

BSS International Sleep Medicine Course 2026

15th - 18th September | Newcastle



British Sleep Society



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Sleep in older adults

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Conflict of Interest Disclosures for Speakers

☒

1. I do not have any potential conflicts to disclose.

☐

2. I wish to disclose the following potential conflicts of interest:

Type of Potential Conflict	Details of Potential Conflict
Grant/Research Support	
Consultant	
Speakers' Bureaus	
Financial support	
Other	

☐

3. The material presented in this lecture has no relationship with any of these potential conflicts, **OR**

☐

4. 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.
- 2.
- 3.

Learning objectives

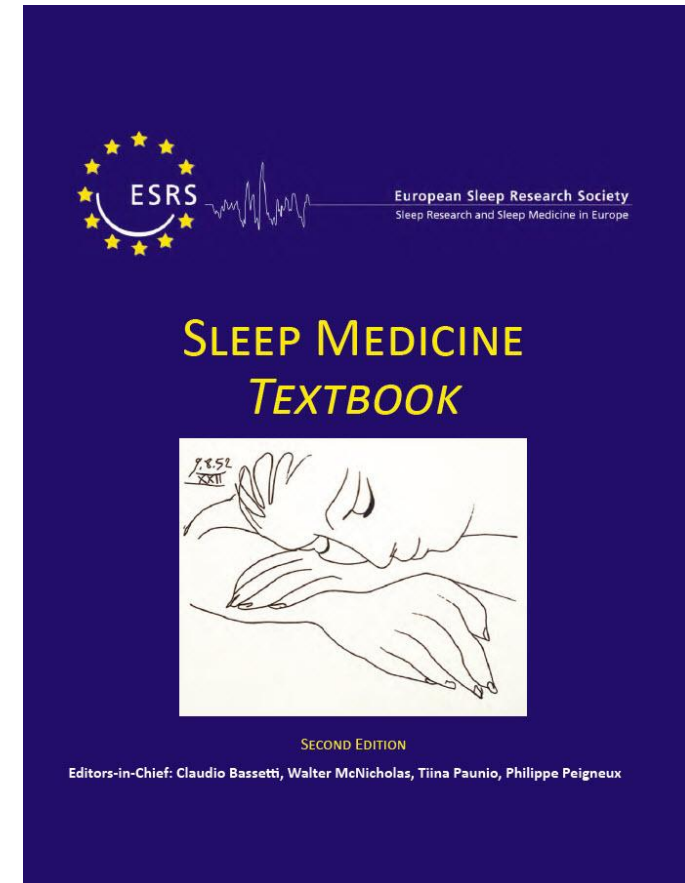
- To review the subjective and objective changes in sleep which occur with normal ageing.
- To discuss similarities and differences in prevalence and presentation of common sleep disorders in older adults.
- To appreciate the bidirectional links between cognitive impairment and sleep in older adults, and its relationship with dementia.
- To consider the psychosocial and pathophysiological aspects of sleep and sleep disorders in older people.

Recommended reading

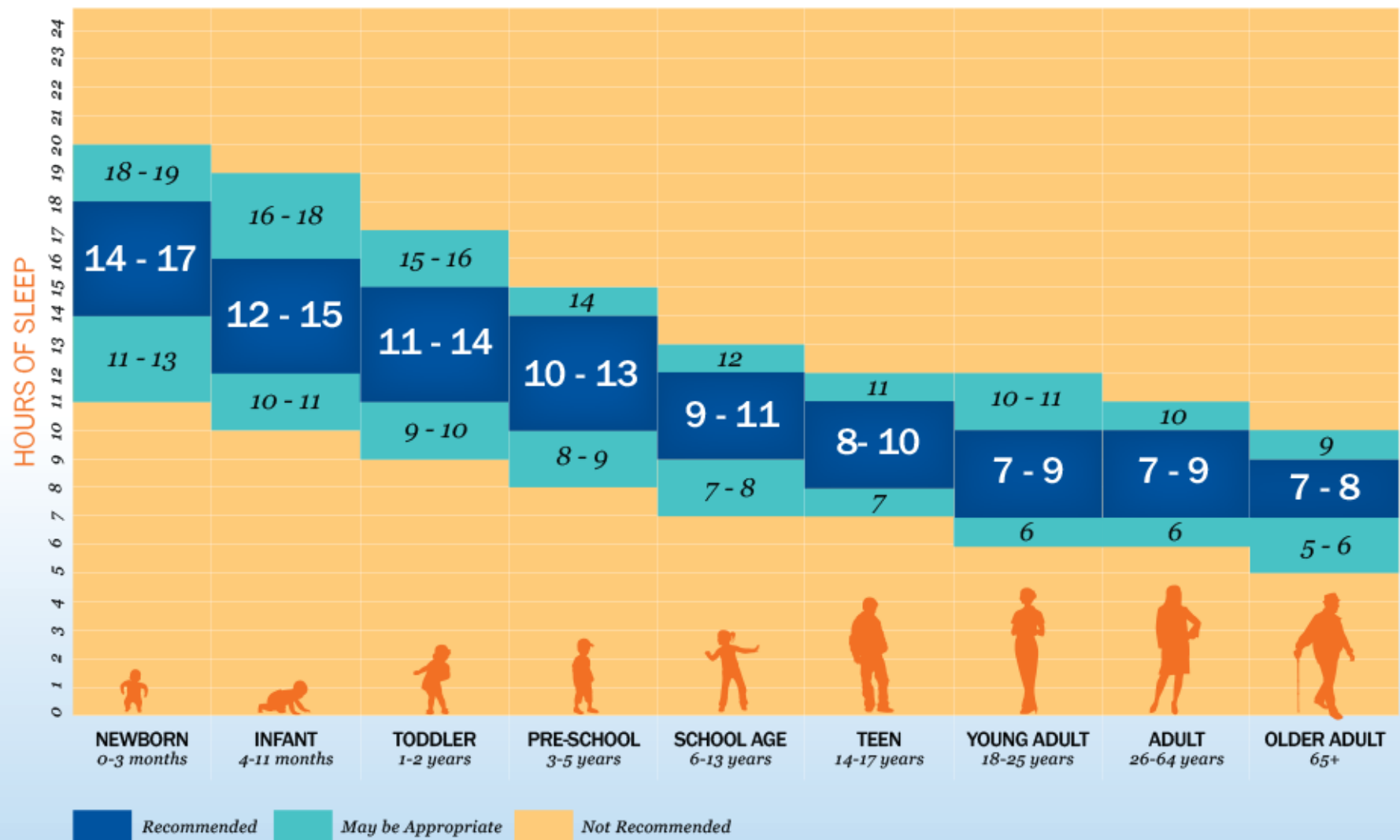
Chapter N, ESRS Sleep Medicine
Textbook 2nd Edition:

Sleep and Geriatrics

pp.1003-1020

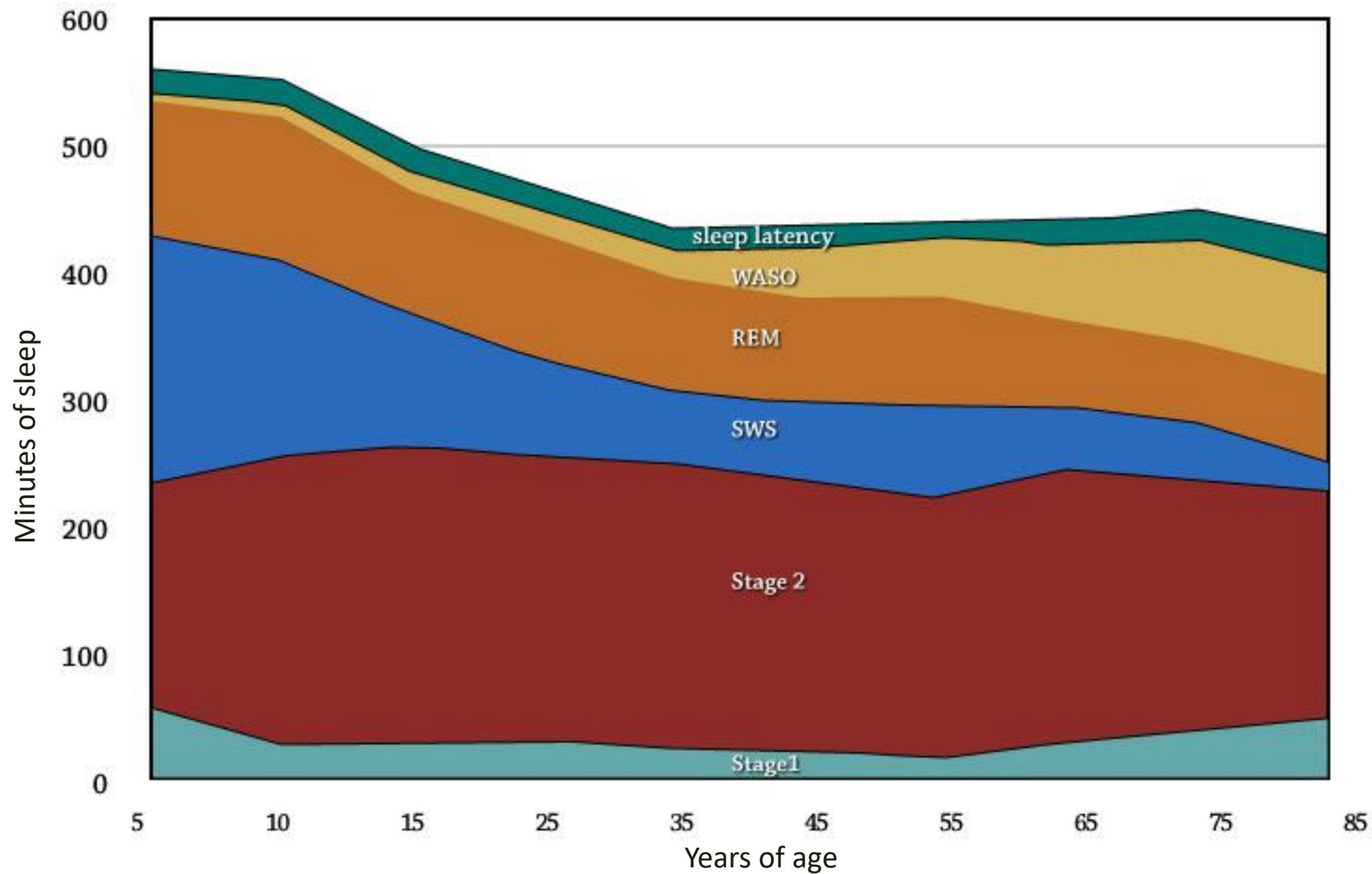


Introduction



SLEEPFOUNDATION.ORG | SLEEP.ORG

Hirshkowitz M, The National Sleep Foundation's sleep time duration recommendations: methodology and results summary, Sleep Health (2015), <http://dx.doi.org/10.1016/j.sleh.2014.12.010>



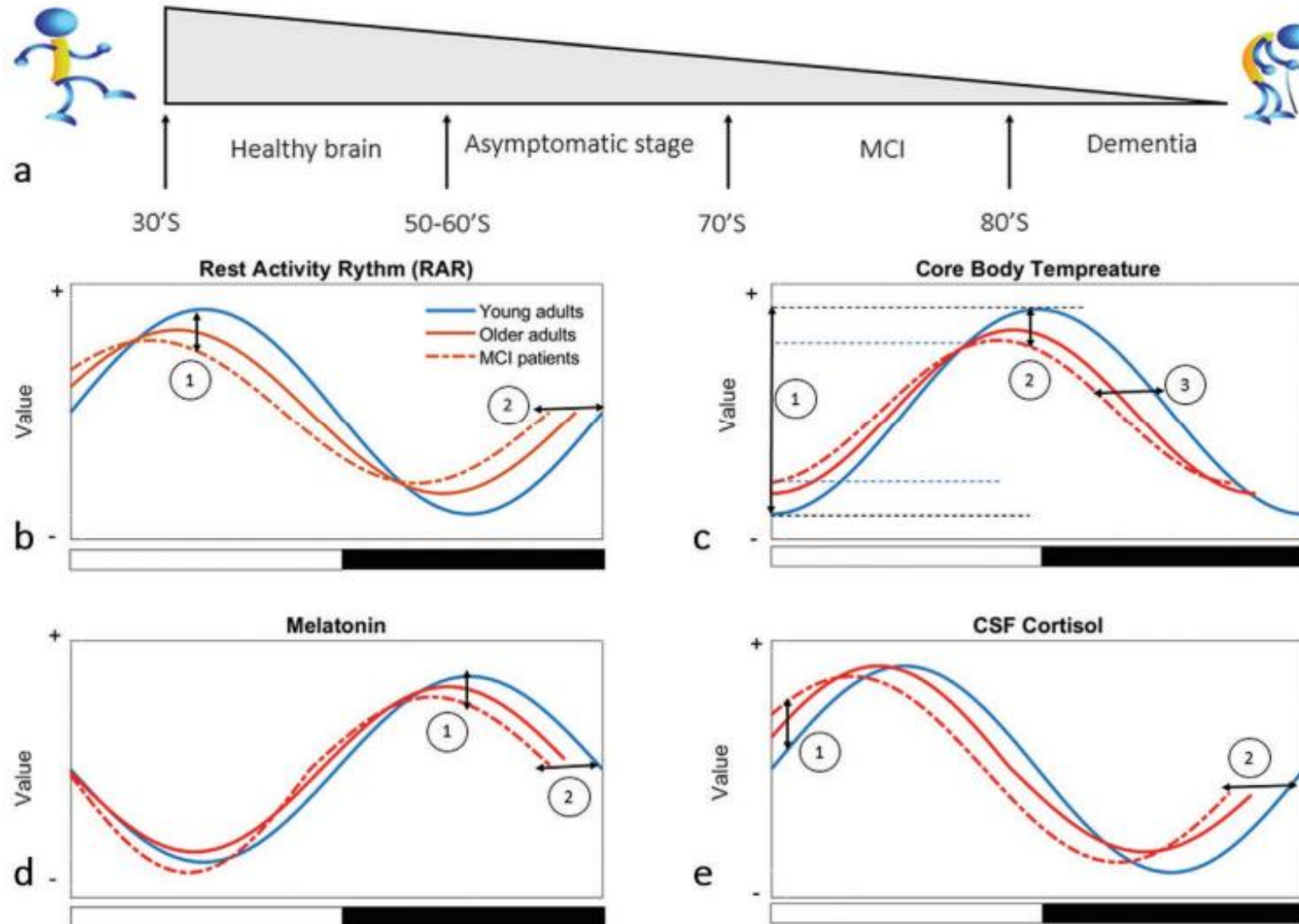
Introduction

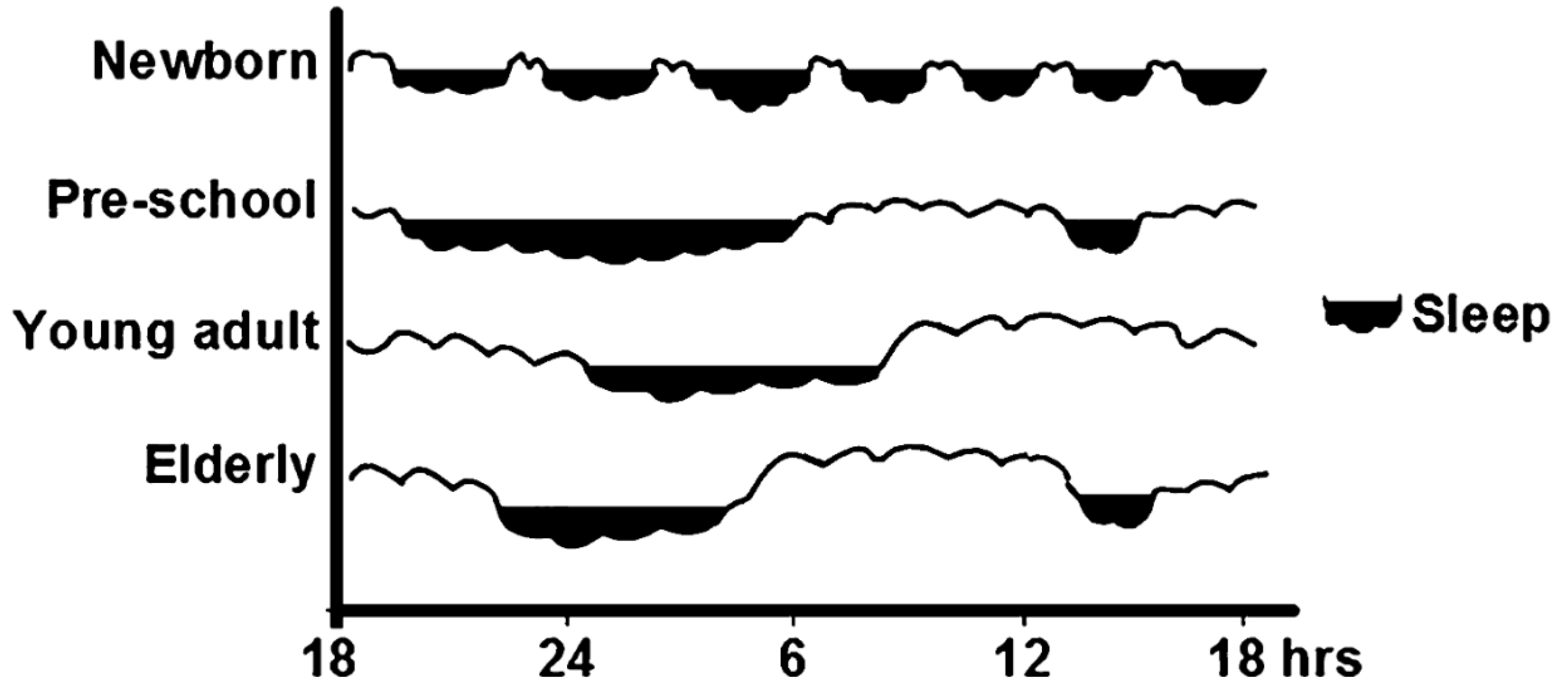
- Changes in sleep are evident with normal aging, independent of pathology
- Some sleep disorders increase in prevalence with age
- Increased risk of conditions which have bidirectional links with sleep disturbance
 - Cardio/cerebrovascular, cognitive impairment, type 2 diabetes

Normal sleep in older people

Circadian rhythm

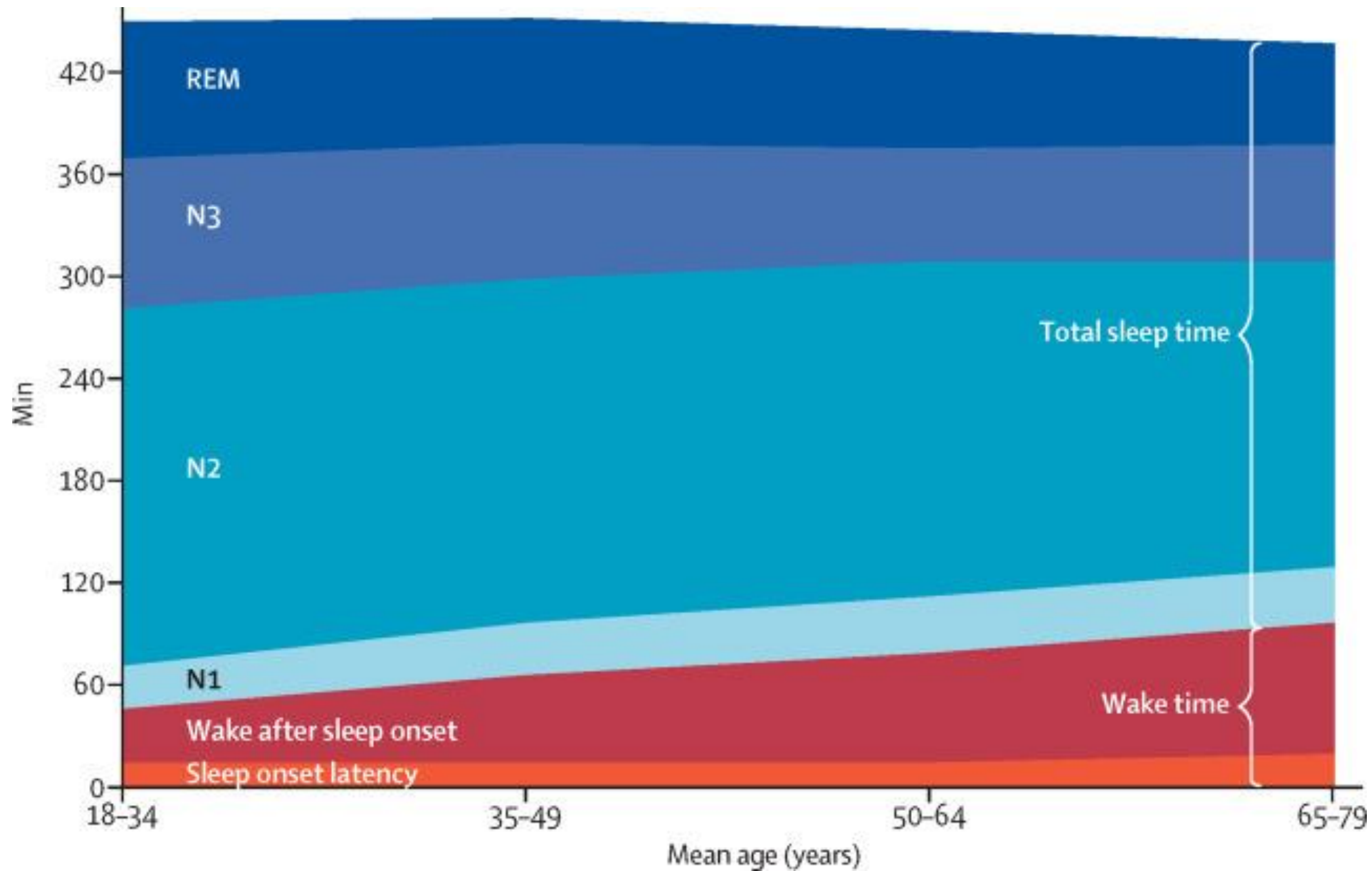
- Overall phase advance
- ↓ amplitude
 - Rest-activity rhythm
 - Core body temperature
- ↓ Melatonin
- ↑ Early-morning cortisol





Sleep architecture

- ↑ Sleep onset latency
 - ↑ Wake after sleep onset
 - ↓ Total sleep time
 - ↓ Sleep efficiency
-
- ↑ N1%
 - No significant changes to % of other stages



Normal polysomnography parameters in healthy adults: a systematic review and meta-analysis

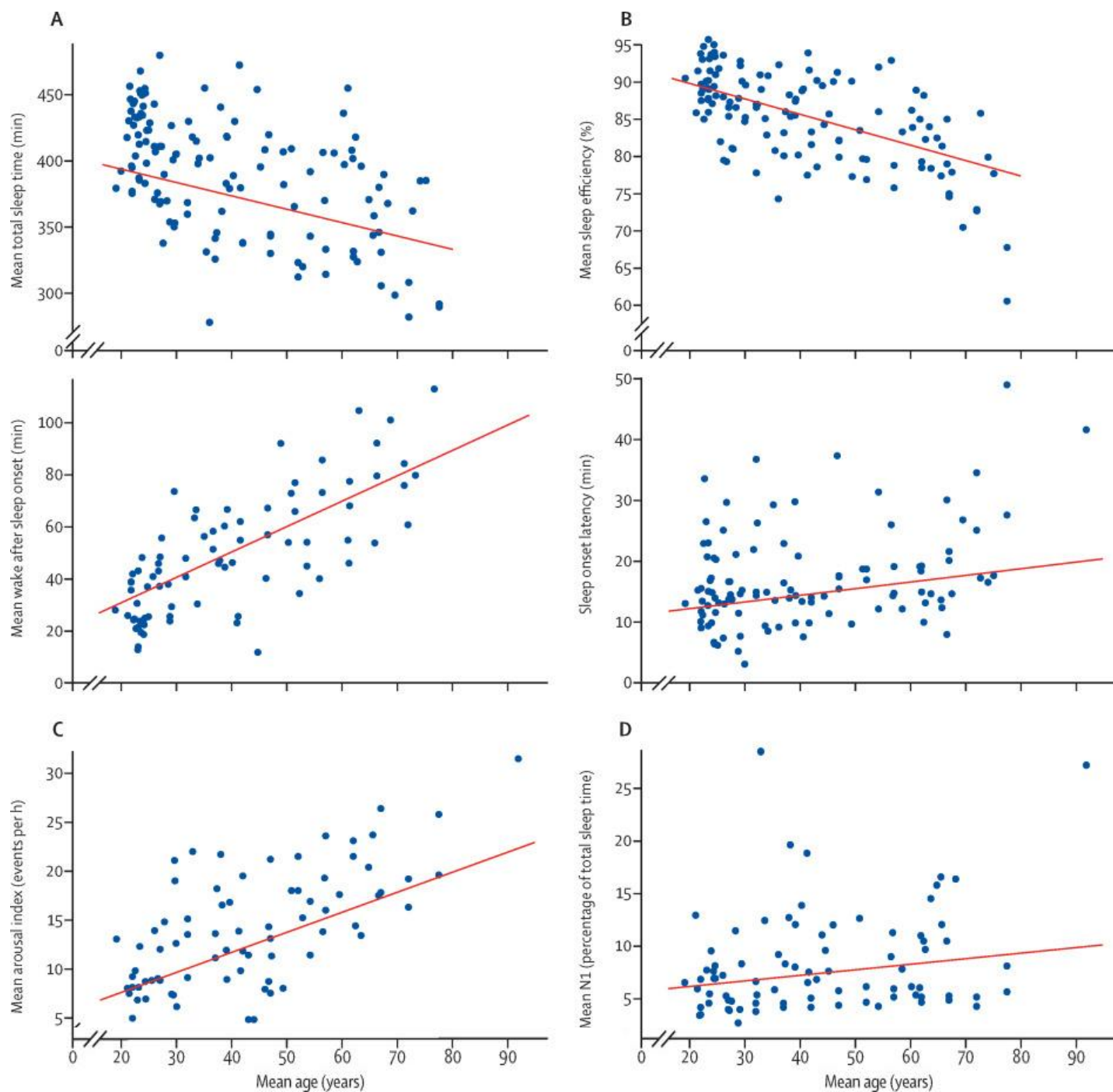


Mark I Boulos*, Trevor Jairam*, Tetyana Kendzerska*, James Im, Anastasia Mekhael, Brian J Murray

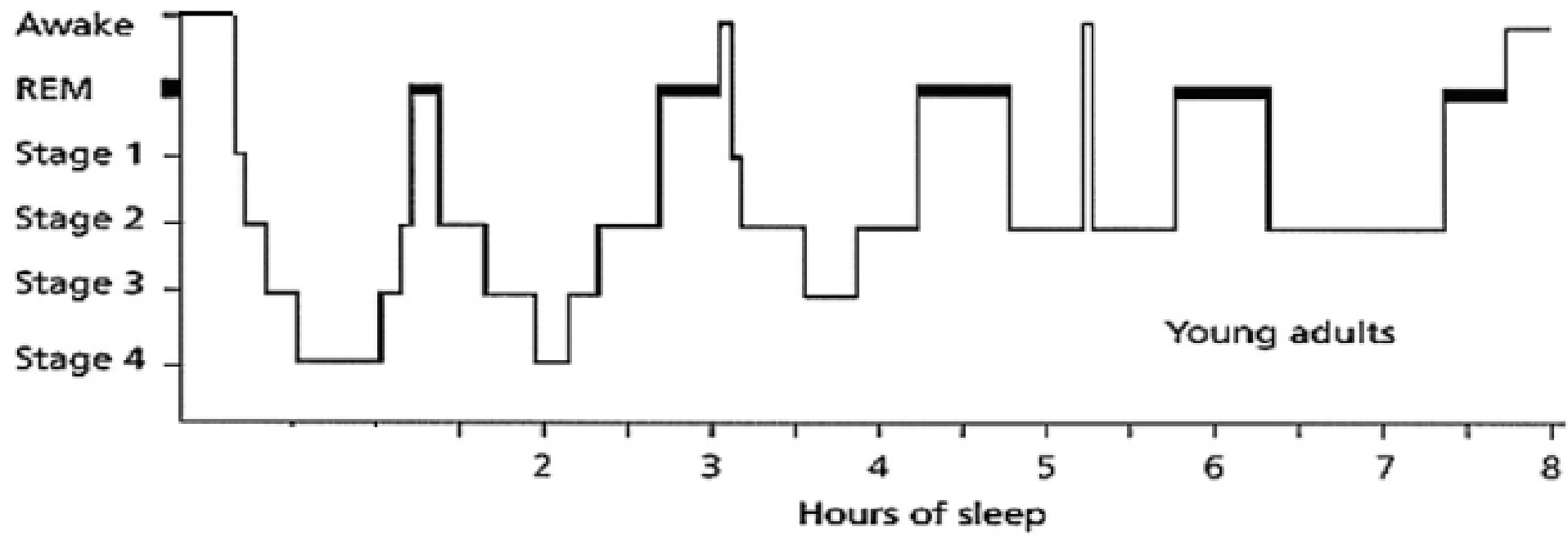
	Total sleep time, min	Sleep efficiency	Wake after sleep onset, min	Duration of sleep stages (percentage of total sleep time)			
				N1	N2	N3	REM
Total sample	394.6 (388.4–400.8); k=158	85.7% (84.8–86.6); k=147	48.2 (43.8–52.6); k=94	7.9% (7.3–8.5); k=104	51.4% (50.2–52.6); k=104	20.4% (19.0–21.8); k=107	19.0% (18.5–19.6); k=108
Mean age, years							
18–34	410.6 (404.5–416.6); k=76	89.0% (88.0–90.0); k=65	32.1 (28.2–36.1); k=42	6.0% (5.3–6.7); k=38;	51.3% (49.6–52.9); k=39	21.4% (20.0–22.8); k=42	19.8% (18.8–20.8); k=44
35–49	386.6 (371.4–401.9); k=32	85.4% (83.7–87.1); k=35	51.1 (41.1–61.1); k=22	8.0% (6.9–9.2); k=23	52.2% (50.6–53.8); k=24	20.4% (18.5–22.2); k=23	19.3% (18.2–20.3); k=24
50–64	372.0 (358.1–85.89); k=26	83.2% (81.0–85.4); k=27	64.0 (55.1–72.9); k=17	8.7% (7.3–10.0); k=22	52.8% (49.8–55.8); k=22	18.1% (15.0–21.2); k=23	18.7% (17.8–19.6); k=23
65–79	346.0 (326.7–365.4); k=17	77.5% (73.0–81.9); k=16	77.1 (57.3–96.9); k=12	9.3% (7.0–11.6); k=11;	53.3% (50.0–56.7); k=11	19.9% (17.8–22.1); k=11	17.7% (16.9–18.5); k=10
≥80	198.6 (142.5–254.7); k=1	45.7% (33.7–57.7); k=1	NA	27.5% (15.0–40.0); k=1	43.5% (37.8–49.2); k=1	19.1% (8.3–29.9); k=1	9.9% (4.4–15.4); k=1

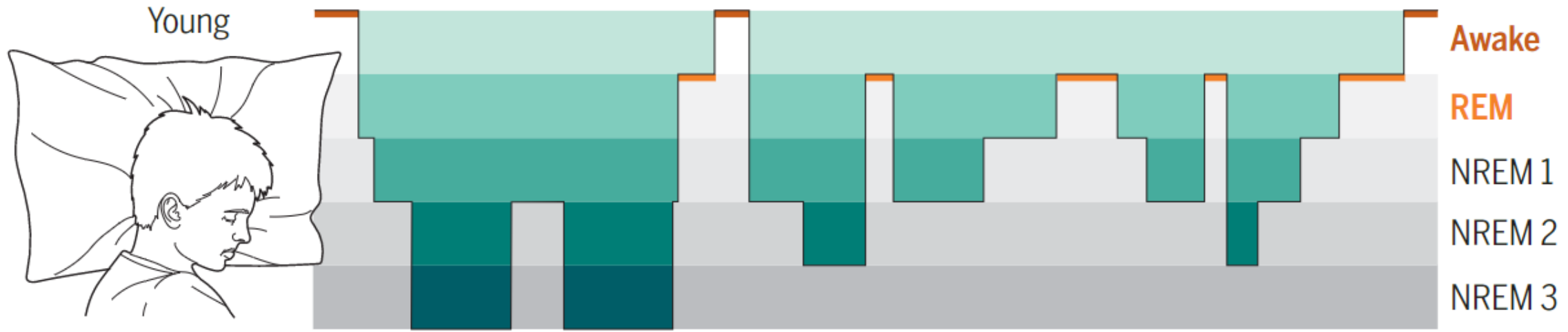
Variable k represents the number of control groups combined to reach the pooled estimate; the corresponding number of participants for each estimate is included in the appendix. Some studies included more than one control group. REM=rapid eye movement. NA=no studies available for this variable at this age cutoff.

Table 2: Means with 95% CIs for total sleep time, sleep efficiency, wake after sleep onset, and duration of sleep stages for total sample and by age, sex, and night of sleep study based on random-effects models



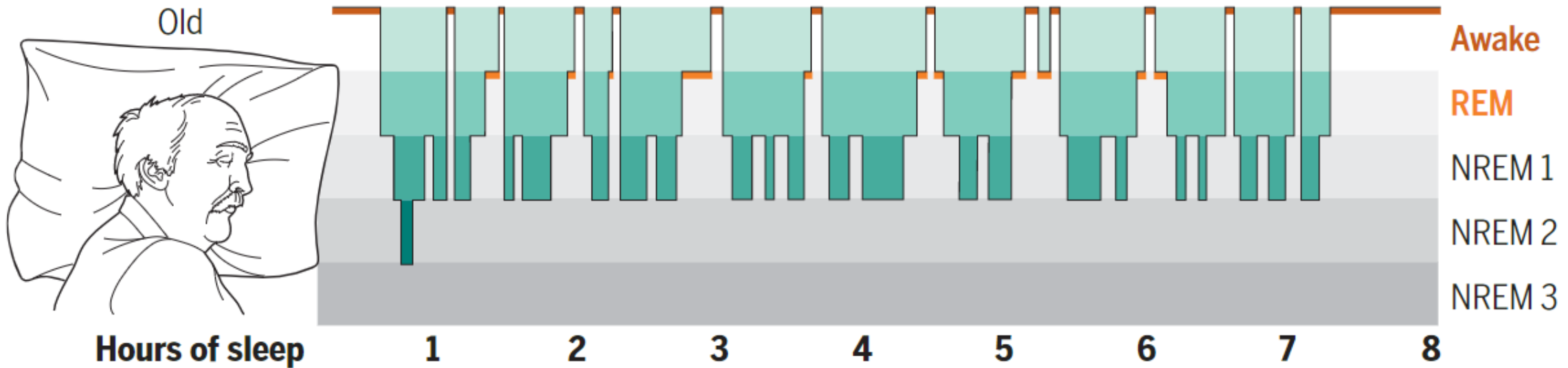
- Overall decrease in sleep quality/stability
- Yet older people are less likely to complain about sleep than younger individuals with same level of sleep disruption





High Low

Glymphatic flow



PSG considerations

- ↓ Amplitude of slow waves
- ↓ Density of slow waves
- ↓ Spindle density in N2

H. Scoring Stage N3^{NI}

1. Score in accordance with the following definition: ^{N2, N3} **RECOMMENDED**

Slow wave activity: Waves of frequency 0.5 Hz–2 Hz and peak-to-peak amplitude >75 μ V, measured over the frontal regions referenced to the contralateral ear or mastoid (F4-M1, F3-M2).

2. Score stage N3 when $\geq 20\%$ of an epoch consists of slow wave activity, irrespective of age. ^{N4, N5, N6, N7} **RECOMMENDED**

Note 1. Stage N3 represents slow wave sleep and replaces the Rechtschaffen and Kales nomenclature of stage 3 and stage 4 sleep.

Note 2. K complexes would be considered slow waves if they meet the definition of slow wave activity.

Note 3. Pathological wave forms that meet the slow wave activity criteria, such as those resulting from neurological impairment, encephalopathy, or epilepsy, are not counted as slow wave activity of sleep. Similarly, waveforms produced by artifact or those of non-cerebral origin should not be included in the scoring of slow waves.

Note 4. Sleep spindles may persist in stage N3 sleep.

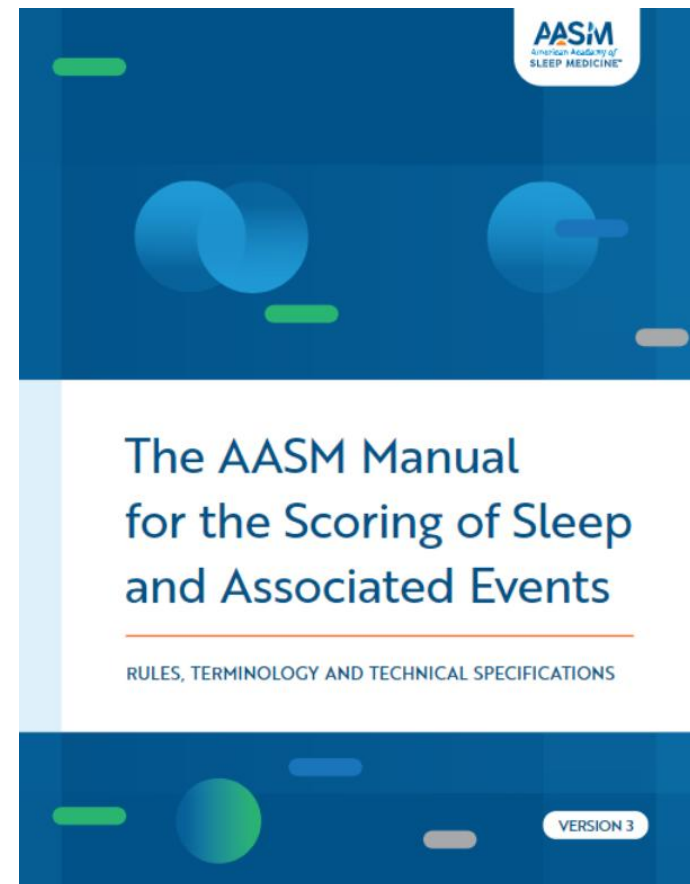
Note 5. Eye movements are not typically seen during stage N3 sleep.

Note 6. In stage N3, the chin EMG is of variable amplitude, often lower than in stage N2 sleep, and sometimes as low as in stage R sleep.

Note 7. Due to reported difficulty correctly identifying qualifying slow waves, 75 μ V lines inserted in the recording or identification of delta waves by concurrent digital analysis, may assist the scorer. Candidate slow waves may be marked such that the total duration of slow waves may be quantified.

G. Scoring Stage N2

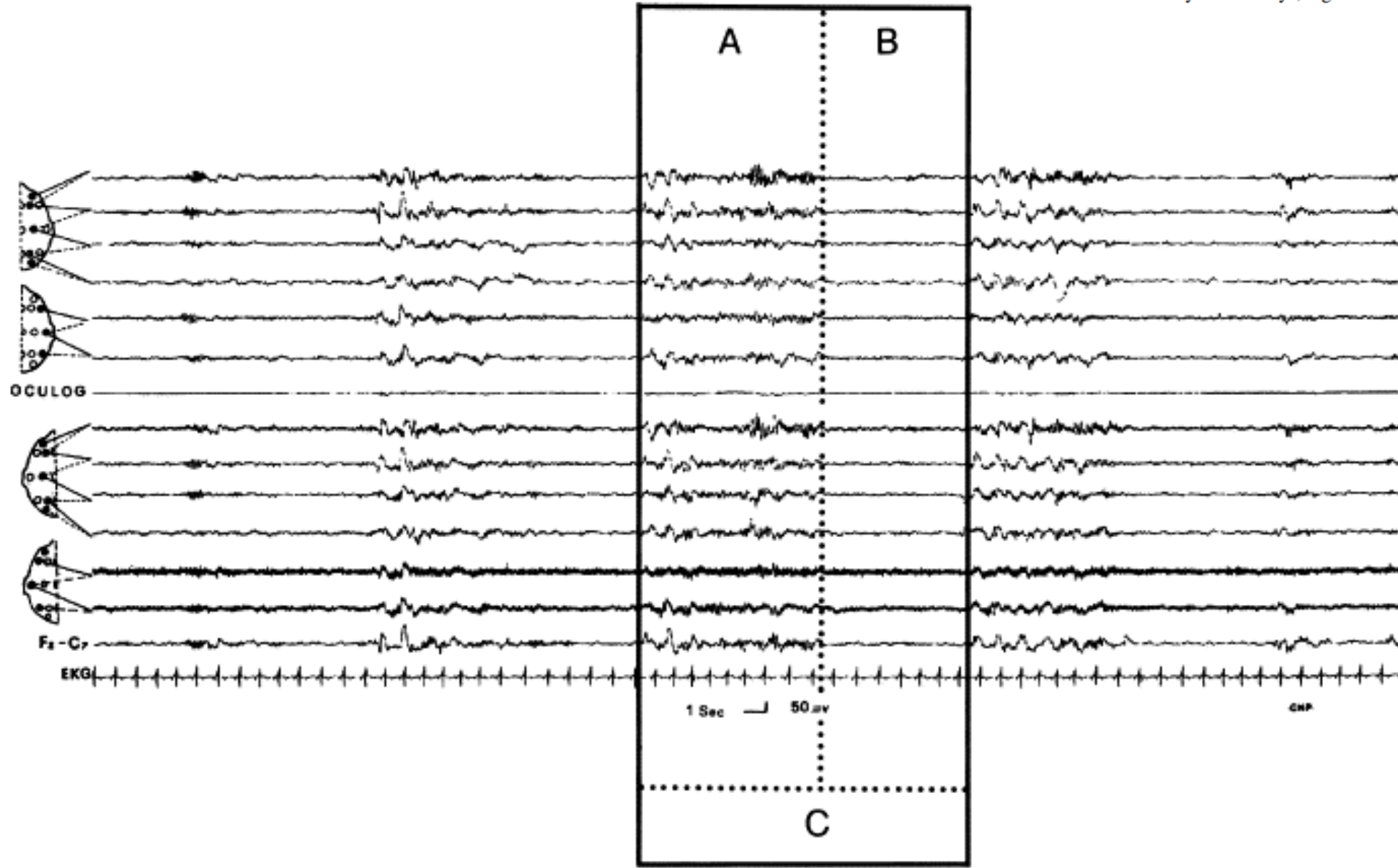
Epochs following an epoch of stage N3 that do not meet criteria for stage N3 are scored as stage N2 if there is no intervening arousal and the epoch does not meet criteria for stage W or stage R. (see Figure 9) **RECOMMENDED**



• ↑ Cyclic alternating pattern

Atlas, rules, and recording techniques for the scoring of cyclic alternating pattern (CAP) in human sleep

Mario Giovanni Terzano^{a,*}, Liborio Parrino^a, Adriano Sherieri^a, Ronald Chervin^b,
Sudhansu Chokroverty^c, Christian Guilleminault^d, Max Hirshkowitz^e, Mark Mahowald^f,
Harvey Moldofsky^g, Agostino Rosa^h, Robert Thomasⁱ, Arthur Walters^j



Subjective changes

- Daytime napping is common, and considered normal, in older people
- Older people complain less about poor sleep than their younger counterparts, regardless of similar objective impairment
- Excessive daytime sleepiness reduces with age

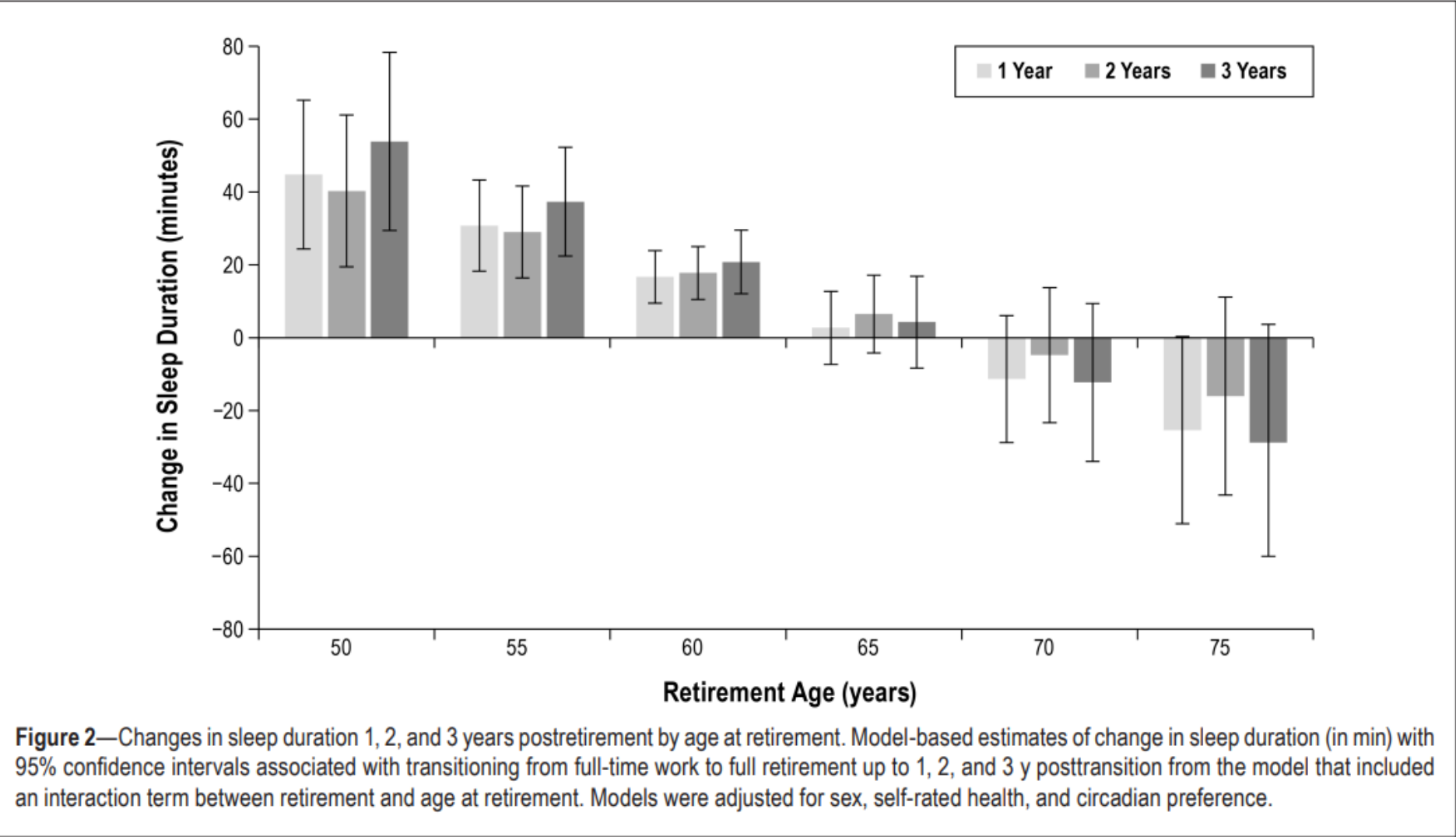
Subjective changes

- Less impact on daily activities during retirement?
- Element of overshadowing?
 - “Older people don’t sleep well”
 - “Older people just need less sleep”
 - “It’s just my age”
- Limitations of subjective measurement tools, e.g. ESS

SLEEP DURATION/SLEEP QUALITY

Changes in Sleep Duration and Sleep Timing Associated with Retirement Transitions

Erika W. Hagen, PhD¹; Jodi H. Barnet, MS¹; Lauren Hale, PhD²; Paul E. Peppard, PhD¹



The contribution of social isolation and loneliness to sleep disturbances among older adults: a systematic review

Sleep and Biological Rhythms (2022) 20:153–163
<https://doi.org/10.1007/s41105-022-00380-x>

Akbar Azizi-Zeinalhajlou^{1,2} · Mojgan Mirghafourvand³ · Haidar Nadrian⁴ · Siros Samei Sis^{1,2} · Hossein Matlabi^{5,6} 

References	Summary of results
Jia and Yuan [29]	Older adults with higher levels of loneliness had poorer sleep quality Five dimensions of sleep quality, including subjective sleep quality, sleep latency, sleep duration, use of sleeping medication, and daytime dysfunction, were associated with loneliness
Benson [27]	Loneliness and social isolation were associated with WASO and percent sleep (TST divided by the duration of the first to the last epochs scored as sleep). Neither was associated with TST -Sleep calculated duration, the calculated time in bed, and later wake times were significantly associated with social isolation in adjusted models Increased loneliness was strongly associated with more insomnia symptoms, but social isolation was not
Shankar [25]	Following adjustment for covariates, baseline loneliness score was associated with an increase in the odds of reporting more sleep problems at follow-up
Griffin [34, 41]	Loneliness and sleep were bidirectionally related. Loneliness is a risk factor for sleep disturbance and vice versa Loneliness and sleep disturbance predicted each other over time, suggesting reciprocal causality between loneliness and sleep disturbance
Cho et al. [23]	The associations between subjective and objective social isolation with sleep disturbance remained significant after adjusting for all covariates
Makarem and Naji [30]	There was an inverse relationship between loneliness and quality of sleep
Cheng et al. [33]	Poor social networks and restless sleep reciprocally influence each other through depressed moods in older adults
Yu et al. [26]	After controlling confounders, social isolation at the baseline predicted poor sleep quality 6 years later, while the association between loneliness and sleep quality was no longer significant There is an adverse effect of social isolation on sleep quality, but this effect is independent of loneliness It seems that loneliness and social isolation have distinct pathways in affecting the quality of sleep among older adults
Eshkoo et al. [31]	Social isolation and being single increased sleep disruption
McHugh and Lawlor [24]	After controlling for demographic factors and for sleep quality at baseline, loneliness at baseline predicted sleep quality at follow-up
Yao et al. [32]	There was a significant relationship between a social network (relationships with relatives/friends) and sleep quality

Limitations of subjective measure

- Difficult to disentangle sleep changes related to sleep disorders and age-related changes
- Common measures may not be well-suited for an older population
- May not be suitable for individuals with cognitive impairment

Developing an Alternative Version of the Epworth Sleepiness Scale to Assess Daytime Sleepiness in Adults with Physical or Mental Disabilities

Janine Gronewold^a Michelle Chantal Isidora Lenuck^a Isra Gülderen^a
Anne-Carina Scharf^a Thomas Penzel^b Murray W. Johns^c Helmut Frohnhofen^d
Dirk M. Hermann^a

Table 8. Final English version of the ESS-ALT approved by M.W. Johns

ESS-ALT items

- 1. Sitting and reading
- 2. Watching TV or a video
- 3. Sitting in a waiting room
- 4. As a passenger in a car or a bus for about half an hour
- 5. Lying down to rest in the afternoon
- 6. Sitting and talking to someone
- 7. Sitting quietly by yourself after lunch
- 8. Sitting and eating a meal

- Fewer missing responses (23 vs. 73%)
- Higher level of internal consistency (Cronbach’s α = 0.64 vs. 0.23)

Sleep disorders in older people

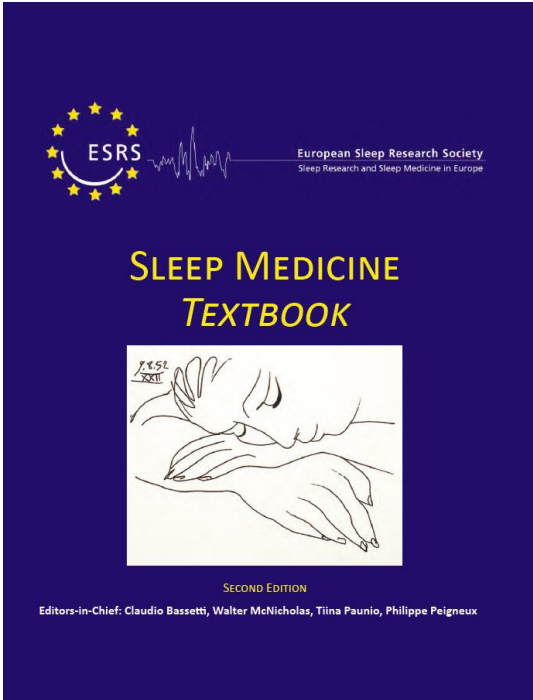
TABLE 1 Somatic comorbidity, polypharmacy, mental, and social dimensions of sleeping problems in the elderly

Dimension	Examples
Somatic comorbidity	Allergy, Anaemia, Arthritis, Colitis, Chronic obstructive airway disease, Congestive heart failure, Coronary artery disease, Dehydration, Diabetes mellitus, Diarrhoea, Gastric ulcer, Gastroesophageal reflux, Hypertension, Hypoglycaemia, Immobility, Incontinence, Inflammatory conditions, Insulinoma, Menopause, Metabolic syndrome, Migraine, Nycturia, Obesity, Pain, Paresis, Parkinson's disease, Peripheral artery disease, Physical disability, Polyneuropathy, Prostatic hypertrophy, Pruritus, Renal failure, Rhinitis, Stroke, Thyroid disorder, Visual impairment, ...
Polypharmacy	Anticholinergics ^a Antidepressants (tricyclic), Antidepressants (e.g., selective serotonin reuptake inhibitor), Antihistamines, alpha-Blockers, beta-Blockers, Benzodiazepines (tolerance, rebound insomnia, muscle relaxation, nocturnal falls), Caffeine, Cholinesterase-inhibitors in the evening, Diuretics, Interferons, Levo-Dopa, Nicotine, OTC ^b , Steroids, Stimulants, Theophylline, ...
Psychology	Alcoholism, Anxiety, Benzodiazepine-dependence, Confusional state, Dementia, Depression, Mania, Schizophrenia, ...
Social issues	Disruptive care activities (in nursing homes), Free-running circadian rhythm (in retirees), Loneliness, Room sharing (Nursing home), Social disengagement

^aAlmost any molecule other than acetylcholine can act as an anticholinergic due to low receptor specificity.

^bOver-the-counter-drugs (OTC) may do little harm in younger patients without additional medical problems and medications. However, they should be used cautiously (or not at all) in the elderly. Also there is a lack of scientific data to support short- or long-term use of OTC drugs for sleeping problems.

Remember:
Older people can experience the same range of sleep disorders as younger people



Evidence-Based Recommendations for the Assessment and Management of Sleep Disorders in Older Persons

Harrison G. Bloom, MD, AGSF,^{ab} Imran Ahmed, MD,^c Cathy A. Alessi, MD,^{de} Sonia Ancoli-Israel, PhD,^f Daniel J. Buysse, MD,^g Meir H. Kryger, MD,^{hi} Barbara A. Phillips, MD, MSPH, FCCP,^{jk} Michael J. Thorpy, MD,^{cl} Michael V. Vitiello, PhD,^m and Phyllis C. Zee, MD, PhDⁿ

JAGS 57:761–789, 2009

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0002-8614/09/\$15.00

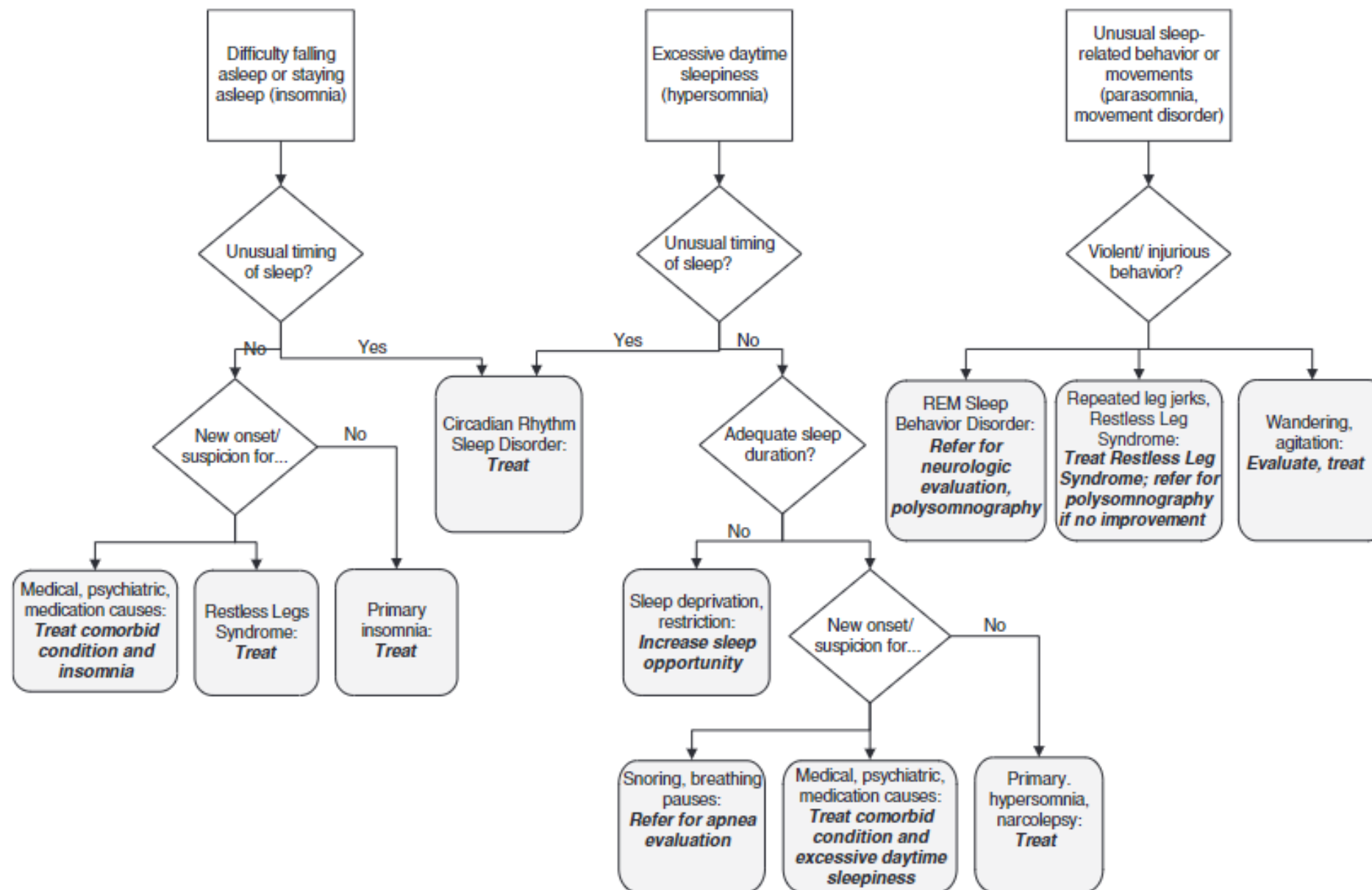
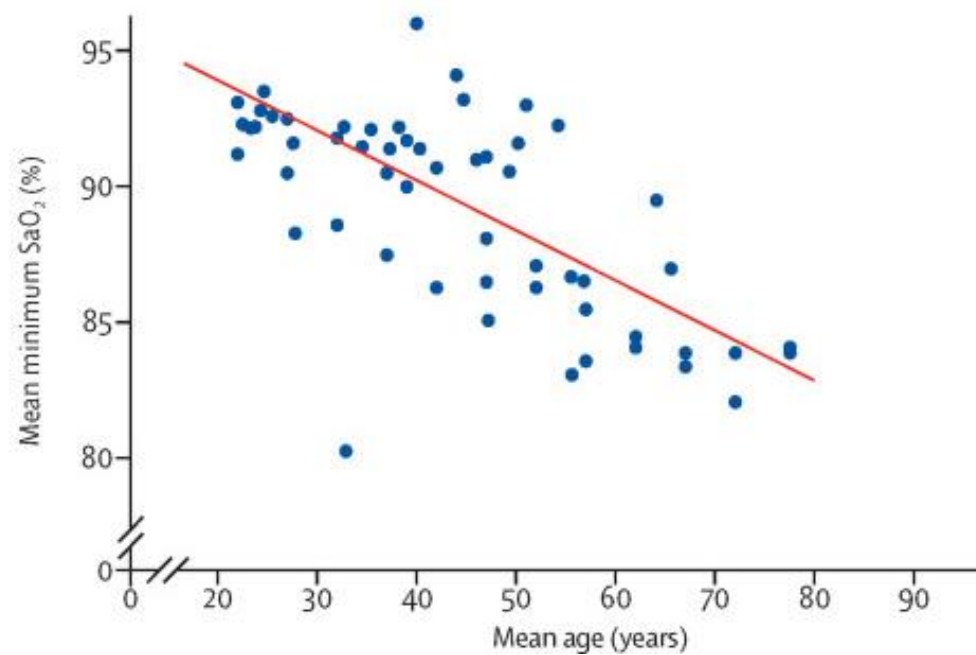
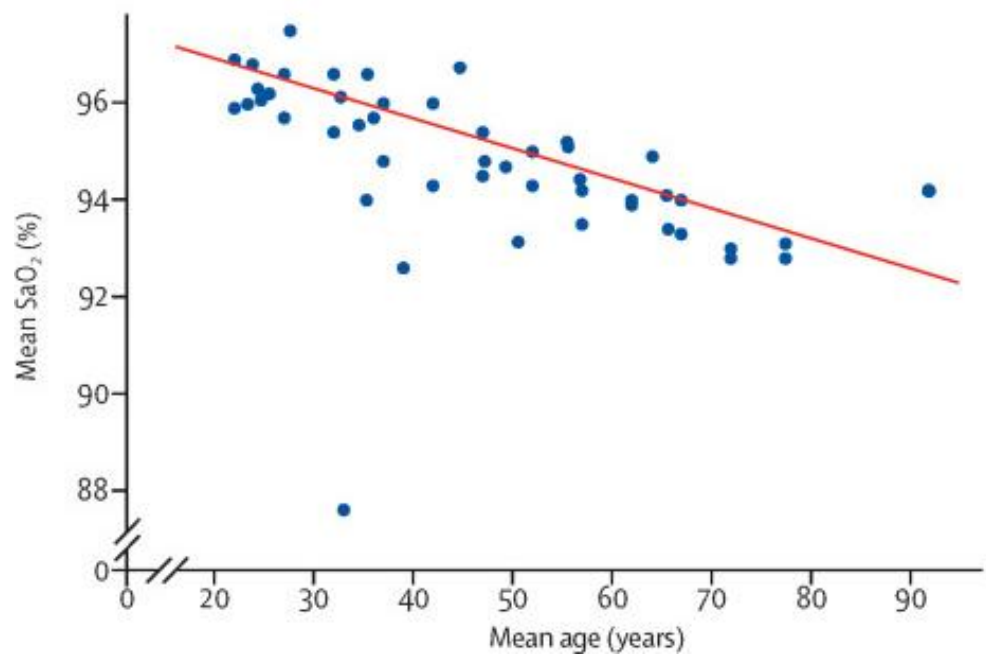
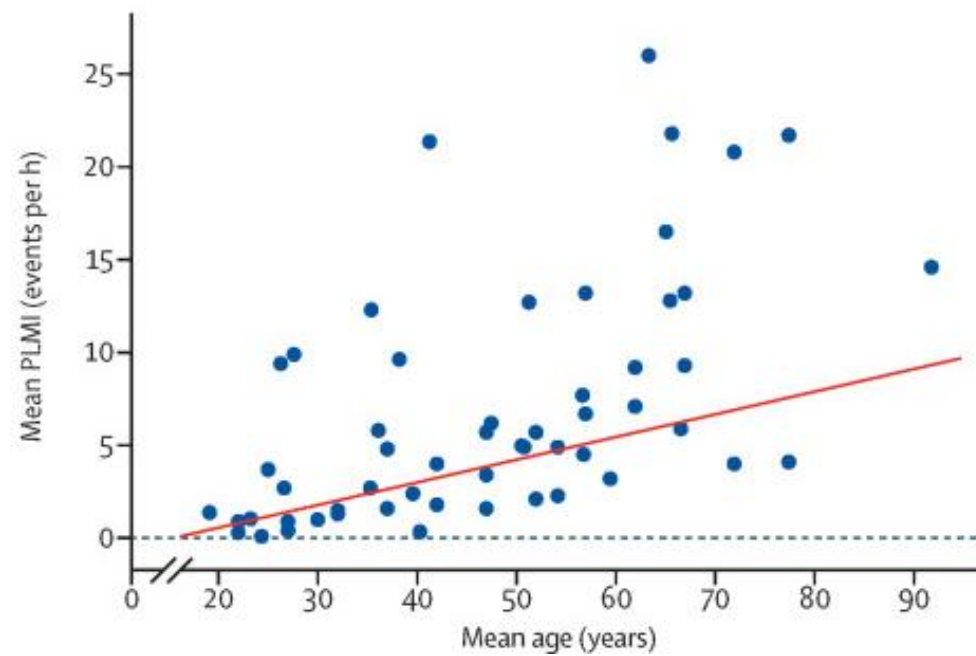
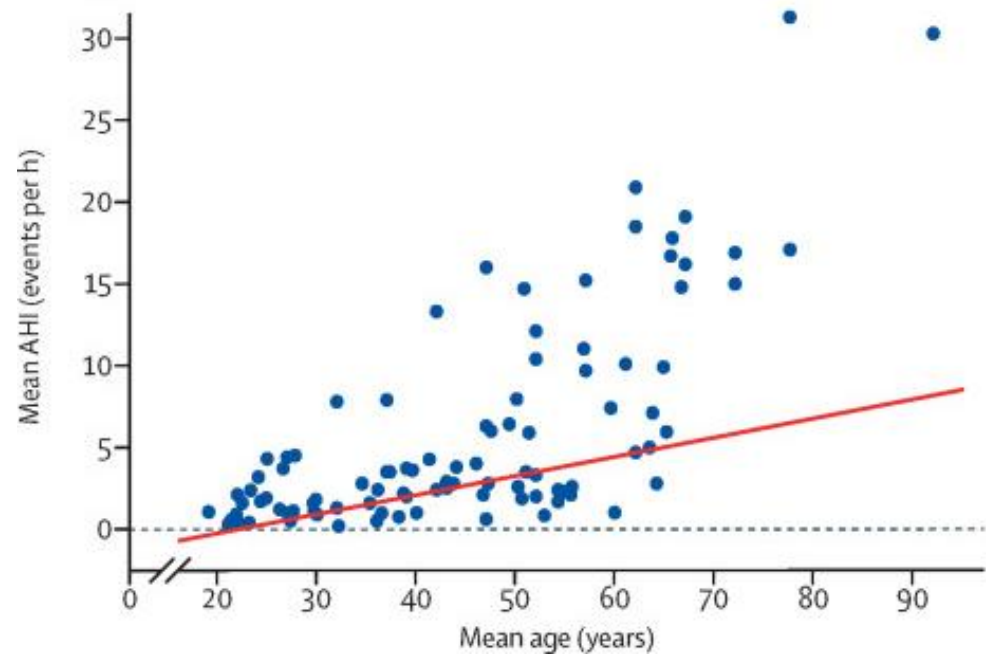


Figure 1. Diagnostic algorithm for sleep disorders in older persons.

Sleep-related breathing disorders

- ↑ SDB prevalence (20-65%)
- ↑ OSA prevalence (~35%)
- ↑ CSA prevalence (~12%)
- Physiological, comorbidities, medication...
- Few studies of CPAP in older people





breathe

PRACTICE-FOCUSED EDUCATION
FOR RESPIRATORY PROFESSIONALS

Sleep apnoea in older people

Educational Aims

- ▶ To provide a comprehensive, up-to-date review of the prevalence of obstructive sleep apnoea in older people
- ▶ To describe the mechanisms of central and obstructive sleep apnoea in older people
- ▶ To outline the symptoms of sleep apnoea in older people
- ▶ To discuss the evidence base for the treatment of obstructive sleep apnoea syndrome in older people.

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Continuous positive airway pressure in older people with obstructive sleep apnoea syndrome (PREDICT): a 12-month, multicentre, randomised trial

Alison McMillan, Daniel J Bratton, Rita Faria, Magda Laskawiec-Szkonter, Susan Griffin, Robert J Davies*, Andrew J Nunn, John R Stradling, Renata L Riha†, Mary J Morrell†, on behalf of the PREDICT Investigators‡

	BSC group (N=138)	CPAP group (N=140)
Age (years)	71.3 (4.6)	70.9 (4.7)
Male sex	109 (79)	120 (86)
Ethnic origin		
White	134 (97)	133 (95)
Asian	3 (2)	5 (4)
Other	1 (1)	2 (1)
Body-mass index (kg/m ²)	33.6 (6.4)	33.9 (5.7)
Neck circumference (cm)	42.6 (4.0)	44.0 (4.4)
Systolic blood pressure (mm Hg)	140.4 (20.0)	137.7 (17.7)
Diastolic blood pressure (mm Hg)	77.6 (12.4)	77.7 (10.2)
Current drivers	111 (80)	117 (84)
Oxygen desaturation index (>4% dips per h)	27.9 (18.5)	29.4 (19.7)
Time SpO ₂ <90% (min)	33.2 (13.9–84.4)	38.5 (14.6–91.0)
Epworth sleepiness score	11.6 (3.9)	11.6 (3.4)
Oxford Sleep Resistance Test (min)	20.3 (9.4–37.5)	22.4 (13.3–40.0)
European Quality of Life-5 dimensions	69.2 (18.2)	69.2 (17.1)
Sleep Apnea Quality of Life Index	4.7 (1.2)	4.8 (1.2)
Townsend Disability Scale	2.5 (1–7)	2.5 (1–5)
Mini Mental State Examination	29 (28–30)	29 (27–30)
Comorbidity		
Ischaemic heart disease	49 (36)	42 (30)
Hypertension	104 (75)	98 (70)
Diabetes	43 (31)	40 (29)
Peripheral vascular disease	32 (23)	26 (19)
Atrial fibrillation	41 (30)	28 (20)
Heart failure	11 (8)	7 (5)
Cerebral vascular disease	19 (14)	16 (11)

Data are mean (SD), median (25th–75th percentiles), or number of patients (%). BSC=best supportive care.

CPAP=continuous positive airway pressure. Data were unavailable for body-mass index for two patients (one in BSC group, one in group CPAP), oxygen desaturation index for two patients (one in BSC group, one in CPAP group), time SpO₂ for 48 patients (23 in BSC group, 25 in CPAP group), Oxford Sleep Resistance test for two patients in CPAP group, European Quality of Life-5 dimensions for one patient in BSC group, Mini Mental state Examination for one patient in BSC group, and heart failure for one patient in BSC group. The oxygen desaturation index and Epworth sleepiness score are those recorded at the baseline visit; which in some cases differed from the values recorded at diagnosis (note the values recorded during the baseline visit were used in the analysis).

Table: Baseline characteristics

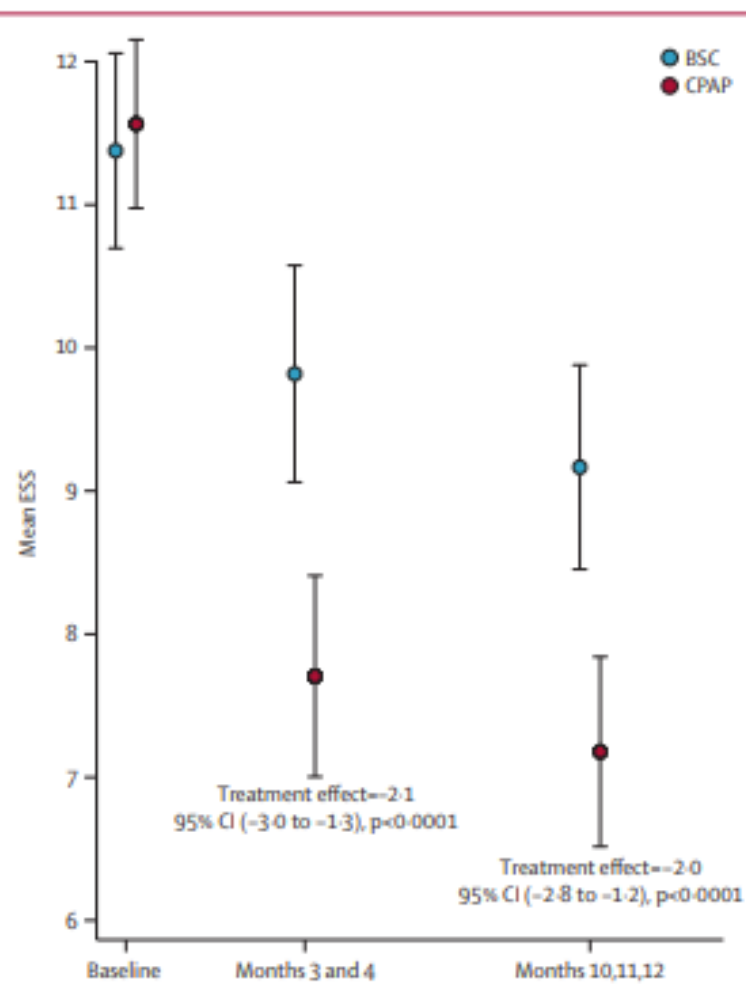


Figure 2: Treatment effect of CPAP compared with BSC on subjective sleepiness measured by mean ESS

Continuous positive airway pressure in older people with obstructive sleep apnoea syndrome (PREDICT): a 12-month, multicentre, randomised trial

Alison McMillan, Daniel J Bratton, Rita Faria, Magda Laskawiec-Szkonter, Susan Griffin, Robert J Davies, Andrew J Nunn, John R Stradling, Renata L Rihai†, Mary J Morrell†, on behalf of the PREDICT Investigators‡*

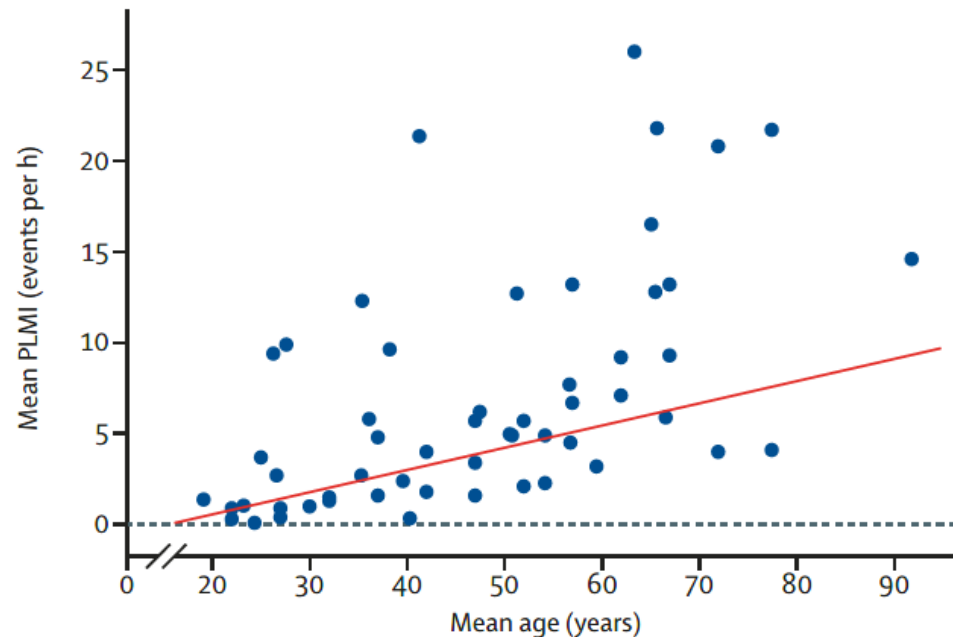
Table S14: Continuous positive airway pressure usage over 3 and 12 months

	Over 3 months	Over 12 months
Data available N (%)	117/140 (84)	102/140 (73)
Median usage (mean hours/night)	01:52 (00:19-05:12)	02:22 (00:10 - 05:09)
Using CPAP >4 hours/night no. (%)	41/117 (35)	36/102 (35)
Median usage (hours/night) Including patients with missing data as 0 hours/night	01:33 (00:13-05:00)	01:26 (00:04 - 04:45)

Data presented as number of patients N (%), mean (SD), median (25th-75th percentiles)

Sleep-related movement disorders

- RLS affects 3-5% aged ≥ 65 yr
- Physiological, comorbidities, medication...
- $\uparrow$ PLM index

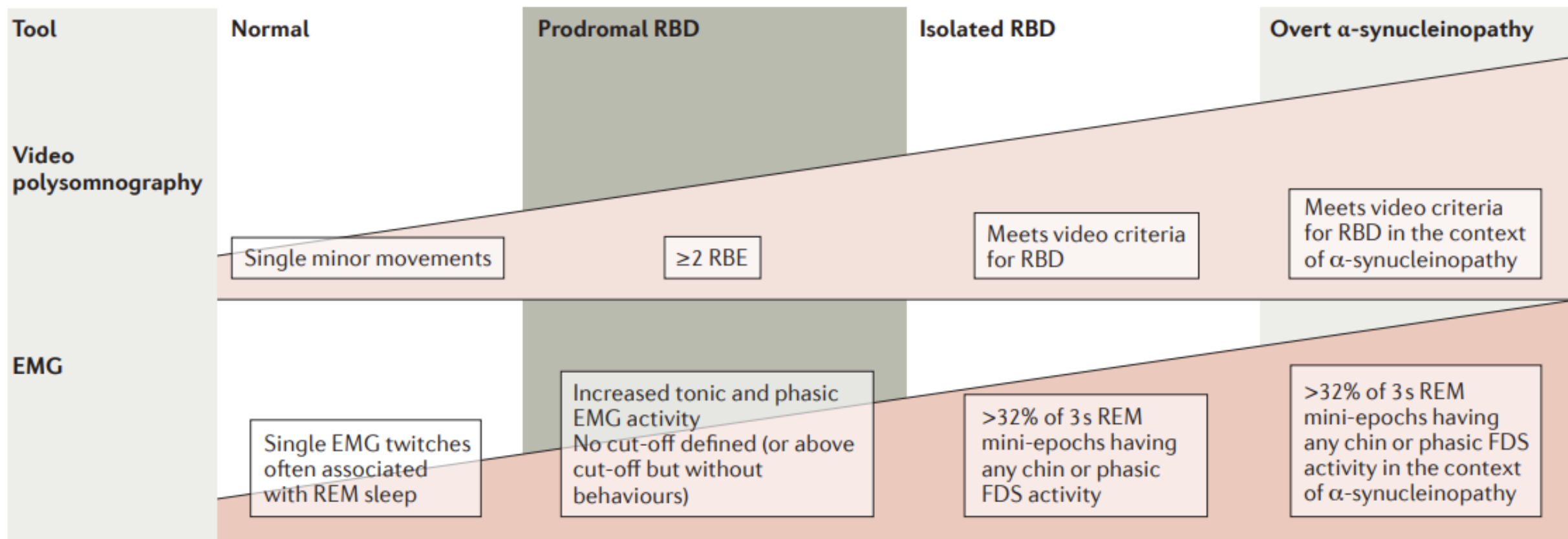


Parasomnias

- REM sleep behaviour disorder (~0.5%)
- Male predominance (~75%)
- Prodromal stage of α -synucleinopathies
- But can also be secondary to medication

Idiopathic REM sleep behaviour disorder and neurodegeneration — an update

Birgit Högl¹, Ambra Stefani¹ and Aleksandar Videnovic²



Insomnia

- Affects up to 50% of older people
- Assessment and treatment as per younger patients
 - Address underlying somatic, pharmacological, mental and/or social issues
 - Exercise non-pharmacological interventions
 - Attempt symptomatic pharmacological treatment
- Consider falls risk with therapies
 - SRT
 - Drug treatments

Efficacy of cognitive behavioral therapy for insomnia (CBT-I) in older adults with insomnia: A systematic review and meta-analysis

Australasian Psychiatry
2022, Vol. 30(5) 592–597
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Dementia

Dementia

- Poor/disordered sleep leads to cognitive impairment in general population
- Older people may be more sensitive to the cognitive effects of poor sleep/sleep loss
- Bidirectional relationship between poor/disordered sleep and dementia
- Sundown syndrome common in mid-late stage

Table 2. Neuropsychiatric symptoms presented in Sundown Syndrome.

Symptom	Number of patients	%
Irritability	21	55.3
Nocturnal behavior	18	47.4
Aggressiveness	16	42.1
Hallucinations	15	39.5
Aberrant motor behavior	14	36.8
Apathy	14	36.8
Disinhibition	10	26.3
Anxiety	9	23.7
Delusion	7	18.4
Euphoria	6	15.8
Eating alterations	6	15.8

<http://dx.doi.org/10.1590/1980-57642018dn13-040015>

**Sundown syndrome in patients with
Alzheimer’s disease dementia**

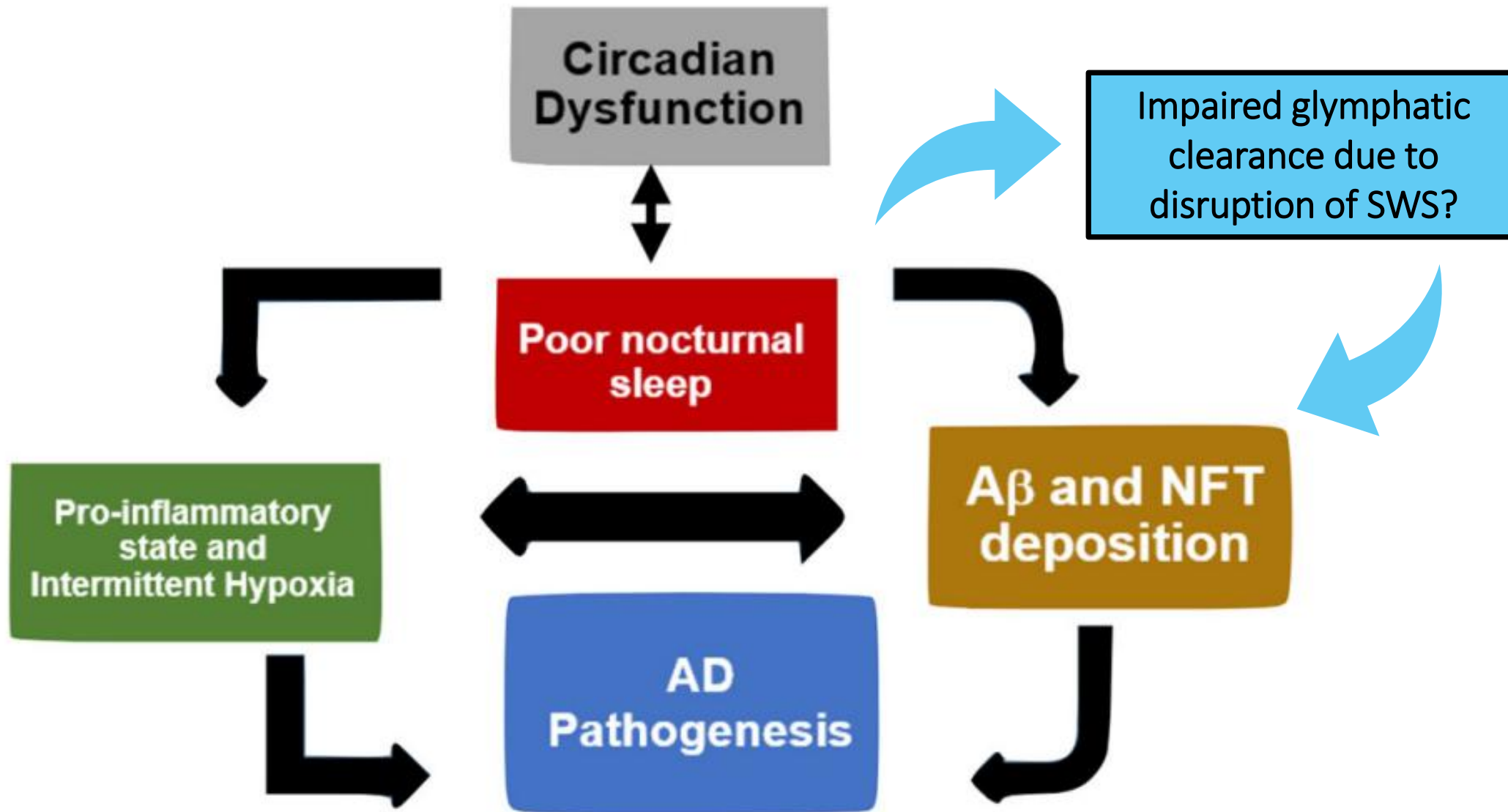
Cristiani Sartorio Menegardo¹, Fernanda Alencar Friggi¹, Julia Baldon Scardini²,
Tais Souza Rossi², Thais dos Santos Vieira², Alessandra Tieppo³, Renato Lirio Morelato⁴

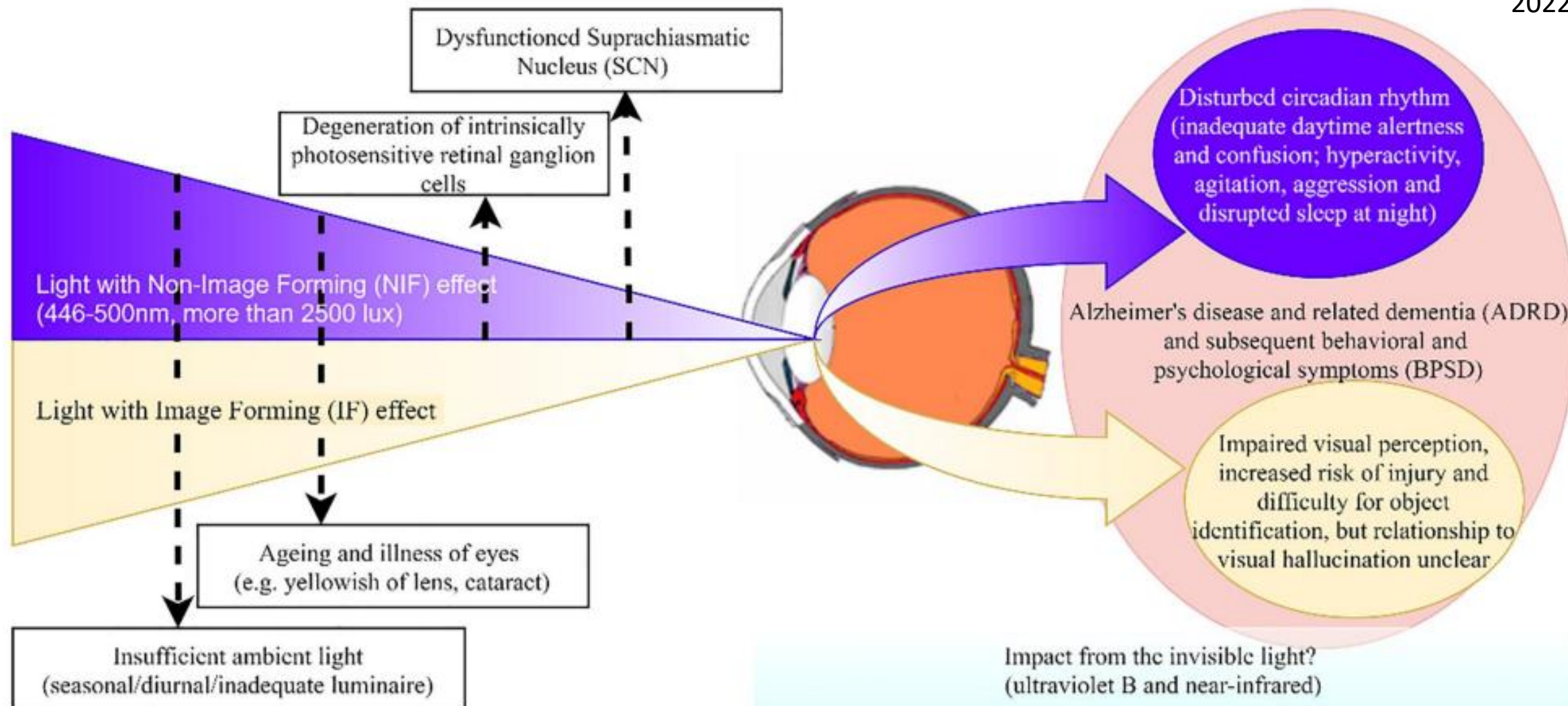
TABLE 1 | Factors that have been associated with the pathophysiology and clinical occurrence of sundowning among persons with dementia.

Neurobiological factors	Degeneration of the suprachiasmatic nucleus Decreased melatonin production Disruption of circadian rhythms Impaired cholinergic neurotransmission Dysregulation of the HPA axis
Pharmacological factors	Antipsychotics Anticholinergics Antidepressants Hypnotics
Physiological factors	Fatigue Hunger Unmet physical or psychological needs Temporal changes in body temperature Circadian modifications of blood glucose levels Circadian changes in blood pressure
Medical factors	Sleep disorders Sensory deprivation Pain Mood disorders and fluctuations Cognitive deficits (e.g., agnosia)
Environmental factors	Exposure to inadequate amount of light Lower staff–patients ratio in residential facilities Lessened availability of home caregivers Caregiver fatigue Environmental overstimulation (noise and chaos)

Sundowning in Dementia: Clinical Relevance, Pathophysiological Determinants, and Therapeutic Approaches

Marco Canevelli*, Martina Valletta, Alessandro Trebbastoni, Giuseppe Sarli, Fabrizia D’Antonio, Leonardo Taricotti, Carlo de Lena and Giuseppe Bruno





Conclusions

Conclusions

- Complex interplay of ageing and morbidity affects sleep in older people
 - Sleep quality/quantity diminishes with age
 - Many sleep disorders increase in prevalence with increasing age
 - Bidirectional link between comorbidities and sleep
- Changes to sleep architecture are noted, though normative PSG data on sleep is scarce beyond age 65 years and current scoring guidelines may be inadequate.

Conclusions

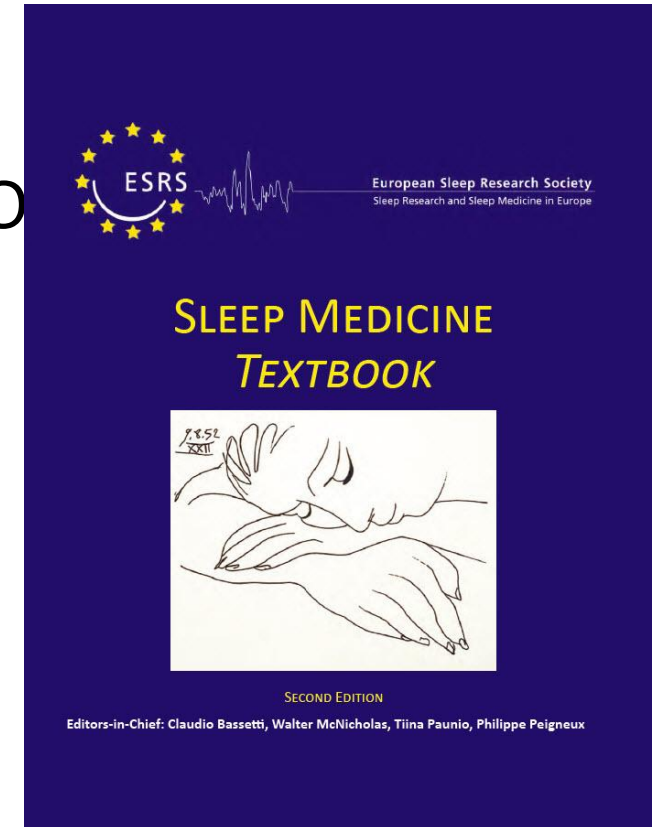
- Older people complain less of poor sleep than younger counterparts, even if objective impairment is similar.
- Older people can experience the same range of sleep disorders as younger people, though specific age-related physiological and psychosocial differences should be borne in mind.
- Common measures may not be well-suited for an older population or those with cognitive impairment.
- Dementia has strong bidirectional links with sleep disorders.

Recommended reading

Chapter N, ESRS Sleep Medicine Textbook
2nd Edition:

Sleep and Geriatrics

pp.1003-1020



PGCert Sleep Medicine

Advanced integrated sleep training
for healthcare professionals



COURSE CONTENT



DESIGN

Created by clinical specialists from NSHCS and NHS England, alongside professional bodies including the British Sleep Society and Association for Respiratory Technology & Physiology.



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To educate staff from a wide range of healthcare professions in the underpinning science and clinical skills related to sleep medicine to support service delivery.



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QR code



Thank you - any questions?

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