 	Brush teeth 	Get a drink 
Go to the bathroom 	Go to bed 	Go to sleep 

Choices 	Listen to music 	Sing songs 
Draw 	Puzzle 	Read a book 

Delayed sleep phase

Shifting the internal body clock:

1. Set a regular morning wake time.
2. Bedtime fading:
   - Set bedtime close to when your child is falling asleep.
   - Once asleep within about 20-30 mins, make bedtime earlier by 15 mins.
   - Continue until desired bedtime is reached.
3. Morning light exposure.
4. No daytime napping.

Delayed sleep phase

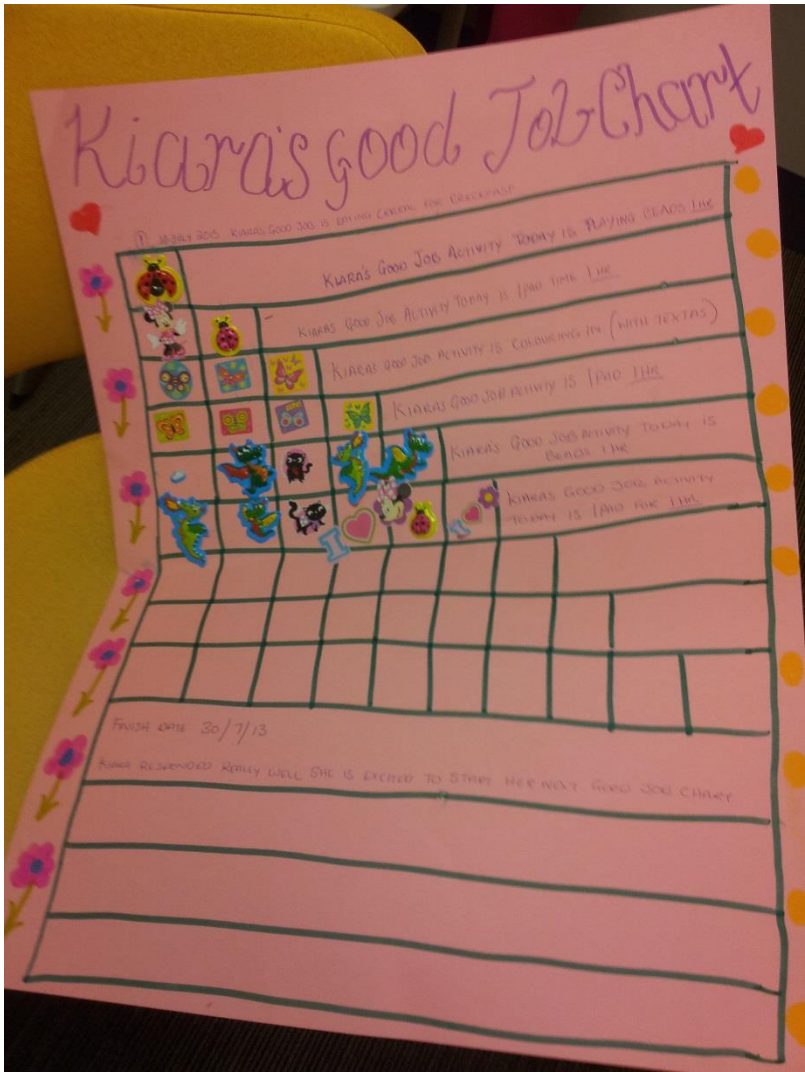
Night	Bedtime
Nights 1 and 2	10.30pm
Nights 3 and 4	10.15pm
Nights 5 and 6	10.00pm
Nights 7 and 8	9.45pm
Nights 9 and 10	9.30pm
Nights 11 and 12	9.15pm
Nights 13 and 14	9.00pm
Nights 15 and 16	8.45pm
Nights 17 and 18	8.30pm

Limit setting difficulties

- Establish clear bedtime rules
- Ignore complaints and protests, returning children to bed.
- Responding consistently.
- Bedtime pass.
- Checking method.
- Positive reinforcement e.g., reward charts.
- Bedtime fading.

Positive reinforcement

- Target one key behaviour
- Small, immediate rewards
- Make it achievable
- Start off easy & then increase difficulty
- Based on number of successes – doesn't have to be consecutive!



Insomnia

- Good sleep hygiene practices + bedtime fading
- Visual imagery & relaxation:
  - ✓Lying down with eyes closed and then tightening and relaxing all the muscles in their body, one after the other.
- Simple coping statements:
  - ✓"Tonight I will just relax and rest at bedtime"
- Stimulus control – only use bed for sleep

Deep breathing

Deep breathing can help children relax. You can teach your child to breathe out slowly using bubble-blowing.

At bedtime

Get your child to relax his shoulders. Ask him to breathe in for four counts (count, "One rabbit, two rabbit, three rabbit, four rabbit"). Now hold the breath for four counts.

Ask him to breathe out for four counts. If he has trouble, remind him of breathing out slowly when blowing bubbles. Now hold the breath for four counts. Repeat up to four times. Talk to your child about how it will relax him, and how it will get easier with daily practice.

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Visual imagery can help

Choose a book with pictures of a place your child can imagine (try to avoid dark or scary pictures). Talk about the picture and ask your child if she can see it in her mind. She can use her imagination to change the picture or add to it.

The more your child can learn to create pictures in her mind, the more it can help her relax.

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Insomnia - adolescence

Stimulus control:

- Discontinue activities not conducive to sleep
- Only go to bed when sleepy
- Consistent sleep-wake schedule
- Get out of bed if not asleep within 15-20 minutes & engage in a non-stimulating activity – repeat cycle!

Sleep restriction:

- Restrict to about 6-7 hours to increase sleep efficiency, consolidate sleep & disrupt negative associations.
- Set time in bed to estimated sleep at baseline & once sleep efficiency is >85%, gradually increase time in bed.

Insomnia - adolescence

Cognitive restructuring:

- Identify negative thoughts about sleep
- Challenging the thought
- Replacing it with a more productive one
- Consistent sleep-wake schedule

Sleep onset association & anxiety

- Graduated extinction (eg camping out).
- Checking method.
- Positive reinforcement.
- Visual imagery and relaxation.
- Discuss fears during the day and reassure safety.
- Coping skills eg ‘brave behaviour’, ‘worry book/box’.

Early morning waking

Why is child waking early?

- going to bed too early?
- reward for getting up eg watching TV?

If none of the above, may have a 'lark' body clock, so try…..

- books, toys in bed
- only come out when hear the music or when time says 6:00 on the clock!

Extinction burst

- Burst of behaviour you have extinguished
- Usually 2-3 weeks down the track
- Affects around 20% of children
- Must warn parents about it...otherwise they think they are 'back to square one'

Evidence

Treating Sleep Problems in ADHD

Authors	N	Program	Benefits
Keshavarzi et al. 2014 *World J Biol Psychiatry*	**N=60 ADHD** 40 intervention	12 week sleep training	Sleep Psychosocial health
Hiscock et al. 2015 *BMJ*	**N=244 ADHD** 122 intervention	2 sessions plus phone call	Sleep Psychosocial health Working memory
Corkum et al. 2016 *J Pediatr Psychol*	**N=61 ADHD & non-ADHD** 31 intervention	5 session distance sleep education	Sleep Psychosocial health

Psychological Medicine

cambridge.org/psm

Sustained impact of a sleep intervention and moderators of treatment outcome for children with ADHD: a randomised controlled trial

E. Sciberras[1,2,3,4], M. Mulraney[2,4], F. Mensah[2,3,4], F. Oberklaid[2,3], D. Efron[2,3,4] and H. Hiscock[2,3,4]

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Original Article

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Key words:
Attention-deficit/hyperactivity disorder; intervention; moderator; quality of life; randomised controlled trial; sleep

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Abstract

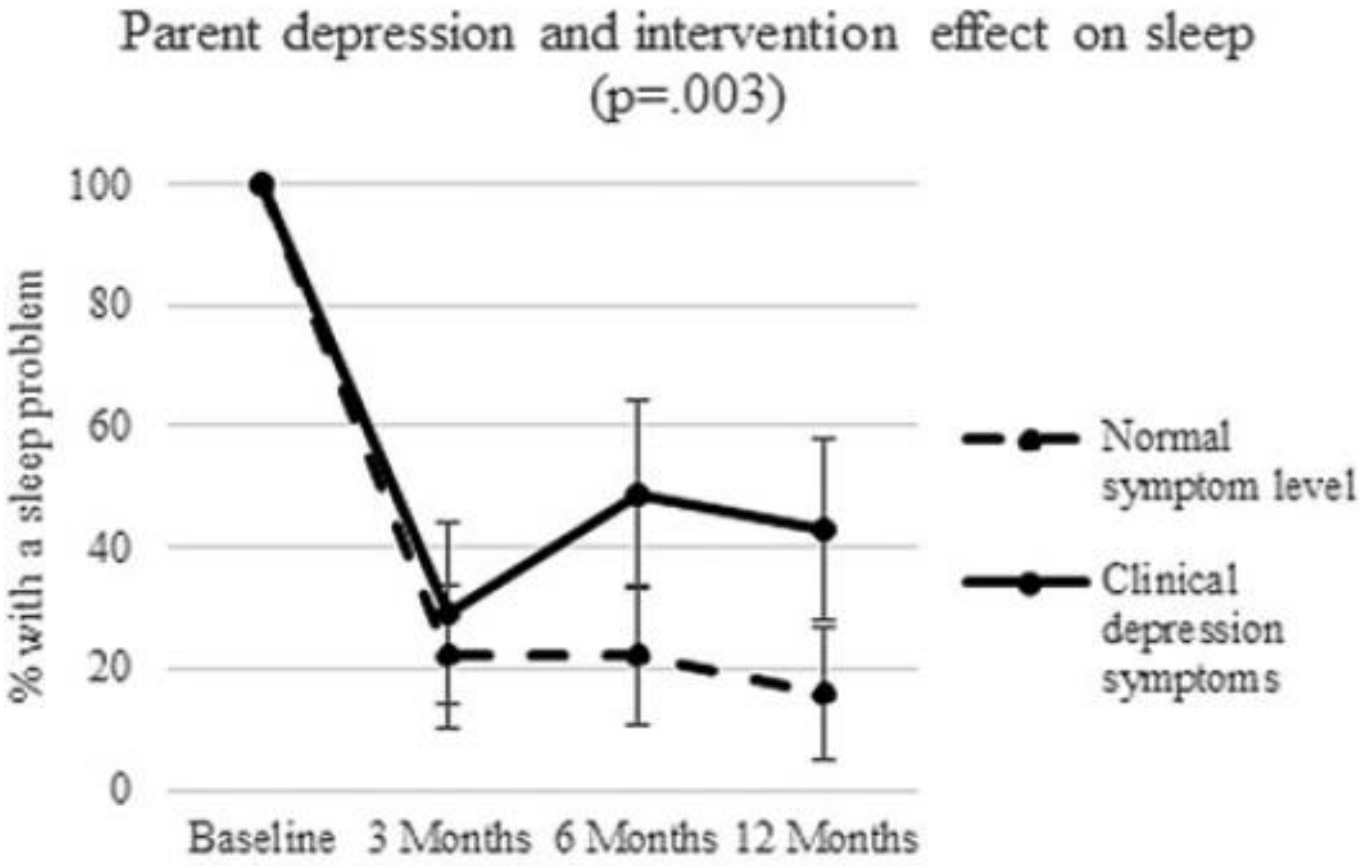
Background. We aim to (1) determine whether a behavioural sleep intervention for children with attention-deficit/hyperactivity disorder (ADHD) leads to sustained benefits; and (2) examine the factors associated with treatment response.

Methods. This study was a randomised controlled trial of 244 children (5–13 years) with ADHD from Victoria, Australia. All participants had a moderate/severe sleep problem that met American Academy of Sleep Medicine criteria for an eligible sleep disorder by parent report. The two-session intervention covered sleep hygiene and standardised behavioural strategies. The control group received usual care. Parent- and teacher-reported outcomes at 12 months included sleep, ADHD severity, quality of life, daily functioning, behaviour, and parent mental health. Adjusted mixed effects regression analyses examined 12 month outcomes. Interaction analyses were used to determine moderators of intervention outcomes over time. The trial was registered with ISRCTN, http://www.controlled-trials.com (ISRCTN68819261).

Results. Intervention children were less likely to have a moderate/severe sleep problem by parent report at 12 months compared to usual care children (28.4% *v.* 46.5%, $p = 0.03$). Children in the intervention group fared better than the usual care group in terms of parent-reported ADHD symptoms (Cohen's *d*: −0.3, $p < 0.001$), quality of life (*d*: 0.4, $p < 0.001$), daily functioning (*d*: −0.5, $p < 0.001$), and behaviour (*d*: −0.3, $p = 0.005$) 12 months later. The benefits of the intervention over time in terms of sleep were less for children not taking ADHD medication and children with parents experiencing depression.

Conclusions. A behavioural sleep intervention for ADHD is associated with small sustained improvements in child wellbeing. Children who are not taking ADHD medication or have parents with depression may require follow-up booster sleep sessions.

SCIBERRAS ET AL. (2019) PSYCH MED



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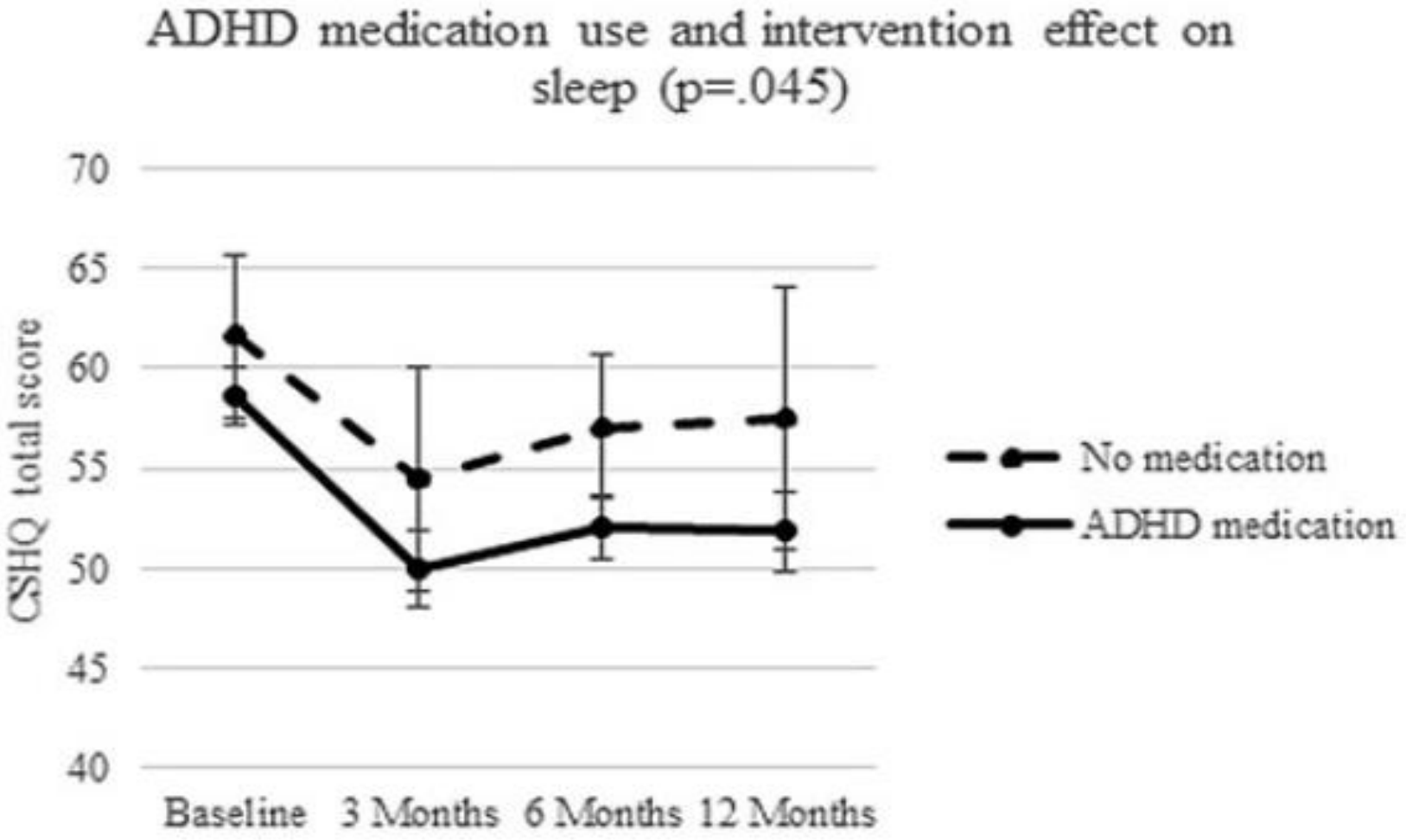

The Journal of Child Psychology and Psychiatry

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Impact of a behavioral intervention, delivered by pediatricians or psychologists, on sleep problems in children with ADHD: a cluster-randomized, translational trial

Harriet Hiscock,[1,2,3] Melissa Mulraney,[2,3] Helen Heussler,[4] Nicole Rinehart,[5] Tibor Schuster,[6,7] Anneke C. Grobler,[3,6] Lisa Gold,[8] Shalika Bohingamu Mudiyanselage,[8] Nicole Hayes,[4] and Emma Sciberras[1,3,5]

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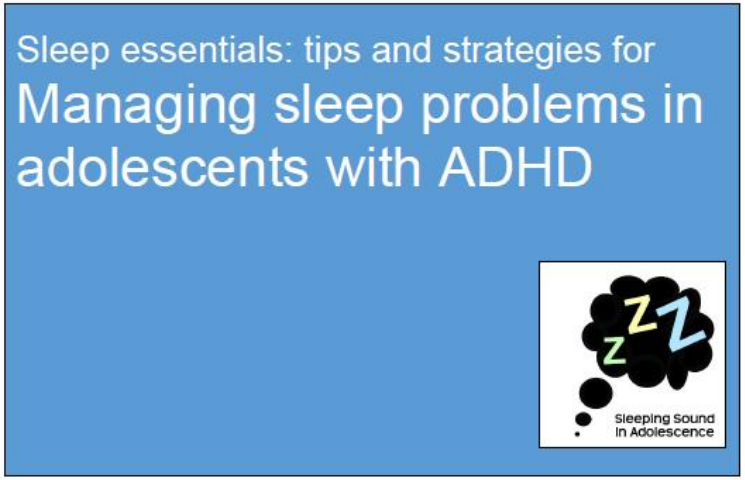
Background: We have demonstrated the efficacy of a brief behavioral intervention for sleep in children with ADHD in a previous randomized controlled trial and now aim to examine whether this intervention is effective and cost-effective when delivered by pediatricians or psychologists in community settings. **Methods:** Translational, cluster-randomized trial of a behavioral intervention versus usual care from 19th January, 2015 to 30th June, 2017. Participants (n = 361) were children aged 5–13 years with ADHD and parent report of a moderate/severe sleep problem who met criteria for American Academy of Sleep Medicine criteria for chronic insomnia disorder, delayed sleep–wake phase disorder, or were experiencing sleep-related anxiety. Participants were randomized at the level of the pediatrician (n = 61) to intervention (n = 183) or usual care (n = 178). Families in the intervention group received two consultations with a pediatrician or a psychologist covering sleep hygiene and tailored behavioral strategies. **Results:** In an intention-to-treat analysis, at 3 and 6 months respectively, the proportion of children with moderate to severe sleep problems was lower in the intervention (28.0%, 35.8%) compared with usual care group (55.4%, 60.1%; 3 month: risk ratio (RR): 0.51, 95% CI 0.37, 0.70, p < .001; 6 month: RR: 0.58; 95% CI 0.45, 0.76, p < .001). Intervention children had improvements across multiple Children's Sleep Habits Questionnaire subscales at 3 and 6 months. No benefits of the intervention were observed in other domains. Cost-effectiveness of the intervention was AUD 13 per percentage point reduction in child sleep problem at 3 months. **Conclusions:** A low-cost brief behavioral sleep intervention is effective in improving sleep problems when delivered by community clinicians. Greater sample comorbidity, lower intervention dose or insufficient clinician supervisions may have contributed to the lack benefits seen in our previous trial. **Keywords:** Sleep; attention-deficit/hyperactivity disorder; randomized controlled trial; effectiveness.



ALL ADOLESCENTS

- Normal sleep
- Healthy Sleep Habits

TAILORED

- Delayed Sleep Phase
- Insomnia
- Muscle relaxation
- Getting up in the morning

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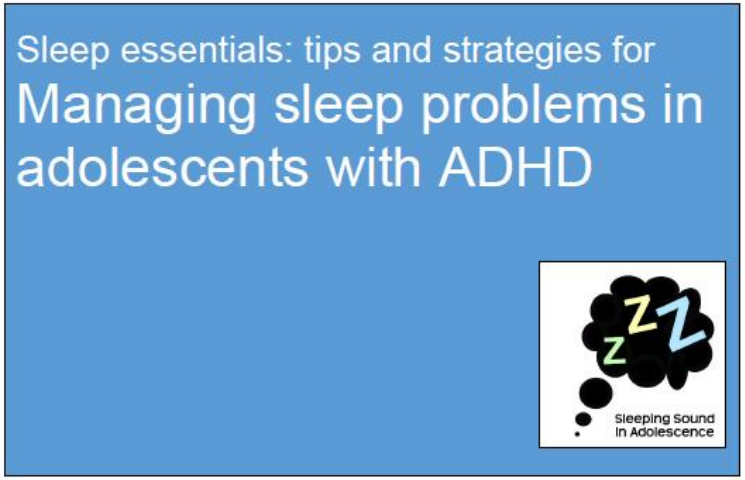

- Adolescent directed sleep plan
- Motivational interviewing
- Simple behavioural experiments
- Monitoring using sleep diaries

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Preliminary Efficacy

	Effect size difference	95% CI
Adolescent Sleep Wake Scale		
Total Score	1.14	.14, 2.13
Going to Bed	.77	-.11, 1.64
Falling Asleep	1.14	.06, 2.23
Maintaining Sleep	1.00	-.13, 2.13
Returning to Sleep	0.61	-.74, 1.96
Returning to Wakefulness	-.44	-1.5, .62
Sleep Disturbance Scale for Children		
Total Score	-.54	-1.96, .89
Disorders of Initiating & Maintaining Sleep	-.73	-1.66, .20

RESOURCES

- https://www.podcastoneaustralia.com.au/podcasts/sleep

- www.raisingchildren.net.au (parenting advice, 0-18 years, evidence-based)

- Sleep Health Foundation http://www.sleephealthfoundation.org.au/pdfs/childrens-sleep-disorders.pdf (parent info for a range of adult and child sleep problems)