

# Sleep and ADHD

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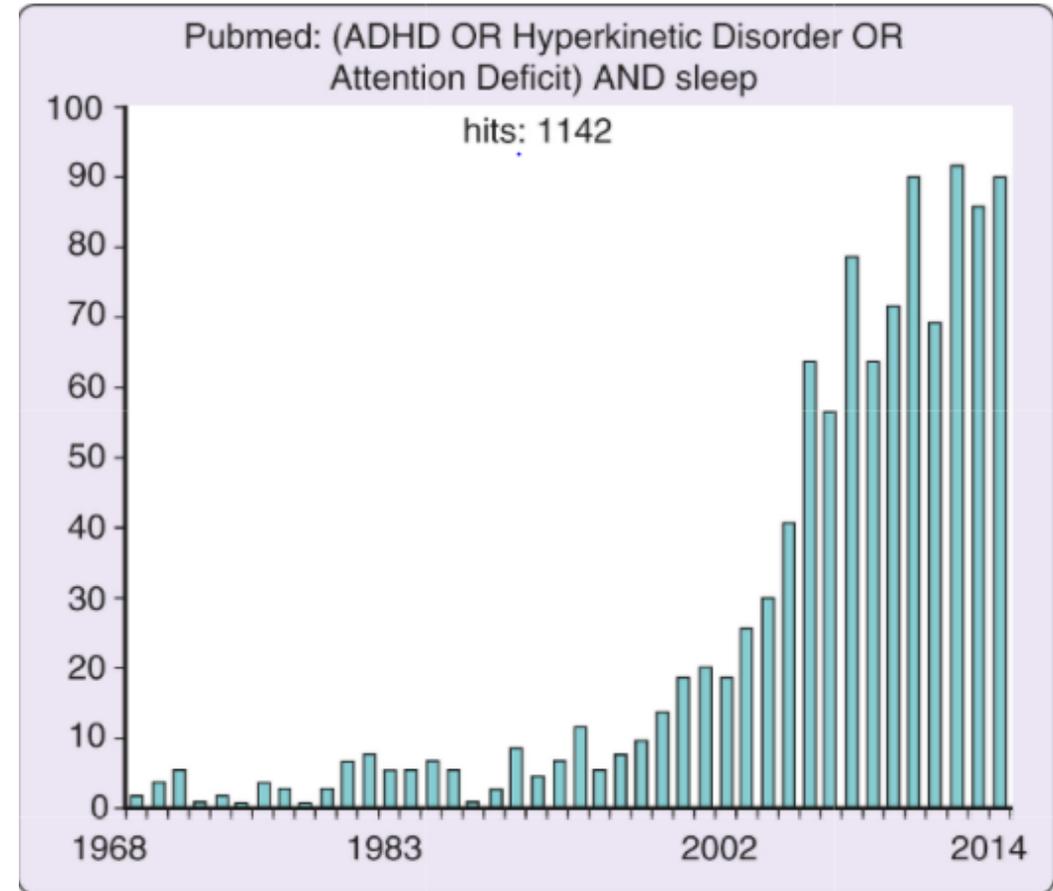
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# Goals

- Demonstrate the close relationship between sleep disorders and ADHD.
- Show the complex multidirectional nature of this relationship.
- Demonstrate how to recognise relevant sleep disorders.
- Discuss treatment options.

# First a Proviso or Two...

- Until around 10 years ago there was very little research into sleep and ADHD.
- There is therefore not a lot of research to draw on.
- A lot of the existing research was conducted in children and we need to extrapolate these results to adults.
- This may be appropriate in some cases but not others.
- There is significant heterogeneity in the criteria used to diagnose ADHD and the sleep disorders.

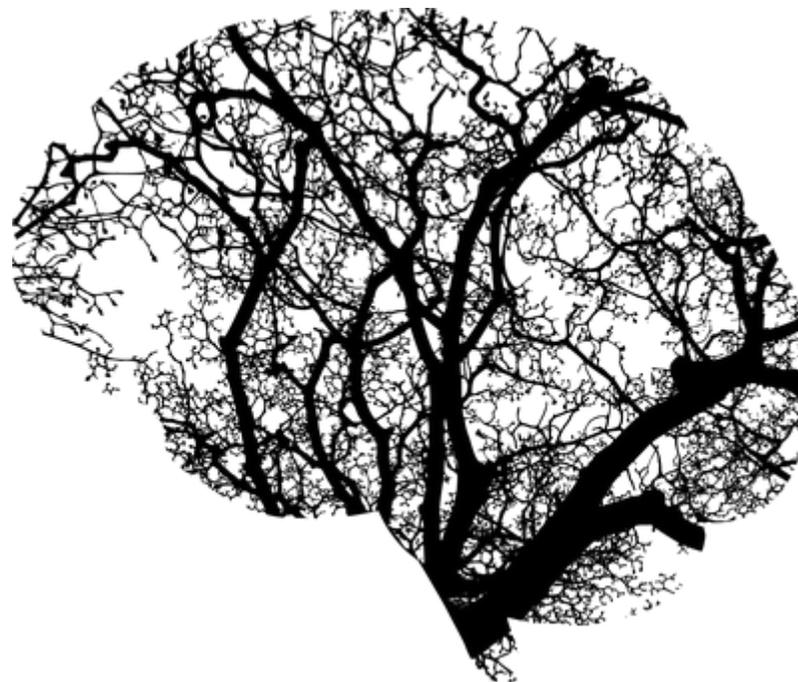


# How Big a Problem Is It?

- 70% of children with ADHD report sleep problems.
- The figures for adults with ADHD are unknown.
- Children with ADHD have:
  - Longer sleep onset latency,
  - Shorter total sleep time,
  - Lower sleep efficiency,
  - More OSA
- Shorter sleep latency on daytime multiple sleep latency test. (Cortese, 2009)

# A Theoretical Basis for the Relationship Between Sleep and ADHD

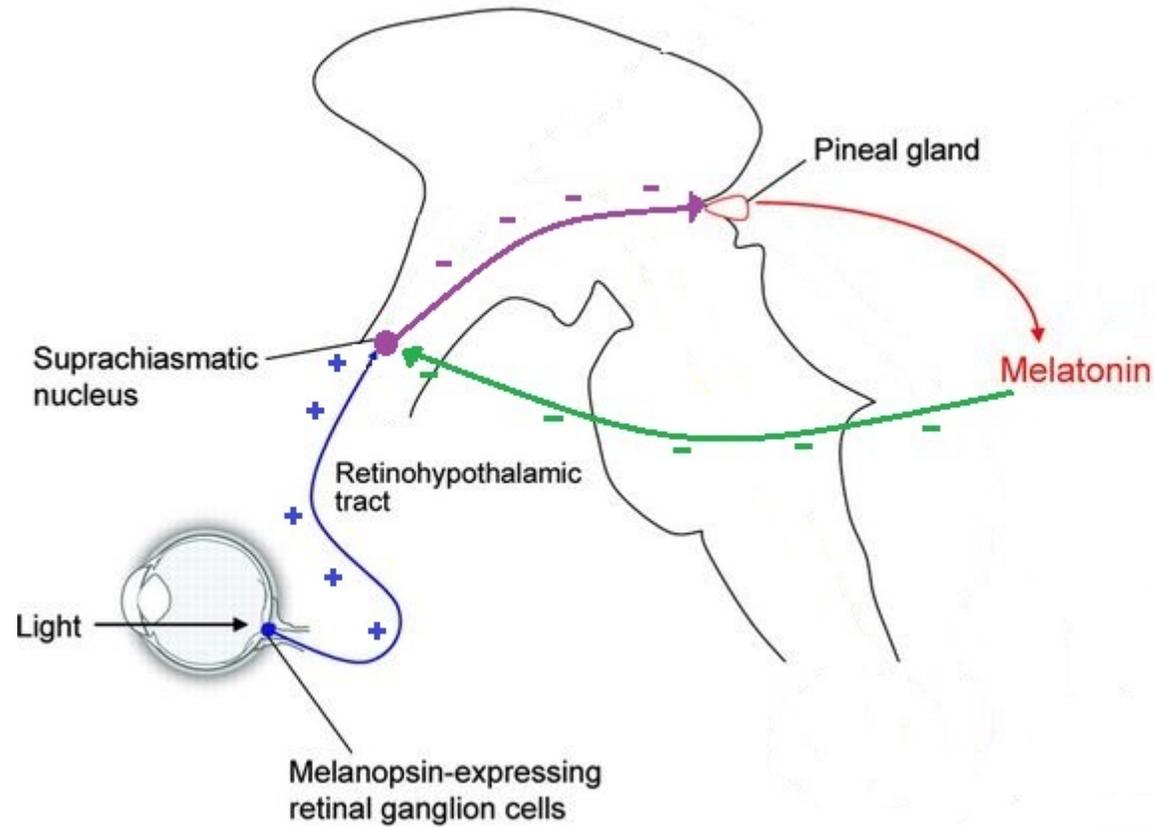
- There is overlap between the cortical and brainstem regions involved in sleep – wake regulation and those implicated in ADHD.
- E.g. frontal, dorsolateral and ventrolateral prefrontal, dorsal anterior cingulate, lateral temporal and parietal, locus coeruleus.



# What is a Circadian Rhythm?

- An innate biological cycle that lasts “about a day” i.e. 24 hours.
- Found in most organisms.
- Governs a range of physiological, psychological and behavioural factors e.g.
  - Immune function
  - Mood
  - Body temperature
  - Cortisol secretion
  - Sleep and wakefulness

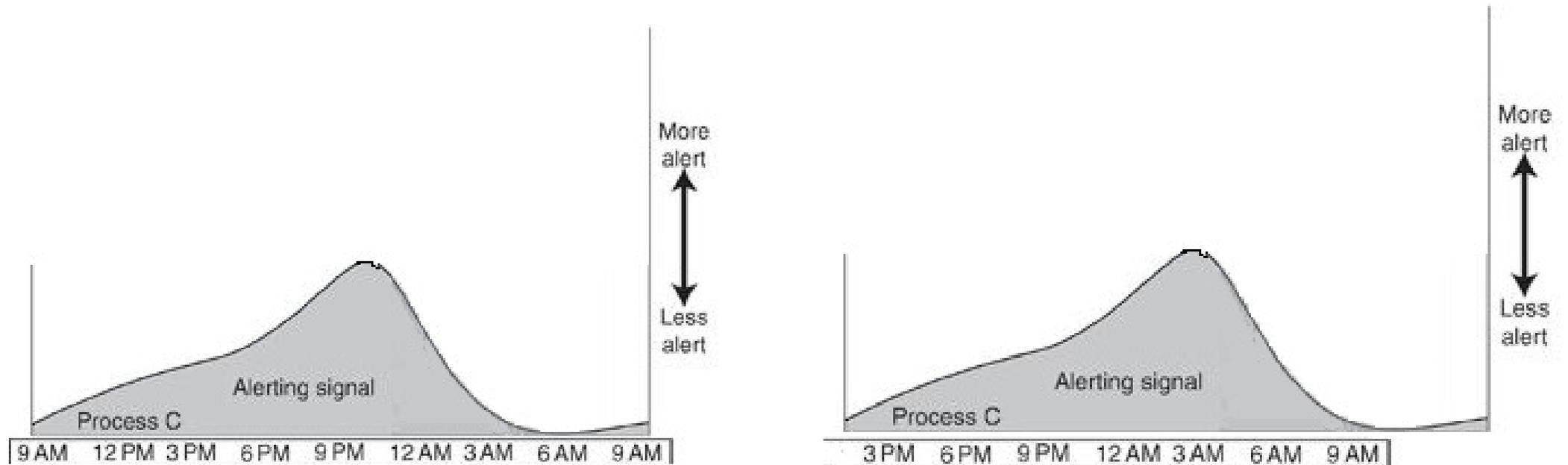
# The Circadian Rhythm



# Delayed Sleep Phase Syndrome

- Body clock is several hours behind external time. Melatonin secretion is delayed.
- Fall asleep very late and, if allowed to, wake up very late.
- My body is in London, but my body clock is in New York.
- If woken will feel significantly worse in the morning and will suffer chronic sleep deprivation.
- Feels most alert late at night.
- Common in adolescents – often mistaken for poor behaviour.

# Why Does DSPS Affect Functioning?

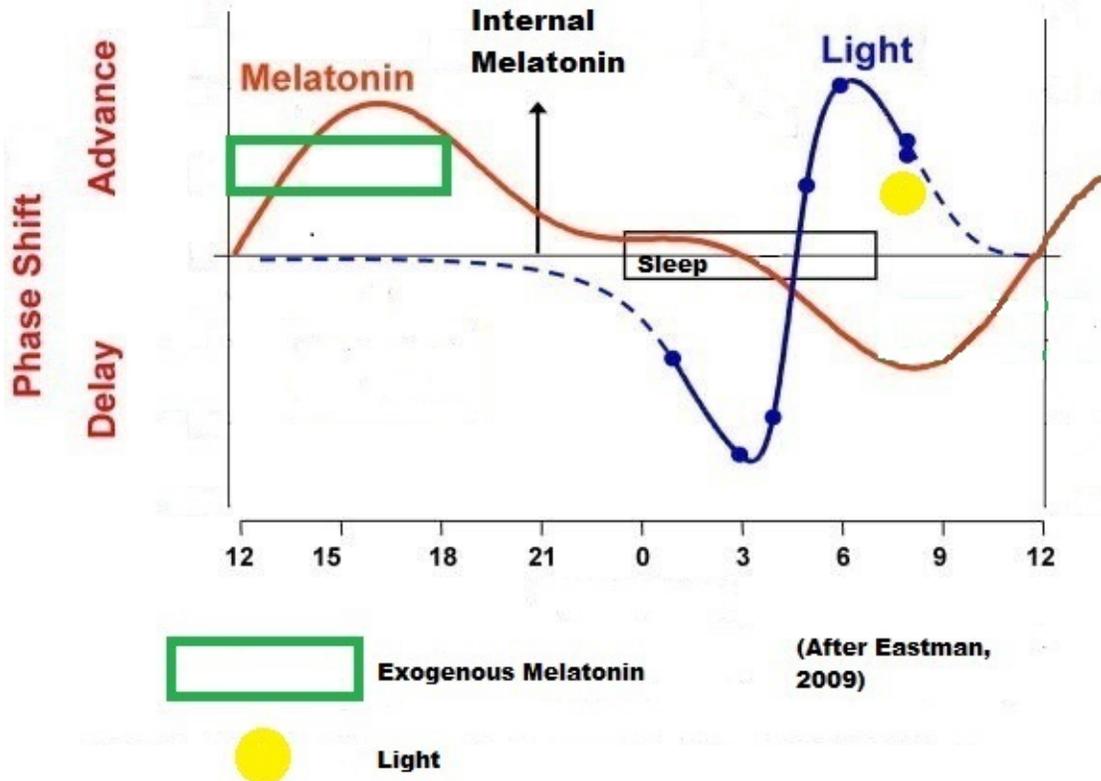


# DSPD and ADHD

- Delayed circadian rhythm in 75% of children and adults with ADHD.
- Melatonin secretion delayed by 105 min in adults and 45 min in children with ADHD. (Kooi, 2014)
- Many ADHD patients are photophobic and wear sunglasses, further delaying the circadian rhythm (Kooi, 2014).



# Treating DSPS



# Treatment

- Phototherapy improves sleep and core ADHD symptoms in adults with ADHD (Rybak, 2006).
- Melatonin improves sleep symptoms, but there is some debate about whether it improves core ADHD symptoms (Van der Heijden, 2007).
- Treatment of the DSPS allows some ADHD patients to discontinue stimulant medication (Borodkin, 2010).

# Restless Legs Syndrome

- Uncomfortable sensation – can be anywhere in the body, but usually the legs.
- Worse at night.
- Worse at rest.
- Temporarily relieved by movement.
- Manifests as sleep onset insomnia.
- Side effect of most antidepressants and antipsychotics especially if they have antidopaminergic or antihistaminergic activity.

# RLS in ADHD

- 10 - 44% of ADHD patients have RLS.
- 26% of RLS patients have ADHD or ADHD symptoms (Cortese, 2017).



# Restless Legs

- Patients can suffer terribly with RLS and never tell a doctor about it.
- So always ask!
- A single question has been shown to have 100% sensitivity and 96.8% specificity for RLS in a neurology outpatient population (Ferri, 2007):
- “When you try to relax in the evening or sleep at night, do you ever have unpleasant, restless feelings in your legs that can be relieved by walking or movement?”
- Is it worse at night?
- Ask them to describe the discomfort – they will almost always struggle to describe it clearly, unlike nocturnal cramps.

# Treating RLS

- Iron (if ferritin < 50 mcg/L).
- Change their medication if possible.
- Dopaminergics eg ropinirole, pramipexole, rotigotine – low doses, but risk of psychosis, compulsive behaviours, augmentation. Have been used successfully off – label in children with ADHD and RLS.
- Anticonvulsants – pregabalin, gabapentin
- Clonazepam
- Opioids

# Obstructive Sleep Apnoea

- Partial or total collapse of the airway during sleep.
- Leads to multiple arousals and often oxygen desaturations during the night.
- Leads to massively disrupted sleep with daytime sleepiness and/or fatigue.

# OSA and Cognition

- 80% of OSA patients report subjective cognitive impairment (Guilleminault, 1978).
- Meta-analyses found consistent deficits in motor coordination, vigilance & executive function. The impact on memory was inconsistent but was there more often than not, and there was no impact on intelligence or verbal abilities (Beebe, 2003; Aloia, 2004).
- Performance, eg on vigilance tasks, may be normal in short tests but deteriorate in longer tests suggesting that fatigueability is an important factor (Weaver, 2001).

# OSA and ADHD

- Very little research in adults.
- Prevalence of OSA in children with ADHD diagnosis 18-65%.
- The majority of children with OSA and ADHD have mild OSA? (Cortese, 2017)
- In children with OSA, adenotonsillectomy halved the number of patients who met the criteria for ADHD (Chervin, 2006).
- Improvements in hyperactivity, inattention and total score on ADHD rating scales is greater in children with mild sleep disordered breathing and ADHD who had an adenotonsillectomy than those on methylphenidate (Huang, 2007).

# Assessing and Treating OSA

- A clinical history of snoring, nocturia, observed or subjective pauses in breathing and daytime fatigue/sleepiness.
- Screening with home pulse oximetry or home respiratory studies now widely available through sleep disorder centres or respiratory medicine/ENT units.
- Mild OSA – mandibular advancement splint.
- Moderate to severe OSA – CPAP.

# ADHD Drugs and Sleep

- Stimulants have insomnia as a side effect.
- Patients need to be educated about not taking stimulants too close to bedtime.
- If using a modified release methylphenidate, and top up doses are required later in the day, it may be better to use short acting methylphenidate for these top ups.
- Atomoxetine leads to less sleep disruption on subjective and objective measures than methylphenidate.

# Insomnia

- Difficulty initiating or maintaining sleep, or having sleep of poor quality, leading to daytime dysfunction.
- Prevalence in ADHD unknown.
- One needs to exclude RLS or DSWPD in order to confirm the diagnosis.
- Is a side effect of ADHD medications, though some patients report improvement in insomnia on starting ADHD meds.

# Hypnotics

	Tmax (hours)	T <sub>1/2</sub> (hours)	Hangover
Zopiclone	0.5-2	5-6	Yes
Zolpidem	1.7-2.5	1.5-2.5	Probably not
Temazepam	1-3	8-20	Maybe
Clonazepam	1-2	35-40	Yes

# Insomnia prescribing: Practical Advice

- Avoid polypharmacy if possible.
- If initial or mid insomnia then zolpidem or zopiclone probably best.
- If terminal insomnia then use a longer acting drug e.g. zopiclone at bedtime.
- Hypnotics should be taken at (and only at) bedtime.

# Insomnia prescribing: Practical Advice

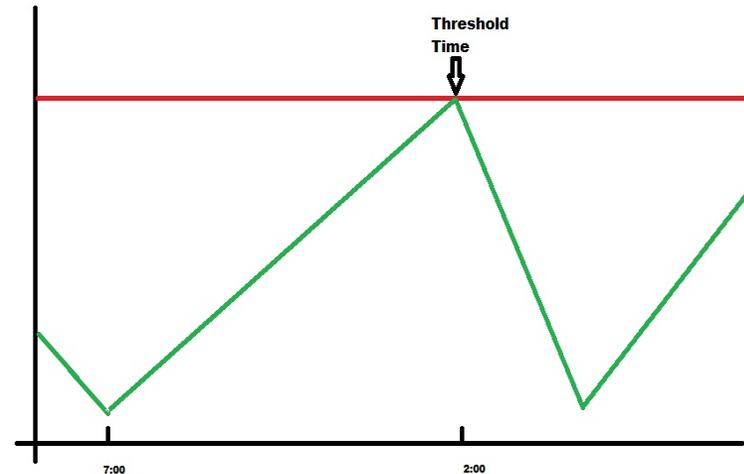
- If daytime sedation is undesirable avoid long acting drugs (always ask about driving).
- Intermittent dosing may reduce the risk of physiological tolerance but repeated rebound insomnia may raise risk of psychological dependence.
- If tolerance develops consider switching to a different class of drug rather than escalating dose.
- Don't rely solely on medication – combine with behavioural approach.<sup>1</sup>

# What Are You Aiming For

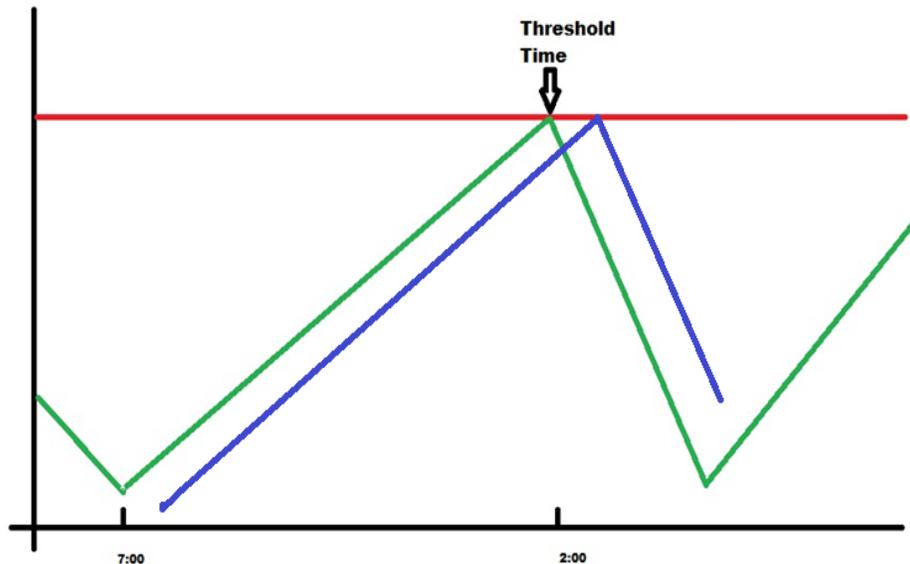
- Discard the myth of the 8 hour sleep.
- The average sleep time in adults in the Western world is about 7.5 hours.
- But there is variation either side of that mean.
- Explain that the right amount of sleep for them at the moment is the amount that makes them feel alert most of the day most days.

# The Homeostatic Sleep Drive

- From the moment we wake up in the morning we start to accumulate sleepiness. We are filling up our sleep tank with sleep fuel.
- When we sleep at night we use up the fuel.
- When we run out of fuel in the morning we wake up.

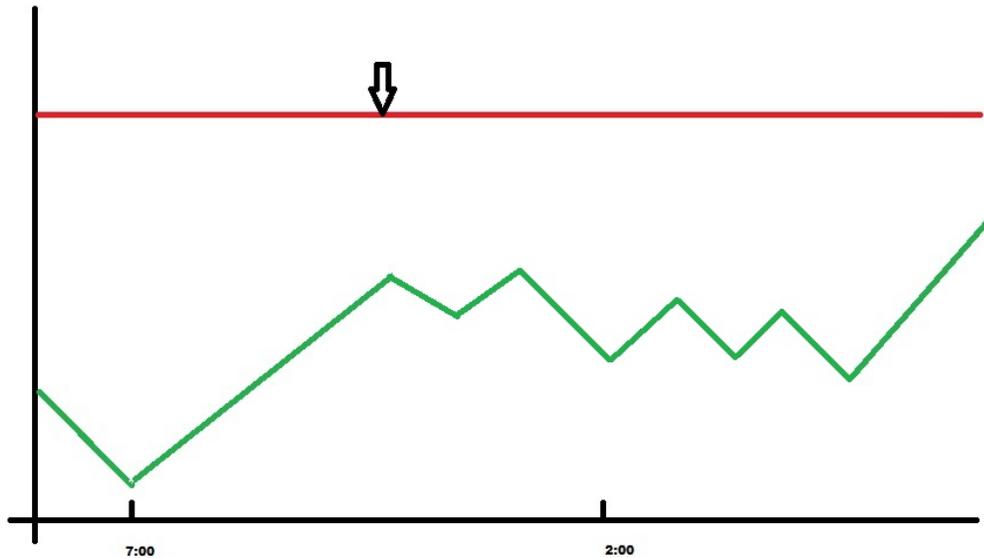


# Start Filling Your Tank at the Same Time Every Day



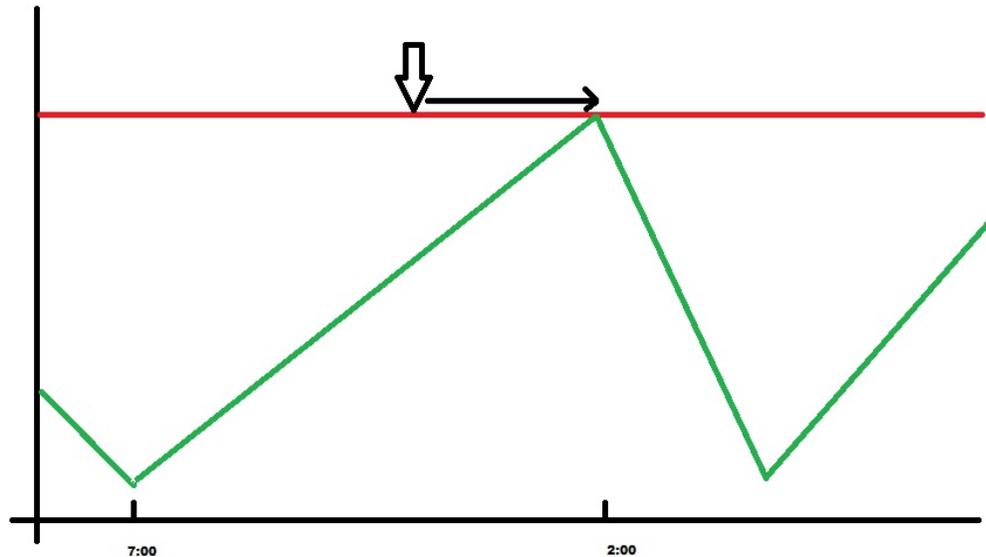
- Set an alarm to wake up and get up at the same time every day.
- If you start to fill your tank at the same time every day, it will reach full at the same time every night.
- You will therefore feel sleepy at the same time every night and your bed time will become more consistent too.

# Jealously Guard Your Sleep Fuel



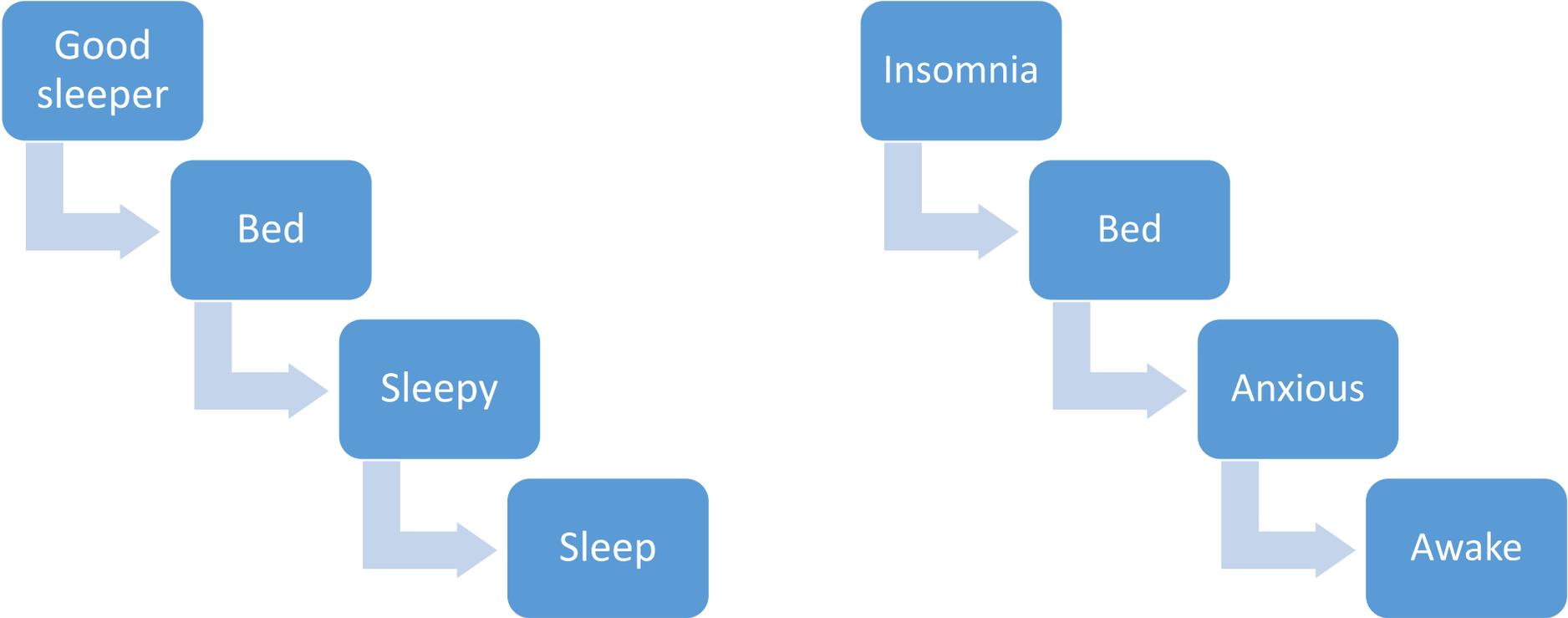
- Every time you nap (intentionally or unintentionally) you use up some of your sleep fuel.
- Any sleep during the day is stealing some of your sleep from the night.
- So avoid napping if possible.

# Go to Sleep When Your Tank is Full



- Set an earliest bed time which is calculated as follows:
- Earliest bed = Rising time – average sleep time.
- Only go to bed when you have reached that earliest bed time and you are sleepy.
- When at least 90% of the time in bed is spent asleep we move the earliest bedtime 15 min earlier.
- This technique improves the sleep quality and then the quantity.

# The Power of Conditioning



# Harness the Power of Classical Conditioning 1

Allowed in the Bedroom	Not Allowed in the Bedroom
<ul style="list-style-type: none"><li>• Sleep</li><li>• Sex</li><li>• Getting dressed and undressed (as long as you don't spend more than a few minutes doing this)</li></ul>	<ul style="list-style-type: none"><li>• Reading (yes, reading!)</li><li>• Audiobooks/radio/TV/music</li><li>• Computer/iPad</li><li>• Texting/Talking on the phone</li><li>• Meditation/Prayer</li><li>• Relaxing</li><li>• Exercising</li><li>• Ironing</li><li>• Working/Studying</li><li>• Eating/Drinking</li><li>• Conversations</li><li>• Painting/crosswords/knitting etc.</li></ul>
<p><b>Note:</b> This list is complete. There are <b><u>NO</u></b> other activities that are allowed in the bedroom.</p>	<p><b>Note:</b> This list is incomplete. <b><u>ANY</u></b> other activity you can think of goes in this column!</p>

# Harness the Power of Classical Conditioning 2

- If you are not asleep in about 15 minutes get up, get out of bed, get out of the bedroom and do something relaxing and enjoyable.
- Do not return to bed until you feel sleepy.
- If you do not fall asleep within 15 minutes repeat the above.
- Remember the mantra: **I am not doing this tonight to sleep better tonight. I may sleep worse tonight. I am doing this tonight to sleep better in a month.**

# Case Study

- 26 year old female corporate lawyer.
- Diagnosed with ADHD aged 17 in USA.
- Started on Concerta 18mg, later increased to 27 then 36mg.
- Developed insomnia on Concerta 36mg so started on zopiclone 7.5mg.
- This led to her feeling drowsy in the morning and therefore Concerta was increased to 54mg.
- This made the insomnia worse so zopiclone increased to 11.25mg.
- Which led to more morning sedation....
- When seen in my clinic on Concerta 108mg + zopiclone 22.5mg.

# Options...

- Reduce Concerta.
- Switch some of the Concerta to immediate release methylphenidate.
- Switch Concerta to atomoxetine.
- Reduce zopiclone.
- Switch zopiclone to zolpidem.
- Cognitive behaviour therapy for insomnia.

# Questions?

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