Cognitive Behaviour Therapy for Insomnia of Older Adults:

An Interactive Hands-on Workshop

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cagp | acgp

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Faculty/Presenter Disclosure

- **Faculty:** Gail Myhr

- **Relationships with commercial interests:**
  - Employee of Régie de l'assurance du Québec
  - Staff member of McGill University Health Centre

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- This program has received no financial support from outside organizations.
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Key Learning Objectives

At the end of the session, the participant will:

1. Be familiar with the evidence for CBTi in older adults
2. Understand the effects of age and medications on sleep architecture
3. Conceptualize processes causing and maintaining insomnia in older adults
4. Use stimulus control and sleep restriction to reverse conditioned arousal and improve sleep quality
5. Use cognitive interventions to reduce psychological arousal and eliminate sleep effort

References

- Manber & Carney. (2015) *Treatment Plans and Interventions for Insomnia, A Case Formulation Approach*. New York, Guilford.
- Mitchell, Gehrman, Perlis & Umscheid. (2012) Comparative effectiveness of cognitive behavioral therapy for insomnia: a systematic review. *BMC Family Practice* 13:40
- Carney et al (2012) The Consensus Sleep Diary: Standardizing prospective sleep self-monitoring. Sleep, 35 (2), 287-302.
- Morin, C.M. (1993) *Insomnia: Psychological Assessment and Management.* New York, Guilford.
- Morin & Espie (2003). *Insomnia: A clinician's guide to assessment and treatment.* New York: Springer.

Agenda

- Measuring Sleep
- Insomnia Disorder
- Why CBT-I?
- Sleep Architecture
- Conceptualizing Insomnia in CBT-I:
    1. Sleep drive
    2. Circadian clock
    3. Conditioned arousal
    4. Arousal related to sleep cognitions (sleep effort, safety behaviours)
    5. Arousal related to general worry
    6. Other factors
- CBT-I interventions

Measuring Sleep

Group Exercise: Calculating your own Sleep Parameters

Three Ways to participate in poll:

1. TEXTING:

    Send text to 37607 with message as follows: GAILMYHR553

2. ONLINE:

    Visit website: PollEv.com/gailmyhr553

3. APP: If you have the Poll Everywhere App:

    Log in as a participant, join a presentation with username: gailmyhr553

NB: PLEASE TURN OFF YOUR CELL PHONE RINGER!

CONSENSUS SLEEP DIARY-M (2011)	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
What time did you get into bed?							
What time did you try to go to sleep? (lights out)							
How long did it take you to fall asleep?							
How many times did you awaken, not counting final one?							
In total, how long did these awakenings last?							
What was your final awakening?							
After your final awakening, how long did you stay in bed?							
What time did you get out of bed for the day?							
How would you rate the quality of your sleep?							
How refreshed did you feel when you woke up?							
How many times did you nap or doze?							
In total, how long did you nap or doze?							
# caffeinated drinks? Time of last one?							
# alcoholic drinks? Time of last one?							
Medications, dose & time taken. (OTC & prescription)							

Sleep Parameters & Sleep Log

- **SOL** = Sleep Onset Latency = time to fall asleep
- **WASO** = Wakefulness after Sleep Onset = time awake in the middle of the night between falling asleep and waking up
- **TIB** = Time in Bed = lights out till out of bed in the am
- **TWT** = Total Wake Time = time to fall asleep + time awake in night + time lingering in bed in the am
- **TST** = Total Sleep Time = TIB - TWT
- **SE** = Sleep Efficiency = Time asleep /Time allotted for sleep = TST/TIB

Sleep Parameter Table

Date	Day	TIB (hrs)	SOL (hrs)	WASO (hrs)	Bed Linger (hrs)	TWT (hrs)	TST (hrs)	SE
	AVE							

Weekly Parameters Sample

Date	Day	TIB (hrs)	SOL (hrs)	WASO (hrs)	Bed Linger (hrs)	TWT (hrs)	TST (hrs)	SE
11/07/2016	Mon	10.0	2.0	2.0	0.5	4.5	5.5	55%
12/07/2016	Tues	12.0	1.0	3.0	1.0	5.0	7.0	58%
13/07/2016	Wed	11.0	0.5	2.0	1.0	3.5	7.5	68%
14/07/2016	Thurs	9.0	1.0	2.0	1.0	4.0	5.0	56%
15/07/2016	Fri	12.0	2.0	1.0	2.0	5.0	7.0	58%
16/07/2016	Sat	10.5	2.0	1.0	2.0	5.0	5.5	52%
17/07/2016	Sun	10.5	1.0	2.0	1.0	4.0	6.5	62%
	AVERAGE	**10.7**	**1.4**	**1.9**	**1.2**	**4.4**	**6.3**	**59%**

Sleep Parameters Suggesting Insomnia

- SOL = greater than 30 minutes
- WASO = greater than 30 minutes
- TST = varies with age, individual.
  - older adults < 5 or 6 hrs
  - Teens < 7 hrs
- SE = <85%

Recommended Sleep Guidelines

Age Group	Recommended	May be appropriate	Not recommended
14-17 hrs	8-10 hrs	7 hrs 11 hrs	< 7 hrs > 11 hrs
18- 25 yrs	7-9 hrs	6 hrs 11 hrs	< 6 hrs > 11 hrs
26-64 yrs	7-9 hrs	6 hrs 10 hrs	< 6 hrs > 10 hrs
>65	7-8 hrs	5-6 hrs 9 hrs	< 5 hrs > 9 hrs

National Sleep Foundation, 2015

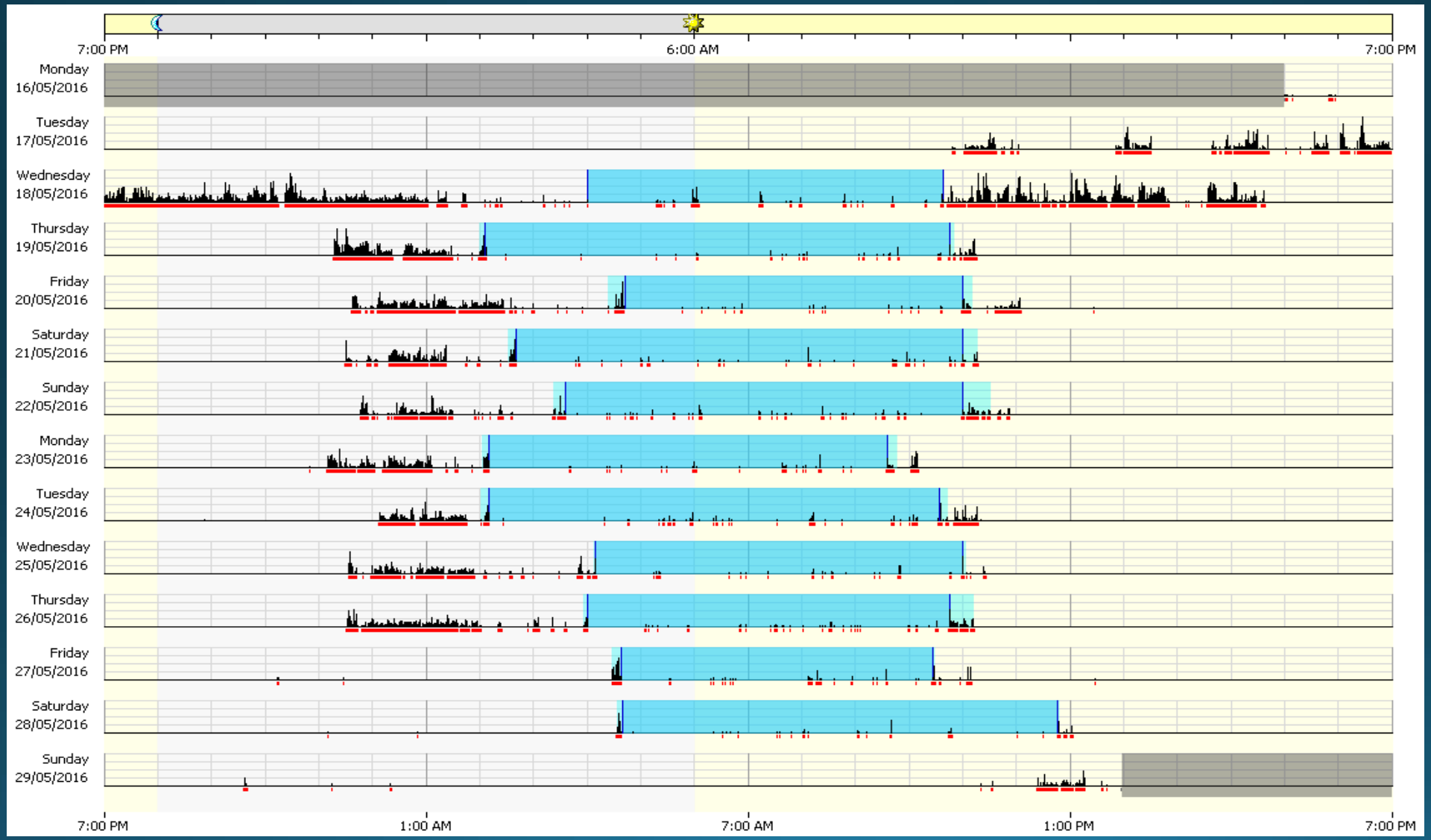
PSG vs Self-report

- PSG = Polysomnography objective measure
- Insomniacs vs Good sleepers
  - underestimate the time they sleep compared to PSG results
  - overestimate the time taken to fall asleep
  - more likely to identify themselves as being awake when awakened from PSG-defined sleep *(Perlis 97)*
  - on average, sleep 25 min less, take 12 min longer to fall asleep than good sleepers *(Perlis 01)*
  - "paradoxical insomnia" =report little or no sleep, yet daytime impairment similar to average insomniac

Sleep Measurement

- Self Report
- Polysomnography (PSG) = gold standard
- Actigraphy
- Fitbit – compared to PSG, actigraphy *(Meltzer et al, 2015)*
  - Normal mode – overestimates TST (41 min) & SE (8%), compared to PSG
  - Sensitive mode – underestimate TST (105 min) & SE (21%)

Sample Actiwatch Tracing



Case of Mrs. M

Case of Mrs. M

- 84 year old married woman, living alone in a senior's residence. Husband in a nursing home with dementia.
- CC: fatigue and poor sleep.
- Sleep Habits:
  - Sleepy in the evening, and often falls asleep watching TV for ½ - 1 hr.
  - Goes to bed around 9:30 pm, reads an hour then lights out.
  - As soon as light is out, feels wide awake. Begins to worry about her husband, various household details (bills etc). Can be awake till early hours of the morning.
  - Up at 5 am to take her thyroid pill, then back to bed where she dozes lightly or stays awake till gets up for breakfast at 8.
  - May cancel social activities next day if hasn't slept enough. (e.g. "I won't be any good at bridge.")

Case of Mrs. M

- Exhausted all day, but no deliberate napping.
- Substances, meds:
  - L-thyroxine, 0.125 mg daily.
  - Two glasses of wine with dinner. No caffeinated drinks. Eats chocolate in the evening.
- Medical history
  - Bilateral knee OA. Primary hypothyroidism.
- Sleep-related beliefs:
  - I need at least 8 hours of sleep to function.
  - If I'm tired, I can't do my usual activities.
  - I can't sleep if I'm worried about something
  - I can't sleep if my knees hurt.
  - Poor sleep is a part of getting old.
  - Getting old is "for the birds".

Group Exercise: Calculating Mrs. M's sleep parameters

CONSENSUS SLEEP DIARY (2011) Patient Mrs M	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
What time did you get into bed?	21:00h						
What time did you try to go to sleep? (lights out)	22:00h						
How long did it take you to fall asleep?	2 h		TIB= ?				
How many times did you awaken, not counting final one?	1		SOL = ?				
In total, how long did these awakenings last?	2 hr		WASO = ?				
What was your final awakening?	7:30		TWT = ?				
After your final awakening, how long did you stay in bed?	0.5 h		TST = ?				
What time did you get out of bed for the day?	8:00h		SE = ?				
How would you rate the quality of your sleep?	poor						
How refreshed did you feel when you woke up?	Not at all						
How many times did you nap or doze?	1						
In total, how long did you nap or doze?	1 hr						
# caffeinated drinks? Time of last one?	0						
# alcoholic drinks? Time of last one?	2/1800h						
Medications, dose & time taken. (OTC & prescription)	5:00h, Th						

Poll everywhere:

Weekly Parameters Mrs M

Date	Day	TIB (hrs)	SOL (hrs)	WASO (hrs)	Bed Linger (hrs)	TWT (hrs)	TST (hrs)	SE
11/07/2016	Mon	10	2	2	0.5	4.5	5.5	55%
	AVERAGE							

Weekly Parameters Ms M

Date	Day	TIB (hrs)	SOL (hrs)	WASO (hrs)	Bed Linger (hrs)	TWT (hrs)	TST (hrs)	SE
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Insomnia Disorder

Insomnia Disorder (DSM-5)

A. Dissatisfaction with sleep quantity or quality. One or more of:
   1. Difficulty initiating sleep
   2. Difficulty maintaining sleep
   3. Early morning awakening

B. Clinically significant distress, impairment of functioning

C. At least 3 nights/week

D. At least 3 months duration

E. Despite adequate opportunity

F. Not better explained by other sleep disorders (narcolepsy, OSA)

G/E. Not attributable to substance, mental or medical disorders

Daytime Impairments of Poor Sleep

(Eidinger 04)

- Sleepiness
- Fatigue
- Impairment attention, concentration, memory
- Irritability, low mood
- Reduced motivation
- Errors at work, driving
- Headache, GI symptoms
- Worries about sleep

Insomnia in Older Adults

- 1/3 of older adults in community have sx of insomnia *(Foley 95)*
- report more severe insomnia sx than younger adults
- less sleepy the next day than younger insomniacs
- greater subjective-objective sleep discrepancy
  - > 35% older adults estimate their sleep to be >1 hr more or less than actigraphy sleep *(van den Berg 08)*
  - varies in direction and magnitude from night to night
  - discrepancy reduces after CBTi *(Kay 15)*
- insomnia in older adults – predicts depression onset, recurrence & relapse *(Livingston 93)*

Hypnotics in Older Adults

- 10-15 % older adults use hypnotics *(Lichstein 92)*– greater prevalence and persistence of sleep difficulties
- age-related absorption & metabolic changes ->
  - increased drug half life, excess drug accumulation
  - residual daytime cognitive & motor impairment
  - worsen sleep disordered breathing
  - increased risk accidents – falls*, MVAs
- tolerance, dependence, rebound anxiety after as little as one week -> rebound insomnia & anxiety -> resumption of BZD use (neg reinforcement)

*incr risk falls in insomnia as well *(Widera 13)*

Symptoms suggesting other sleep disorders

- Inability to fall asleep at desired conventional time
- Difficulty awakening at desired, socially acceptable time
- Sleep ok when allowed to use preferred schedule
- Preferred schedule delayed >2 hrs relative to desired conventional clock
  - E.g. fall asleep naturally at 4 am, awaken naturally at 1 pm

- Suggested Diagnosis: **?**

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- Suggested Diagnosis: **Circadian rhythm sleep-wake disorder, delayed sleep phase type**

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- Difficulty awakening at desired, socially acceptable time
- Sleep ok when allowed to use preferred schedule
- Preferred schedule delayed >2 hrs relative to desired conventional clock
  - E.g. fall asleep naturally at 4 am, awaken naturally at 1 pm
- Suggested Diagnosis: **Circadian rhythm sleep-wake disorder, delayed sleep phase type**
- Proceed with: (Sleep specialist?): Schedule manipulation, use of light/dark exposure, melatonin

Symptoms suggesting other sleep disorders

- Inability to stay awake until a desired conventional bedtime
- Difficulty staying asleep until a desired, socially acceptable wake up time
- Sleep ok when allowed to use preferred schedule
- Preferred schedule advanced >2 hrs relative to desired conventional clock
  - E.g. fall asleep naturally at 8 pm, awaken naturally at 3 am

- Suggested Diagnosis: **?**

Symptoms suggesting other sleep disorders

- Inability to stay awake until a desired conventional bedtime
- Difficulty staying asleep until a desired, socially acceptable wake up time
- Sleep ok when allowed to use preferred schedule
- Preferred schedule advanced >2 hrs relative to desired conventional clock
  - E.g. fall asleep naturally at 8 pm, awaken naturally at 3 am

- Suggested Diagnosis: **Circadian rhythm sleep-wake disorder, advanced sleep phase type**

Symptoms suggesting other sleep disorders

- Inability to stay awake until a desired conventional bedtime
- Difficulty staying asleep until a desired, socially acceptable wake up time
- Sleep ok when allowed to use preferred schedule
- Preferred schedule advanced >2 hrs relative to desired conventional clock
  - E.g. fall asleep naturally at 8 pm, awaken naturally at 3 am

- Suggested Diagnosis: **Circadian rhythm sleep-wake disorder, advanced sleep phase type**
- Proceed with: (Sleep specialist?): Schedule manipulation, use of light/dark exposure, melatonin

Symptoms suggesting other sleep disorders

- snoring, choking in the night
- unrefreshing sleep and EDS despite adequate sleep time
- morning headache
- dry mouth
- frequent urination during the night
- hypertension

- Suggested Diagnosis: **?**

Symptoms suggesting other sleep disorders

- snoring, choking in the night
- unrefreshing sleep and despite adequate sleep time
- EDS – struggling to stay awake during driving, talking to others etc
- morning headache
- dry mouth
- frequent urination during the night
- hypertension

- Suggested Diagnosis: **Obstructive sleep apnea**

Symptoms suggesting other sleep disorders

- snoring, choking in the night
- unrefreshing sleep and despite adequate sleep time
- EDS – struggling to stay awake during driving, talking to others etc
- morning headache
- dry mouth
- frequent urination during the night
- hypertension

- Suggested Diagnosis: **Obstructive sleep apnea**
- Proceed with: Sleep specialist, Polysomnography: CPAP. CBTi ok if controlled

Symptoms suggesting other sleep disorders

- Strong urge to move legs
  - worse in evening or during inactivity
  - relief by moving
  - urge interferes with falling asleep or staying asleep

- Suggested Diagnosis: **?**

Symptoms suggesting other sleep disorders

- Strong urge to move legs
  - worse in evening or during inactivity
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  - urge interferes with falling asleep or staying asleep

- Suggested Diagnosis: **Restless Legs Syndrome**

Symptoms suggesting other sleep disorders

- Strong urge to move legs
  - worse in evening or during inactivity
  - relief by moving
  - urge interferes with falling asleep or staying asleep

- Suggested Diagnosis: **Restless Legs Syndrome**
- Proceed with: check aggravating factors (ferritin, meds), consider medications (DA agonists, alpha-2 delta Ca channel ligands, BZD)

Why CBTi??

CBTi in Primary Insomnia Disorder

- recognized first-line treatment for insomnia
  - NIH Consensus Statement 2005
  - British Association of Psychopharmacology *(Wilson 10)*
- sleep hygiene alone not effective in insomniacs *(Morin 06)*
- CBTi leads to improvement in sleep initiation and/or maintenance
- improvement sustained for 6-24 months post-treatment *(Morin 06)*

CBTi Efficacy in Older Adults*

Parameter	Adults (Cohen's d)	Adults > 55 yo (Cohen's d)
Sleep Latency	-0.52	-0.51
Sleep Quality	0.89	0.60
Wakefulness after Sleep Onset	-0.57	-0.73
Sleep Efficiency	1.00	0.38
Total Sleep Time	0.42	-0.19

Cohen's d= (M1-M2)/Pooled SD
0.2 - a 'small' effect size
0.5 - a 'medium' effect
0.8 - large' effect size.

Irwin, 06.
23 RCTs Meta-analysis

CBTi with Comorbid Psychiatric Disorders

- CBTi effective for insomnia co-morbid with psychiatric disorders
- remission of primary disorder may not resolve sleep problems
- major depressive episodes & onset of sleep problems
  - 40% onset before
  - 30% onset during
  - 30% onset after
- poor sleep predicts future depressive episodes
- CBTi reduces insomnia but also improve depression
  - Manber 08: CBTi + escitalopram vs control rx + escitalopram *(Manber 08)*
  - depression remission 61.5% vs 33.3%
  - insomnia remission – 50% vs 7.7%

CBTi with Comorbid Medical Disorders

- Medical co-morbidity, CBTi effectiveness in:
  - chronic pain - "lightens" sleep, increased sensitivity to pain the next day
    - e.g. lower back pain in older adults *(Bramoweth 16)*
  - cancer
  - HIV
  - migraine
- may have to augment with counter-fatigue measures *(Seibern 11)*
    - scheduled short naps, exercise, judicious use of caffeine

CBTi vs Medications for Insomnia

- CBTi equivalent efficacy to sleep medications
  - temazepam *(Morin 99)*
  - zopliclone *(Sivertsen 06)*
- CBT-I vs Medications *(Mitchell 12)*
  - medications act faster
  - CBT-I effects more durable (1-2 yrs) *(Morin 99)*
- If CBTi administered to older adults with hypnotics, still effective *(Soeffing 08)*
- CBTi effects more durable if hypnotic discontinued during CBTi *(Morin 09)*
  - CBTi + zolpidem acute rx
  - 6 mon maintenance w combo or CBTi alone – no difference
  - 6 mon f/u, pts better off if d/c of meds during active treatment

CBTi vs Medications*

Parameter	Pharmacotherapy (Cohen's d)	CBTi (Cohen's d)
Sleep Onset Latency	0.45	***1.05†***
Sleep Quality	1.20	1.44
Wakefulness after Sleep Onset	0.89	1.03
Sleep Efficiency	-	-
Total Sleep Time	0.84	0.46

† Significant difference

**Smith, 02. Meta-analysis*
21 studies, prospective, within subject

Hypnotic Reduction and CBTi

- best done during CBTi rather than after or before *(Espie 88)*
- if more than one hypnotic used, stabilize on one hypnotic
- choose long-acting over short-acting to minimize rebound
- reduce by no more than one "therapeutic dose" per week
  - e.g. two half doses on two non-consecutive nights
  - start with high-dose nights if doses vary
  - once all nights on lowest dose, begin drug-free nights (one the first week, two the second week etc)
- make medication "time-contingent" not "insomnia contingent"
  - pre-selected nights, at a fixed time, regardless of sleepiness
  - only go to bed when sleepy, as in behavioural protocol to break association between medication and sleeplessness

Sleep Architecture

Sleep Architecture

- NREM – 75% of the night
  - N1 – bridge to deeper sleep
    - shallow
    - 50% people awakened from N1 will not think they were asleep
  - N2 – sleep spindles and K-complexes
  - N3 – slow-wave sleep, delta sleep
    - most in early part of the night.
    - 10-15% of night.
    - linked to cognitive performance in the elderly *(Naylor 00)*
- REM sleep – 25% of the night
  - dreams, muscle atonia (paralysis)
  - sleep deprivation leads to REM pressure – dream earlier & longer to compensate (avoiding sleep NOT effective to avoid nightmares)

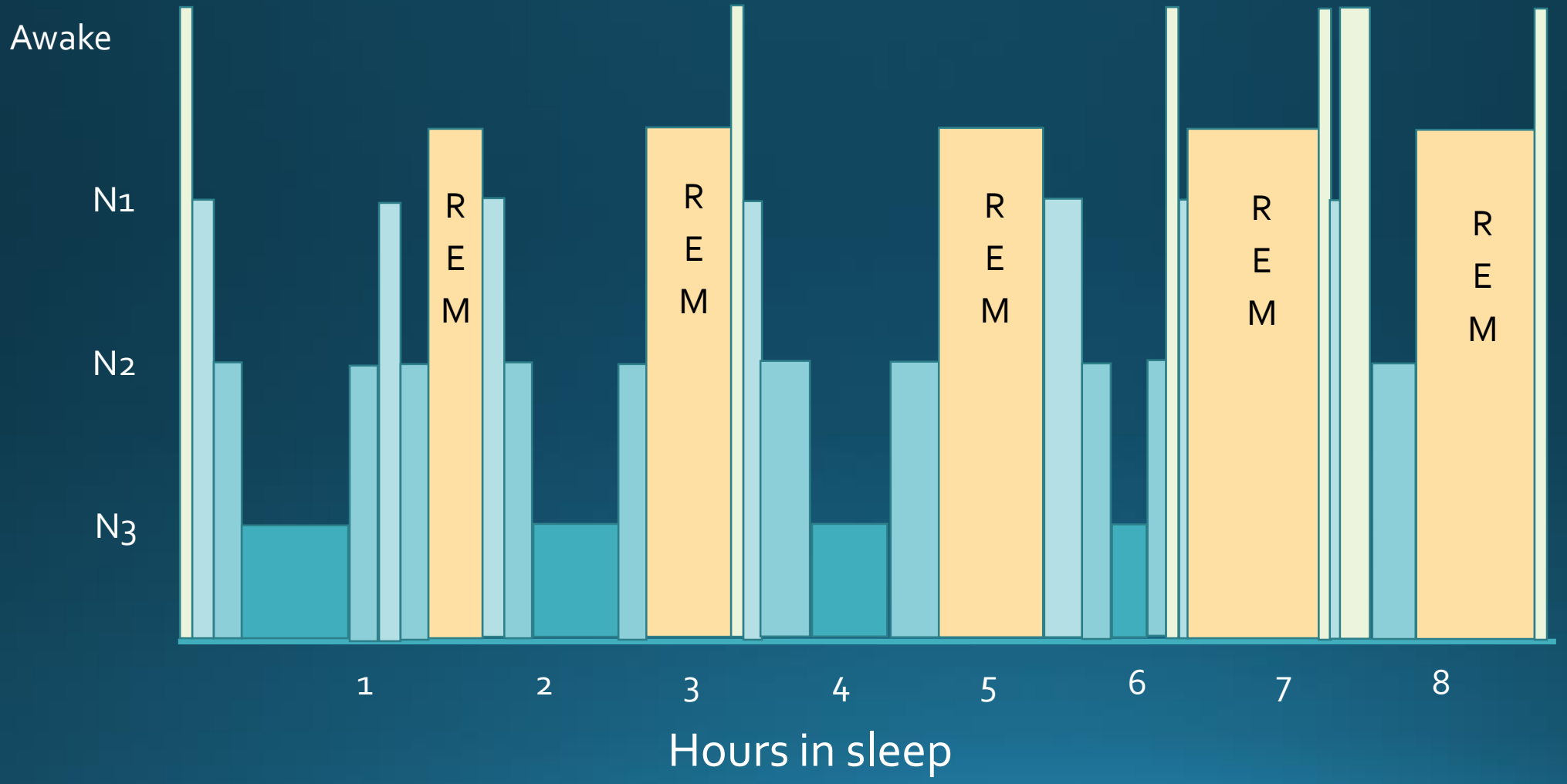
Sleep Organization

- sleep cycles NREM -> REM
- most N3 earlier in the night:
  - explains why more awakening later in the night
  - even if EMA, not totally deprived of deep sleep
- more REM later in the night
  - more likely to awaken with dreams/nightmares second half of the night
- brief awakenings throughout the night is normal

Sleep Organization

- sleep deprivation:
  - increased sleep duration and slow wave sleep next opportunity
  - only 1/3 of total sleep loss recovered, not all
  - slow wave sleep recovered first, then REM
- napping
  - in morning, more REM sleep
  - in afternoon, more slow wave sleep
  - (rationale for napping earlier in the day so as not to decrease slow wave sleep at night)

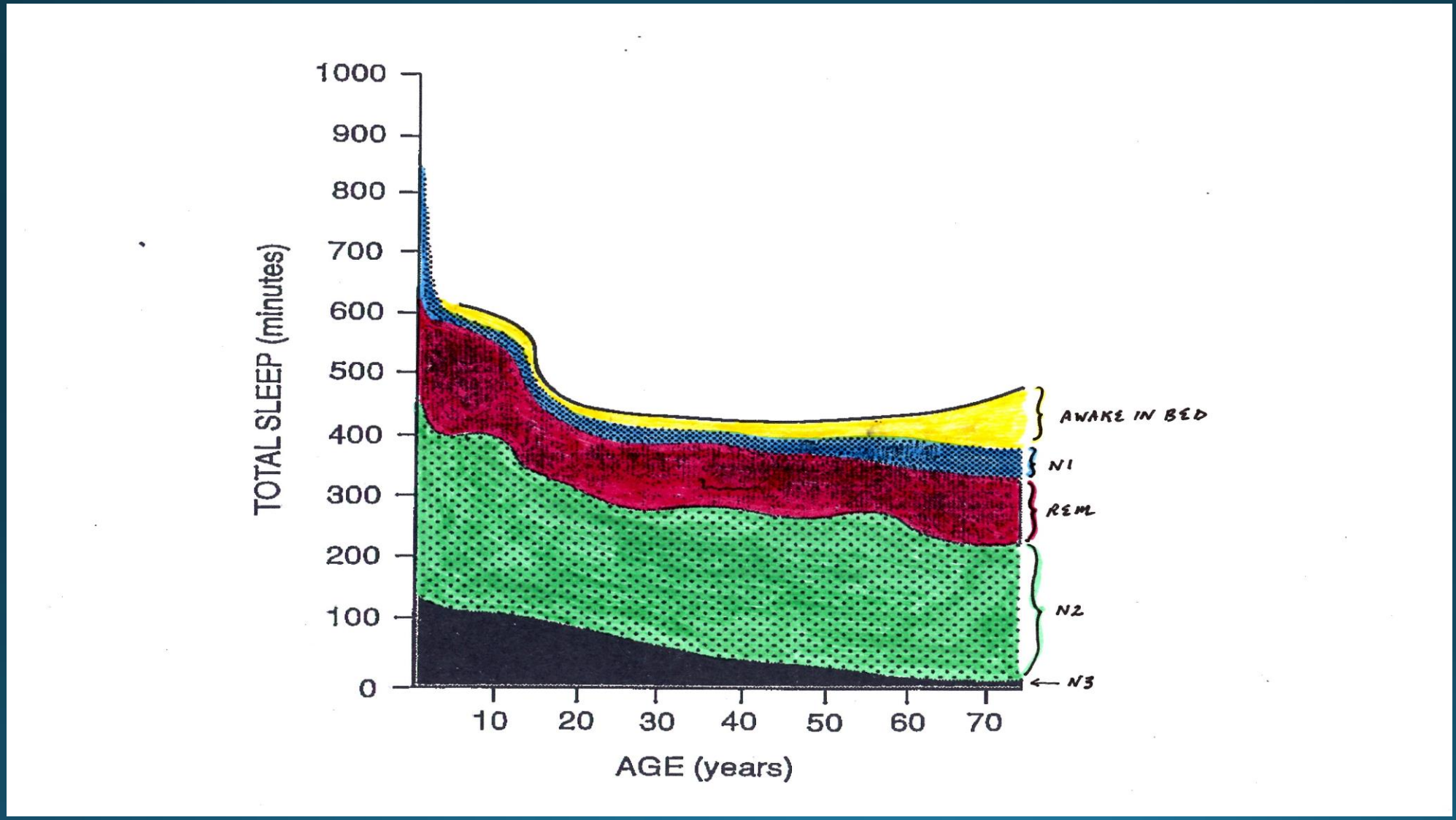
Sleep stages: Young Adult



Sleep Changes with Age

- more frequent awakenings (lower threshold for arousal)
- more N1 sleep, less N3 sleep *(Ohayan 04)*
- reduced REM latency
- order of sleep stages across the night the same
- total sleep time fairly stable over 24 hr period (more napping with age)
  - "Very old" – 6-8 hrs of sleep broken up over 24 hr period (like infants)
- even controlling for illness, medications, cognitive & behavioural factors may play greater role
  - elderly spend more time awake in bed

Sleep Changes with Age



After Morin, 93

Sleep Changes with Medications

Drug	SOL	WASO	TST	N1	N2	N3	REM	SE	EDS
DEPRESSION		↑	↓			↓	↑		
SSRI, SNRI, vortiox		↑	↓	↑			↓	↓	
BZD, zopiclone	↓	↓	↑	↓	↑		↓ *		↑
trazadone	↓	↓	↑			↑	↓		
doxepin (3-6 mg)	-	↓	↑		↑	-	↓	↑	-
mirtazapine	↓	↓	↑	-	↑	↑	-	↑	**
bupropion	-	-	-	-	-	-	***		
olanzapine	↓		↑			↑	↑	↑	
caffeine	↑					↓			
alcohol	↓						↓ †		

*At high doses
** 80-89 yo, less active
*** incr REM latency
† decr REM early, then rebound

Elements of Case Conceptualization in CBT-I

1. Sleep drive
2. Circadian clock
3. Conditioned hyperarousal
4. Arousal related to sleep-related cognitions, safety behaviours, “sleep effort”
5. Arousal related to general worry, stressors
6. Poor sleep Hygiene, environment

CBT CASE CONCEPTUALIZATION

1. Sleep Drive

Sleep Drive = Pressure to Sleep

- lowest in the morning
- increases as the day progresses
- sleep drive reduced by:
  - napping – esp close to bedtime (e.g. in front of TV)
  - caffeine, nicotine
- *"Napping before bed is like having a chocolate bar before supper!"*

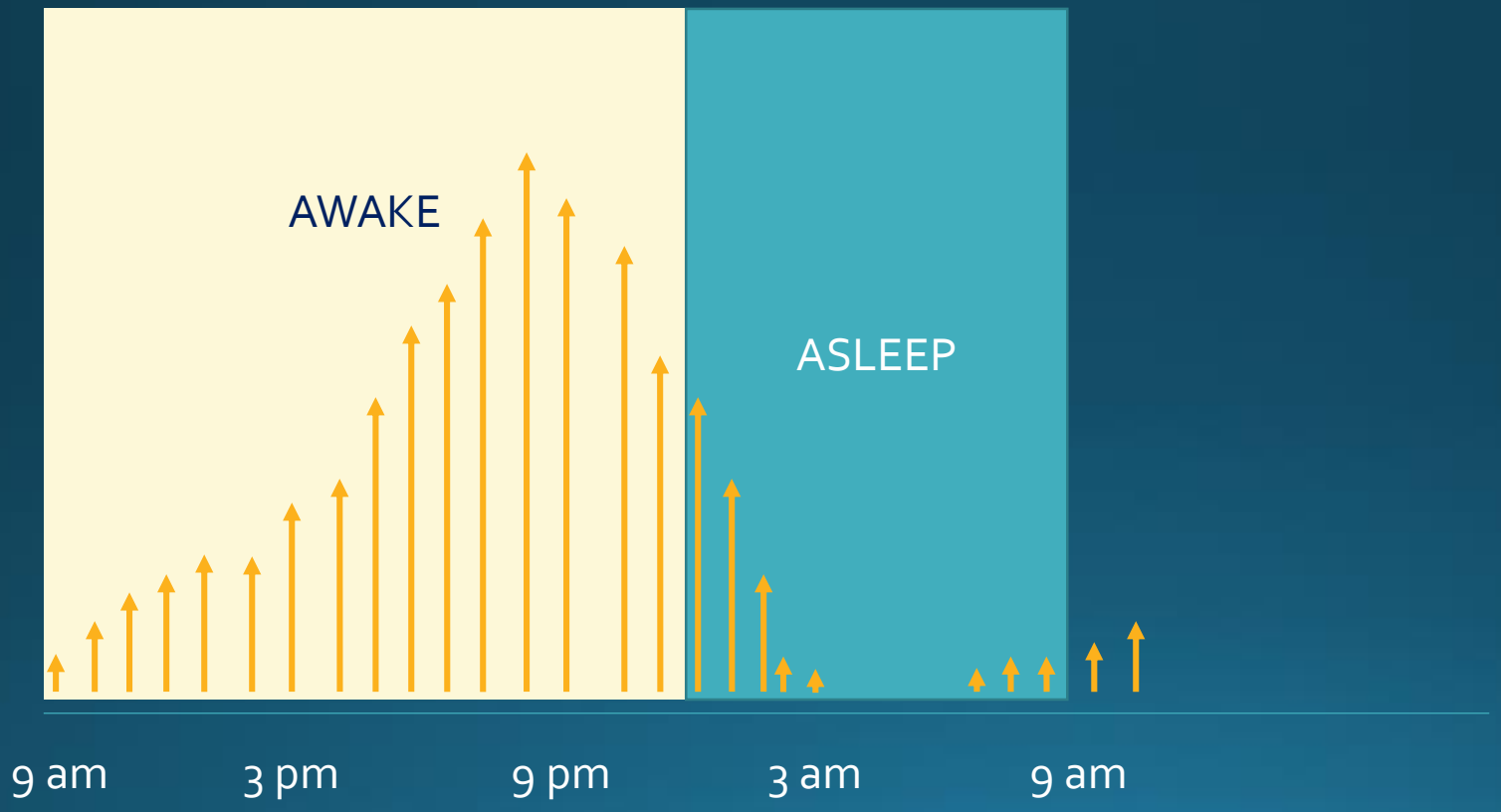
CBT CASE CONCEPTUALIZATION

2. Circadian Clock

Circadian Clock

- rhythm internally driven, but reset by daylight & activities
- circadian oscillator = suprachiasmatic nucleus (SCN) in ant hypothal
  - darkness -> optic n -> SCN -> pineal produces melatonin
  - light-> optic n -> SCN -> suppresses pineal gland production
- generates "alerting signals" inside us
- measured by core body temperature
- chronotypes:
  - morningness – go to bed early, and wake up early.
    - with insomnia, will have trouble maintaining sleep
  - eveningness – go to bed late, wake up late.
    - problems with sleep initiation
- irregularities disturb clock
  - jet lag
  - going to bed 2 hrs later, sleeping in on weekends = body travelling two time zones!
- best to initiate sleep when sleep drive high, and alerting signal dropping

Circadian Clock: Alerting Signals



CBT CASE CONCEPTUALIZATION

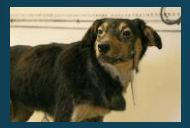
3. Conditioned Arousal

Conditioned Arousal

Classical Conditioning
(Respondant Conditioning)

Operant Conditioning
(Instrumental Conditioning)

Classical Conditioning: Pavlov



Steak (UCS) ⟷ **Salivation (UCR)**

Steak (UCS)+ Bell (CS) ⟷ **Salivation (UCR)**

Bell (CS) ⟷ **Salivation (CR)**

Classical Conditioning: Conditioned Arousal

Worry (UCS) ⟷ **Arousal (UCR)**

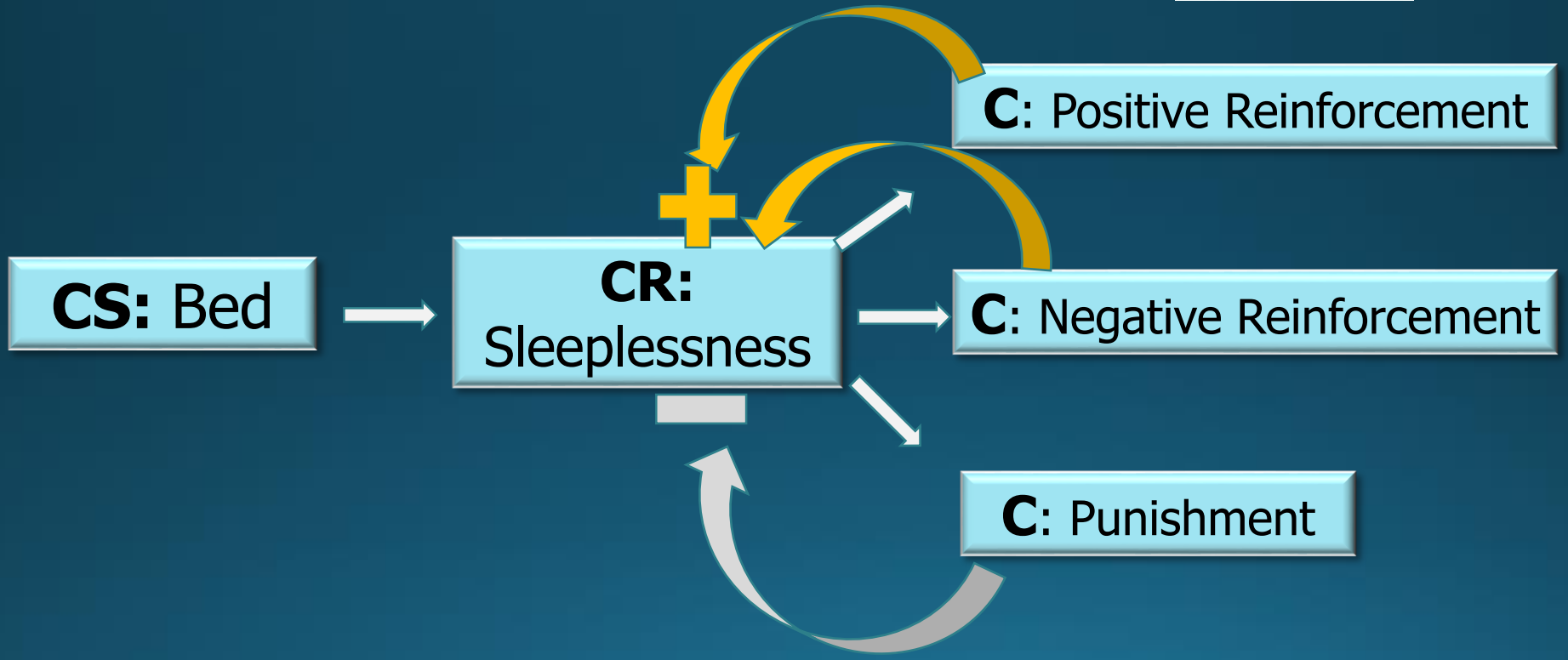
Worry (UCS)+ Bed (CS) ⟷ **Arousal (UCR)**

Bed (CS) ⟷ **Arousal (CR)**

Conditioned Arousal

- classical conditioning (respondent conditioning)
- pairing of bed with wakefulness, anxiety or frustration -> bed becomes cue for arousal: e.g.
  - working in bed
  - staying in bed for prolonged periods “trying to sleep”
  - historical events (e.g. sleeping in combat zones, early sexual abuse)
  - nightmares, nocturnal panic attack
- occurs out of awareness

Operant conditioning: Consequences



Operant Conditioning in Insomnia

(Classical Conditioning)

cause

(Operant Conditioning)

maintenance

Bed + Arousal ⟷ Sleepless in bed ✚

Sleep in chair ⟷ Reduced Distress

(-) Reinforcement of avoidance.
Prevents extinction sleeplessness in bed.

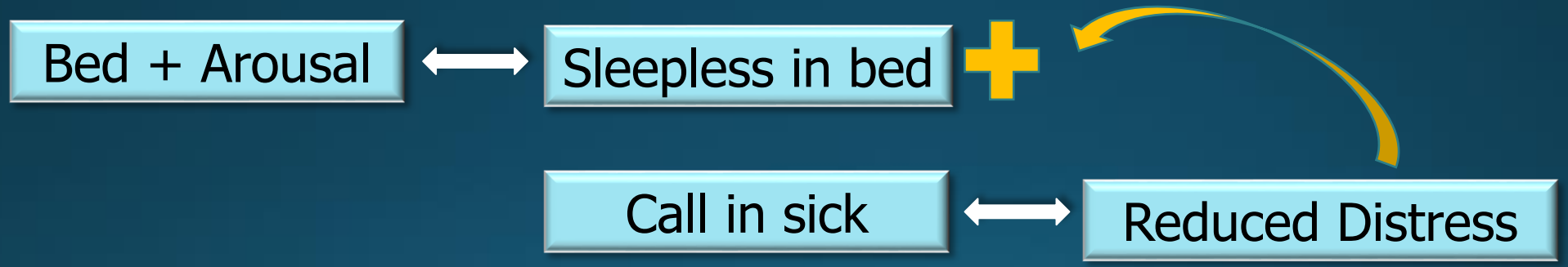
Safety Behaviours in Insomnia

(Classical Conditioning)

cause

(Operant Conditioning)

maintenance



(-) Reinforcement of avoidance.
Prevents extinction sleeplessness in bed.

Safety Behaviours in Insomnia

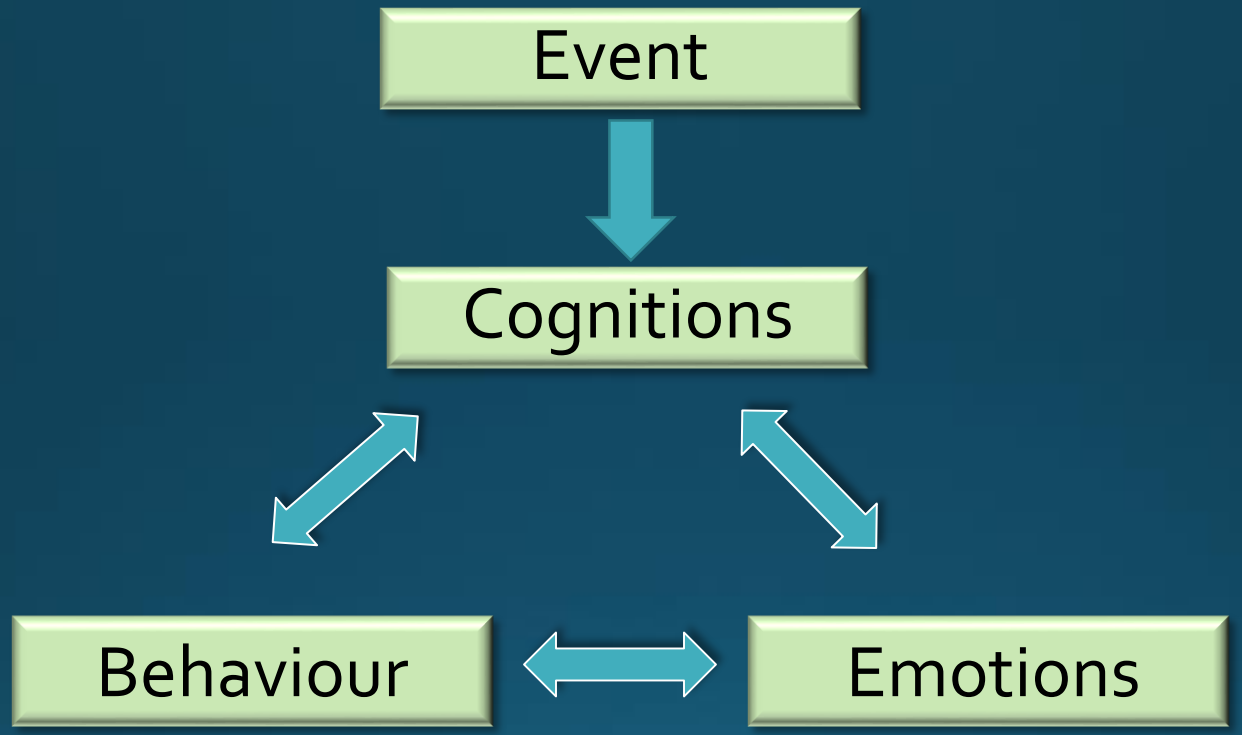
- calling in sick
- avoiding social events in the evening
- cancelling morning activities
- trying to "not think" in bed
  - efforts to suppress thinking triggers rebound thoughts
- excessive fussing with sleep environment
- short term reduction of negative emotion (neg reinforcement) -> long term maintenance of sleep preoccupation, arousal
- prevents learning that can sleep without effort

4. Arousal & Sleep Cognitions

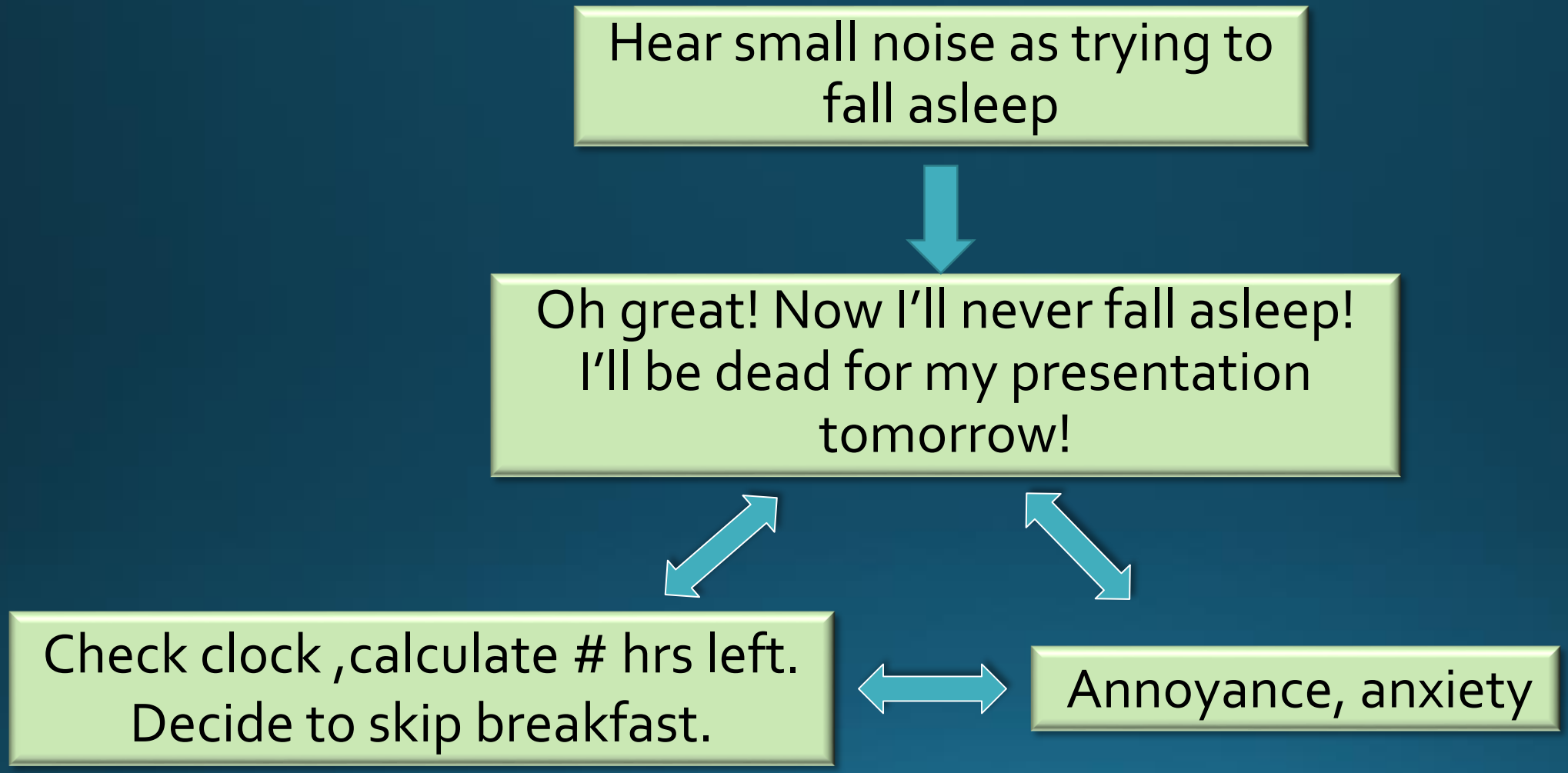
Arousal related to Sleep-related Cognitions

- sleep is effortless when sleep drive is strong, and timing congruent with circadian clock and mind calm
- people with insomnia make "sleep effort"
  - try not to think about their sleep or "think positive"
  - adopt rigid rules about sleep (e.g. must be in bed by nine)
  - avoidance & safety behaviours related to sleep
    - call in sick if a bad night's sleep
    - sleep separate from partner
    - avoid travelling to avoid jet lag
- the greater the sleep effort, the greater the emotional and cognitive arousal during sleep time

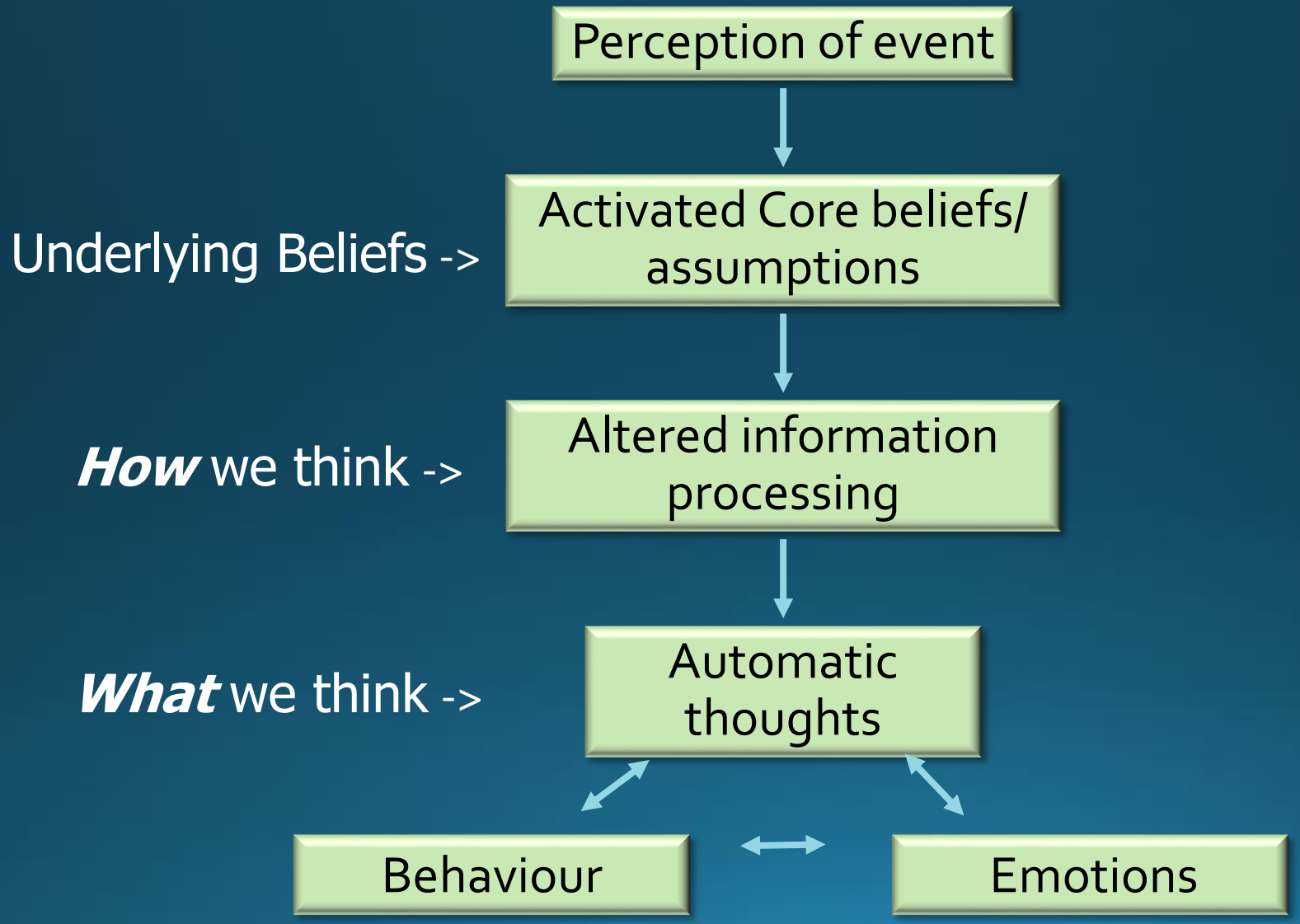
Cognitive Model



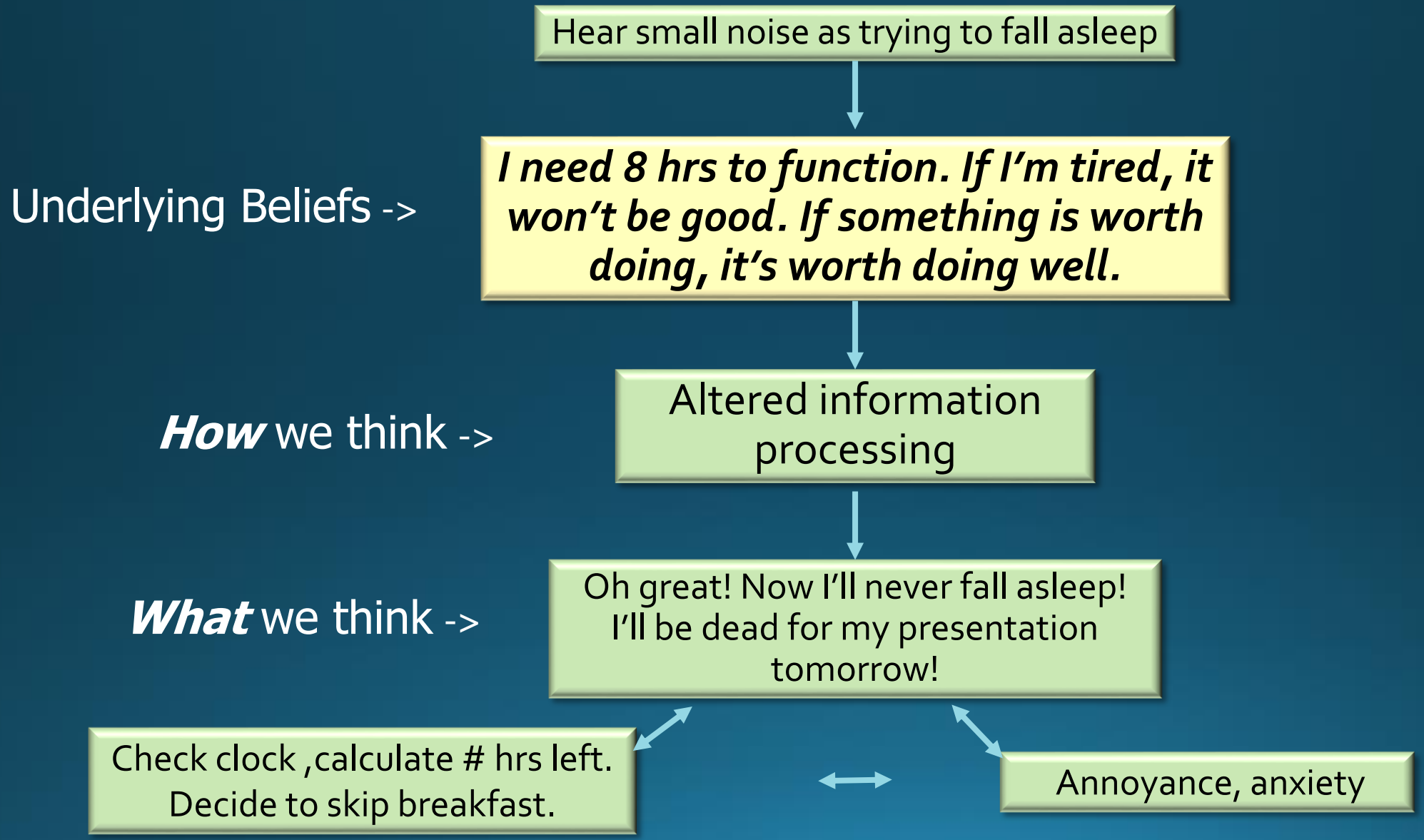
Cognitive Model



Full Cognitive Model



Cognitive Model



Cognitive Biases

- Confirmatory bias
- Black/white thinking
- Selective abstraction
- Discounting the +
- Overgeneralizing
- Fortune telling
- Catastrophizing
- Externalizing bias
- Jumping to conclusions
- Labeling
- Mind reading
- Shoulds & musts
- Personalizing
- Magnification/ minimization
- Emotional reasoning
- Misattributions

Cognitive Biases in Insomnia

- **Confirmatory bias**
- **Black/white thinking**
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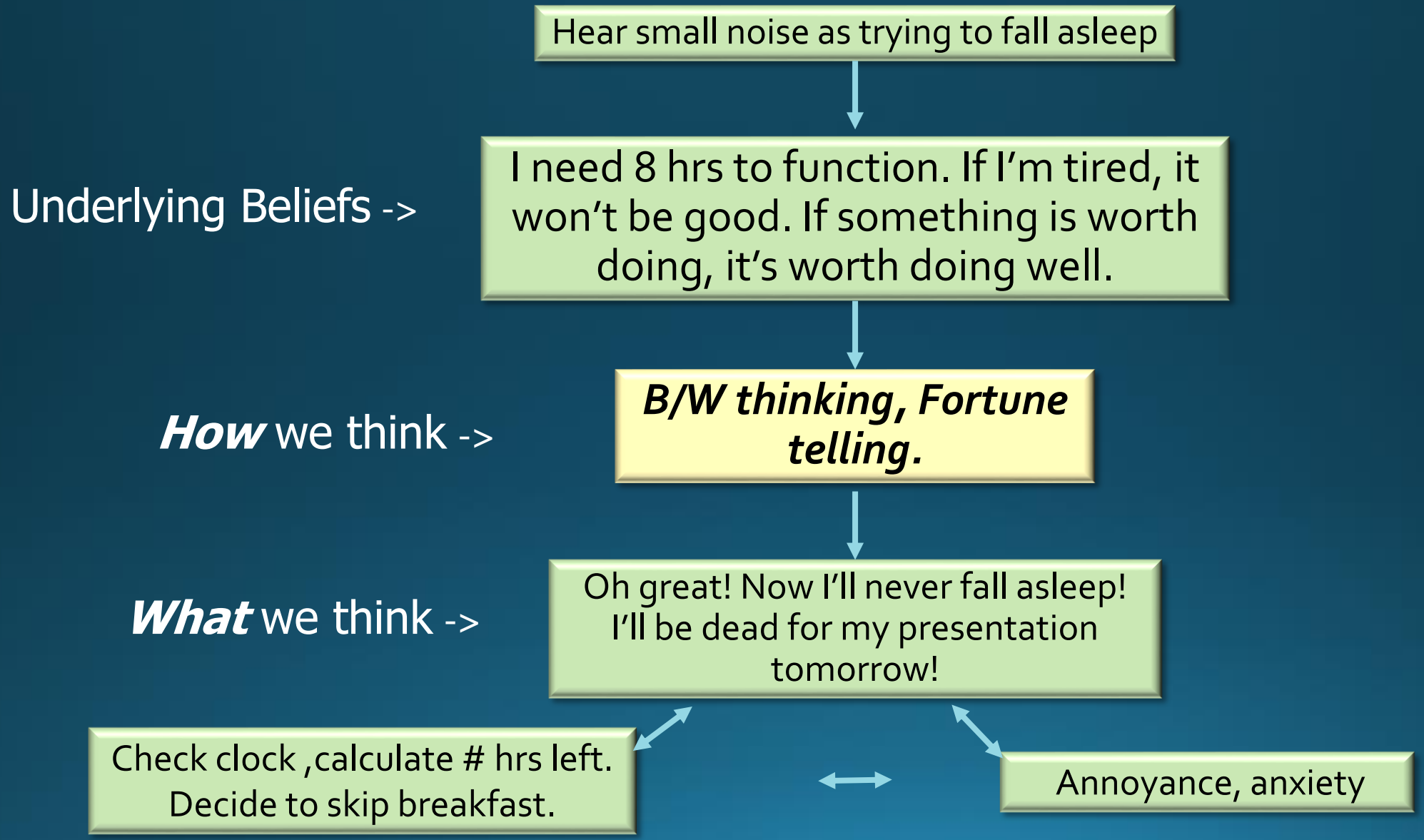


Sleep-related Cognition Themes

- negative consequences of insufficient sleep
- uncontrollability & unpredictability of sleep
- causes of insomnia
- unrealistic sleep expectations
- misconceptions about good sleep practices
- rigid ideas about sleep
  - "I need 9 hrs a night or I can't function"
  - "If I'm tired, it means I haven't slept enough"

Consequences of insufficient sleep

- Typical Automatic thoughts:
  - *If I don't get to sleep soon, I won't be able to perform well tomorrow.*
  - *I am tired today, because I haven't slept enough last night.*
- Underlying Belief:
  - *Insomnia reduces daytime functioning.*
  - *Insomnia is detrimental to my health.*
- Cognitive Errors:
  - Catastrophization. Magnification. Overgeneralization.
  - Misattributions. (Excessive attention to physical symptoms)

Uncontrollability/unpredictability of sleep

- Typical Automatic thoughts:
  - *I have lost control of my sleep.*
  - *Insomnia is destroying my life.*
  - *I need a sleep aid to make my sleep more predictable.*
- Underlying Belief:
  - *One should be in control of one's emotions and all aspects of one's life.*
  - *I can't be happy until my sleep is under control.*
- Cognitive Errors:
  - Catastrophization.
  - Should & must.
  - Overgeneralization.

Causes of insomnia

- Typical Automatic thoughts:
  - *My insomnia is a result of aging, and there is nothing to do about it.*
  - *My insomnia is a result of my pain.*
- Underlying Belief:
  - *Disturbed sleep is a result of aging.*
  - *Unless my pain is corrected, there is nothing I can do to improve my sleep.*
- Cognitive Errors:
  - Misattribution. B/W (absolute) thinking.

Unrealistic sleep expectations

- Typical Automatic thoughts:
  - *I need 8 hours of sleep each night.*
  - *I should fall asleep within minutes like my spouse does.*
- Underlying Belief:
  - *8 hours of sleep is necessary to feel good and function the next day.*
  - *We all sleep alike.*
- Cognitive Errors:
  - Shoulds & musts. B/W thinking.

Misconceptions about good sleep practices

- Typical Automatic thoughts:
  - *I had little sleep last night, so I have to have a nap.*
  - *When I have trouble sleeping, I should stay in bed and try harder.*
- Underlying Belief:
  - *You have to make up for the sleep you lose.*
  - *Lying in bed, even if not sleeping, provides some rest.*
  - *If I get out of bed, I'll be too awake to fall back asleep.*
- Cognitive Errors:
  - Faulty information. B/W thinking.

5. Arousal & Worry

What is worry?

= a collection of thoughts, images and doubts which occur in relation to future negative events, and are accompanied by anxiety

- often « what if… » questions

- Two types of worry: **Current** (real) vs **Hypothetical** (potential, future)

- **Current worries** – problems which can be solved
  - e.g. *what if I can't find parking for my doctor's appointment*
  - deal with by problem solving, facing difficulties
- **Hypothetical worries**– cannot be solved
  - e.g. *what if I die before my husband?*
  - can be dealt with mindfulness, distraction, refusal to engage, cognitive restructuring

6. Sleep Hygiene

Sleep Hygiene

- works well with good sleepers, but not insomniacs
- not useful as a monotherapy *(Morin 06)*
- avoid caffeine, alcohol, nicotine
- don't exercise within 3-4 hours of bedtime
- avoid heavy meal before bed
- sleep environment
  - intermittent noise may awaken – avoid TV on all night
  - white noise – fan, smartphone app, white noise machine
  - dark – iPad disrupts circadian clock 1-2 hrs (Figuero 14)

CBTi Interventions

Steps in CBT-I

- Session 1
  - assessment, goal setting, review or introduction of sleep log
  - brief intro to sleep drive, circadian clock
  - one or two simple recommendations
- Session 2
  - review sleep log (each session)
  - introduce stimulus control, sleep restriction
  - other components based on conceptualization
- Session 3
  - cognitive arousal & role in maintaining insomnia
  - techniques to calm mind (relaxation, buffer zone, mindfulness)
- Sessions 4,5
  - cognitive therapy as needed (test sleep-related cognitions, cost-benefit)
- Session 6
  - Relapse prevention

Behavioural Interventions

Stimulus Control & Sleep Restriction

Stimulus Control Rationale

- goal: reverse conditioned arousal & strengthen bed as a cue for sleep
- bed has been paired with arousal & negative emotions -> want to "unlearn" this association and restore bed as a cue for sleep
- this is an unconscious process, so NOT THE PATIENT'S FAULT
- if pair bed repeatedly with drowsiness and relaxation, new association is formed

Stimulus Control Instructions for the Patient

"Stimulus Control" will strengthen your bed as a cue for going to sleep by ensuring that you will be in bed only when asleep or very sleepy. Follow these five steps:

1. Go to bed when you are sleepy (not just fatigued)
2. Get out of bed if you are unable to sleep after 20 minutes, and go back to bed only when you are sleepy.
3. Use your bed only for sleep (or sex).
4. Wake up at same time each day, and get up within 15 minutes.
5. Do not nap.

After Manber & Carney 15

Stimulus Control Tips

- stress the difference between fatigue and sleepiness
  - *If you "feel" that sleep not going to happen, or you get frustrated, get out of bed. Don't watch the clock.*
  - *Return to bed only when sleepy.*
  - *Don't "Try to sleep". Forcing sleep is counterproductive. "Falling asleep is effortless."*
- "Masked Sleepiness" – people too aroused at bedtime (activity, PTSD, anxiety) to feel sleepy
  - set a bedtime in these cases, but still should leave bed if not sleeping
  - use other techniques to reduce arousal (relaxation, unwinding, cognitive)
- eveningness: difficult to get up at same time each morning. Bright light 5-10 minutes after awakening to influence circadian clock

Sleep Restriction Treatment (SRT)

- a multistep process to reduce time in bed (TIB) in order to de-fragment sleep and improve sleep quality
- increases sleep drive to reduces SOL, reduces WASO
- used in all age groups
- works within two weeks
- alone, SRT is efficacious in improving self report sleep parameters
  - reduce SOL & WASO, reduce TIB, increase SE & TST compared to control, *(Miller 14)*

Sleep Restriction Treatment (SRT)

1. Calculate initial TIB

- two weeks of sleep diary data (discount atypical nights)
- if very variable, take 3 weeks of data
- calculate average TST
- average TST becomes “TIB”
- not less than 5 hrs for safety

Sleep Restriction Treatment (SRT)

2. Fix "Window" for sleep opportunity

- select wake-up time based on commitments and chronotype
- establish bedtime, counting back from wake-up time
- patient can't go to bed before established bedtime
- if not sleepy, stay up past bedtime till sleepy
- keep arising time constant, even on non-work days, or if has slept poorly
- no napping
  - if a question of safety (operating machinery etc.) - <1 hr, before 3 pm.

Sleep Restriction Treatment (SRT)

3. Titrate Sleep Window on a weekly basis

- calculate average sleep efficiency (SE) = ave TST/TIB x 100
- SE < 85% - reduce TIB 15 minutes
- 85% < SE < 90% - keep TIB same for another week
- SE> 90% - increase TIB by 15 minutes

Obstacles to SC & SRT

- 40 outpatients with insomnia underwent group CBTi *(Vincent 08)*
- adherence associated with outcome
- boredom, annoyance, discomfort – especially in leaving bed in the middle of the night = major barrier to treatment
  - problem solve this in advance
- greater sleepiness -> greater variance in wake-up time
  - start SRT after SC
  - on days when morning sleepiness expected to be less
- patients taking medications for sleep -> less attendance at sessions
  - stop medications before CBTi?

SRT in Older Adults

- ***Khankeh 13:*** Iran. Adults ave age 60 yrs. SRT compared to control (19 in each group). SRT greater sleep quality, reduced SOL. No diff in TST, meds.
- ***Hoch 01:*** Healthy older adults over 70: Not insomniac.
  - Group 1: Reduce TIB by 30 min
  - Group 2: Sleep hygiene
  - Group 3: historical control
  - Results: Group 1 – after one year, increase SE, increase deep sleep at 6 mon, increase "delta spectral power" at 2, 6, 12 mon. Implications for functioning, Q of L

Cognitive Interventions

ADDRESSING SLEEP-RELATED COGNITIONS

Addressing Sleep-related Cognitions

- addressing maladaptive sleep cognitions reduces arousal, increases adherence to behavioural measures
- techniques
  - scientific information about sleep
  - Socratic questioning
  - behavioural experiments
  - cost-benefit analysis
  - thought records

Addressing Sleep-related Cognitions

- **Beliefs related to poor sleep leading to poor performance:**
  - Downward arrow to address feared consequences:
    - *If you don't sleep much, what will happen? Make more mistakes*
    - *If you make a mistake what will happen? Lose job.*
    - *If you lose your job? End up on the street, etc*
    - *No wonder you are so worried about your sleep!*
  - Scientific data
    - routine performance usually not compromised, or less than pt predicts
    - sleep deprivation studies on good sleepers, show no change in logic, but some reduction in multitasking, innovation, risk assessment, extra burdens
    - unsure if generalizable to insomniacs (mass media report)
    - insomniacs more aroused, so compensate more the next day

Addressing Sleep-related Cognitions

- **Unrealistic sleep expectations**
  - minimum number of hours, must sleep well, must awaken rested
- Techniques –
  - Socratic questioning- *Where did you get the idea that you need 8 hrs of sleep? When did you last have 8 hrs of sleep? Have you been able to function on other days? What allowed you to do that? Have other factors ever made you feel unwell, besides sleep? Can you always tell what factors are responsible for how you feel?*
  - scientific data- when good sleepers try to sleep more than they normally do, they start to have trouble sleeping!
  - experiment – record # hours on sleep log, on separate paper, record energy level, performance each day

Addressing Sleep-related Cognitions

- **Sleep Effort Beliefs**
  - the more you try, the harder it is

- Technique: Acceptance based stance:
  - "a thought about sleep is just a thought"
  - sleeplessness is just an event
  - don't judge or engage in analysis
  - sleep is becoming "overvalued", interfering with other values

Addressing Sleep-related Cognitions

- **Beliefs about safety behaviours**
  - reflect cognitive preoccupation with sleep, negative emotions
  - short term relief lead to long term maintenance of insomnia
- Technique:
  - psychoeduation re: effects of safety behaviours on conditioned arousal
  - cost-benefit analysis
    - e.g. what is the cost to you of sleeping in the spare room
  - behavioural experiments
    - e.g, what happens to your energy if you skip your morning run after a bad night? What happens if you run anyway? (Remember to put results in a separate page)

Cost Benefit Analysis Safety Behaviour

I have to sleep in the spare room to have the best quality of sleep.	
Benefits	**Costs**
I fall asleep easier	I am not enjoying my nice Queen-size bed
I don't disturb my husband	I am missing out on nice bedtime conversations
I worry less about my sleep there	Less cuddling with my husband.
I feel better the next day.	My husband doesn't like this plan.

7 Column Thought Record & Examine the Evidence

(after Greenberg & Padesky)

Situation	Emotions (0-100%)	Automatic thoughts (Underline the "hot thought")	Evidence that supports the hot thought	Evidence against the hot thought	Alternative/ balanced thoughts	Rate Emotions now

Cognitive Interventions

ADDRESSING WORRY & HYPERAROUSAL

Hyperarousal related to worries, stress

- unwind time before bed – "buffer zone activities" – non-striving activities (TV, non-suspenseful reading, bath)
- relaxation, mindfulness meditation
- worries before bed:
  - *If you haven't solved the problem during the day when you were at your best, you won't solve it now!*
  - postpone, scheduled worry time earlier in the day
  - write out concerns, to do list
  - distraction e.g. cognitive refocussing on a TV show, movie, pleasant event

CBT for Worry

- Awareness of two types of worry: Current vs Hypothetical Worries
- Stress active problem solving rather than avoidance
- Reconsider beliefs about worry
  - e.g. *if I don't worry, I won't be prepared for the worst*
  - e.g. *I've always been a worrier, and can't change now*
- Increase tolerance for uncertainty and ambiguity
  - continue to do new things
  - proceed without excessive amounts of information
  - delegate to others
- Specialized CBT exposure techniques for hypothetical worries
  - exposure to worst case scenarios to face underlying fear (expert interventions)

Worry Self-help Websites

Helpguide.org

- http://www.helpguide.org/articles/anxiety/how-to-stop-worrying.htm

Centre for Clinical Intervention

- http://www.cci.health.wa.gov.au/resources/infopax.cfm?Info_ID=46

Tips CBT-I

- psychoeducation
  - should be personalized and reference specific details of pt's situation
- address non-adherence to plan
  - cognitive interventions may be necessary
- troubleshooting not getting up at set time in am
  - find reasons for it
  - motivational techniques – if don't believe it's worth it
  - cost-benefit analysis
  - if related to "eveningness" – light in the am to help circadian clock adjust

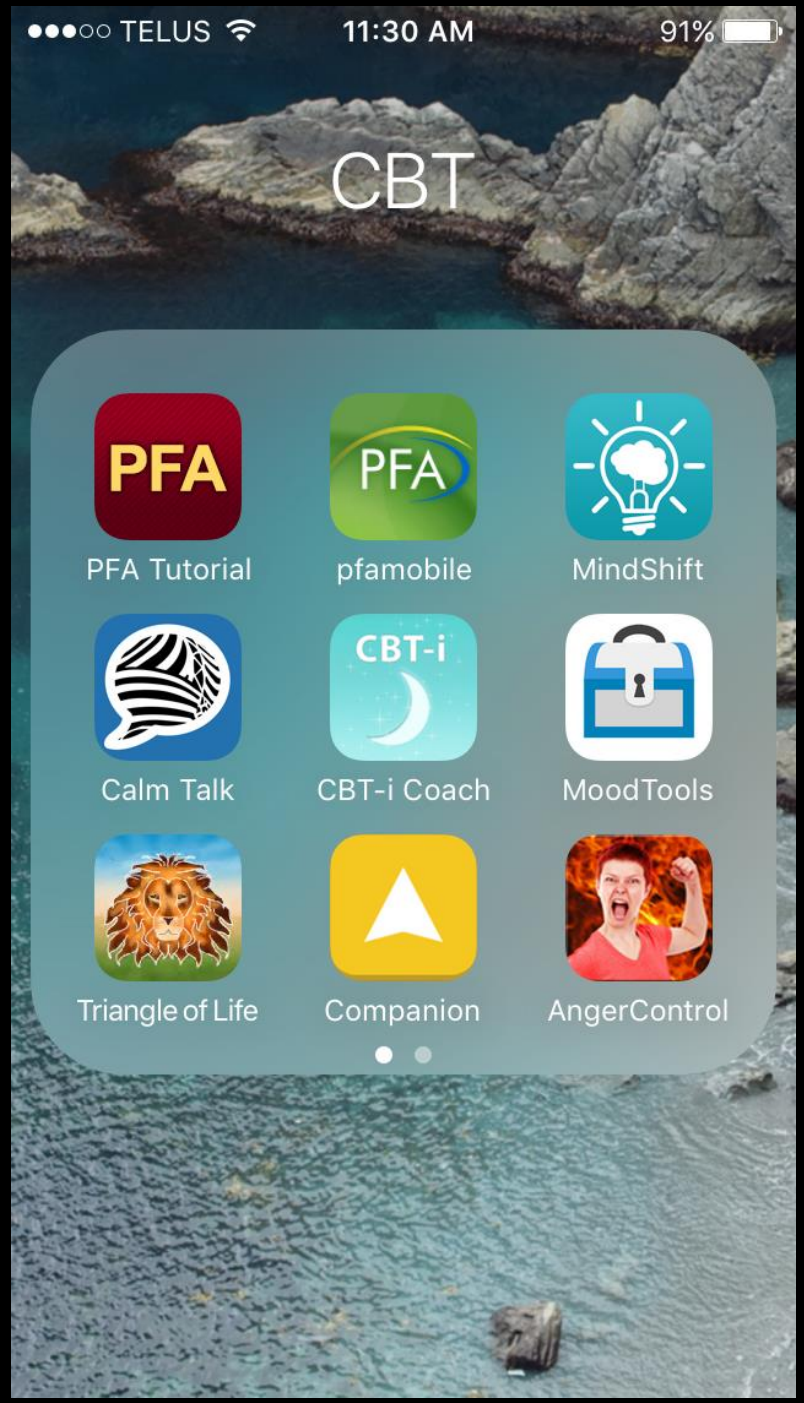
Group Exercise: How would you treat Mrs. M

CONSENSUS SLEEP DIARY (2011) Patient Mrs M	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
What time did you get into bed?	21:00h						
What time did you try to go to sleep? (lights out)	22:00h						
How long did it take you to fall asleep?	2 h						
How many times did you awaken, not counting final one?	1						
In total, how long did these awakenings last?	2 hr						
What was your final awakening?	7:30						
After your final awakening, how long did you stay in bed?	0.5 h						
What time did you get out of bed for the day?	8:00h						
How would you rate the quality of your sleep?	poor						
How refreshed did you feel when you woke up?	Not at all						
How many times did you nap or doze?	1						
In total, how long did you nap or doze?	1 hr						
# caffeinated drinks? Time of last one?	0						
# alcoholic drinks? Time of last one?	2/1800h						
Medications, dose & time taken. (OTC & prescription)							

TIB= 10 hrs
SOL = 2 hrs
WASO = 2 hrs
TWT = 2+2+0.5 = 4.5 hrs
TST = 10-4.5 = 5.5 hrs
SE = 5.5/10 = 55%

ASSUMPTIONS:
I need 8 hours of sleep to function
If I'm tired, I can't do my usual activities
I can't sleep if I'm worried about something.
I can't sleep if my knees hurt.
Poor sleep is a part of getting old
Getting old is "for the birds".

THERE'S AN APP FOR THAT! CBTi Coach



CBTi Coach: Collaboration:

- VA Centre for PTSD
- Stanford University Medical Center
- Dept of Defense National Center for Telehealth & Technology

Summary

- CBT-I has comparable efficacy to hypnotic medications
- daily sleep logs are essential to conceptualize sleep difficulties
- CBT-I involves psychoeducational and behavioural components related to sleep drive & circadian clock
- stimulus control interventions extinguish the association between bed & wakefulness
- sleep restriction reduces time in bed (TIB) to de-fragment sleep, improve sleep quality
- cognitive interventions target sleep-related beliefs and safety behaviours
- stress & worries contributing to nighttime arousal dealt with through general and specific techniques
- other interventions target the sleep environment, electronics and substance use

Extra Slides

Melatonin

- melatonin rises early evening, peaks at time of minimum temp
- secreted by pineal gland in response to darkness (SCN)
- physiologic doses
  - 0.1 to 0.3 mg for sleep (3 hrs before expected bedtime)
  - 0.3 to 0.5 mg for phase-shifting
    - late pm -> phase advance (blunts wakefulness)
    - early am -> phase delay (antagonizing the effect of bright light)
- high doses as an hypnotic
  - 1-6 mg ½ hr before bedtime
- ramelteon - synthetic melatonin agonist (activates MT1 and MT2 melatonin receptors). In US only

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SE = 5.5/10 = 55%

Ms M: CBT-I elements

1. Sleep Drive
2. Circadian clock
3. Stimulus control
   - Don't fall sleep in chair watching TV. (e.g. trying ironing in front of TV instead)
   - Go to bed/turn out the light only when sleepy
   - Take thyroid medication in am when get out of bed. Don't go back to bed, but remain active for 30 min till breakfast.
   - Reduce safety behaviours – continue to do normal activities even if feels sleep deprived

   Sleep Restriction
   - Limit time in bed to average sleep time: 7 hrs (6.3 hrs)
   - Set wake-up time: 7:00 am each morning.
   - Set bed time, no earlier than 12:00.
   - Stay up later if not sleepy
   - Adjust TIB prescription depending on SE

Ms M: CBT-I elements

4. Sleep cognitions
   - Reduce sleep effort: clock to wall.
   - I need 8 hours of sleep to function: Soc Q. Test idea out through monitoring sleep & functioning..
   - If I'm tired, I can't do my usual activities: Try going to bridge anyways and see what happens.
   - I can't sleep if I'm worried about something.: Soc Q. Is this true? Worry techniques.
   - I can't sleep if my knees hurt. Soc Q. Is this true? Pain control. Knee exercises. (WebMD)
   - Poor sleep is a part of getting old: Information about sleep and aging.
   - Getting old is "for the birds".
5. Worry.
   - Distract self from worries about next day. Relaxation in evening. Distinguish real from hypothetical problems. Focus on recent TV program if begins to worry. Self help worry.
6. Hygiene measures – avoid chocolate in evening.