

# Public Health Dimensions of Cognitive Aging: Sleep Mindfulness

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# Disclosures: Sonia Ancoli-Israel

Type of Potential Conflict	Details of Potential Conflict
Grant/Research Support	NIA; NCI
Consultant	Acadia, Actelion, Arena, Astra Zenica, Ferring Pharmaceuticals Inc., Merck, NeuroVigil, Inc., Otsuka

This talk does not present material that is related any of these disclosures

# Is Poor Sleep Related to Cognition?

- Subjective complaints of sleep
- Objective measures of sleep
- Sleep disorders
- Treatments



# Is Poor Sleep Related to Cognition?

- Subjective complaints of sleep



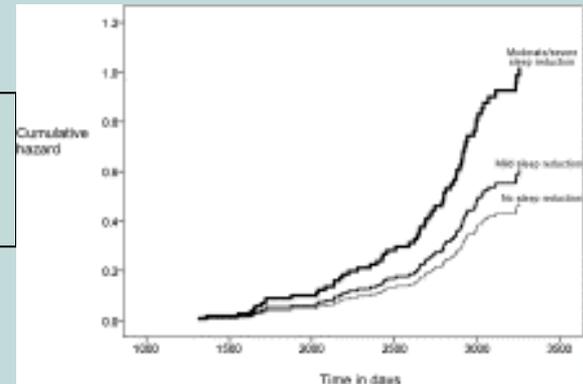
# Sleep Complaints Associated with Decreased Cognitive Function (n=838; $\geq$ 50 years)

- Prospective study to determine whether subjective sleep complaints in a population-based sample predicted cognitive decline over 3 years.
- Sleep complaints measured at baseline
  - assessed with the subscale Sleep Problems of the Symptoms Checklist-90
- Cognitive performance at 3-year follow-up, measured with the Mini Mental Status Examination
- Results: Sleep complaints were associated with decreased MMSE scores
  - Controlling for the effects of age, gender, length of follow-up interval, systemic diseases, and cognitive function at baseline

# Self-Reported Sleep Problems increase Risk of Dementia (n=214; $\geq 75$ y/o; 80% women)

- Examined a subjective report of change in sleep pattern (reduced duration and/or depth) in relation to subsequent risk of incident all-cause dementia and Alzheimer's disease (AD) over 9 years.
- Between the 6th and 9th year after baseline, 28.5% were diagnosed with all-cause dementia, 22.0% of whom had AD.
- Reports of reduced sleep were associated with
  - 75% increased all-cause dementia risk (hazard ratio: 1.75; 95% confidence interval: 1.04-2.93,  $p = 0.035$ )
  - 2x the risk of AD (hazard ratio: 2.01; 95% confidence interval: 1.12-3.61;  $p = 0.019$ )
    - adjusting for age, gender, and education, lifestyle and vascular factors; **not significant after controlling for depression**
- Conclusions: Self-reported sleep problems may increase the risk for dementia, and depressive symptoms may explain this relationship

Compared with no sleep reduction, moderate/severe sleep reduction was associated with statistically significant greater risk of all-cause dementia; mild sleep reduction was not associated with risk of dementia



# Self-Reported Sleep Problems increase Risk of Dementia (n=214; $\geq 75$ y/o; 80% women)

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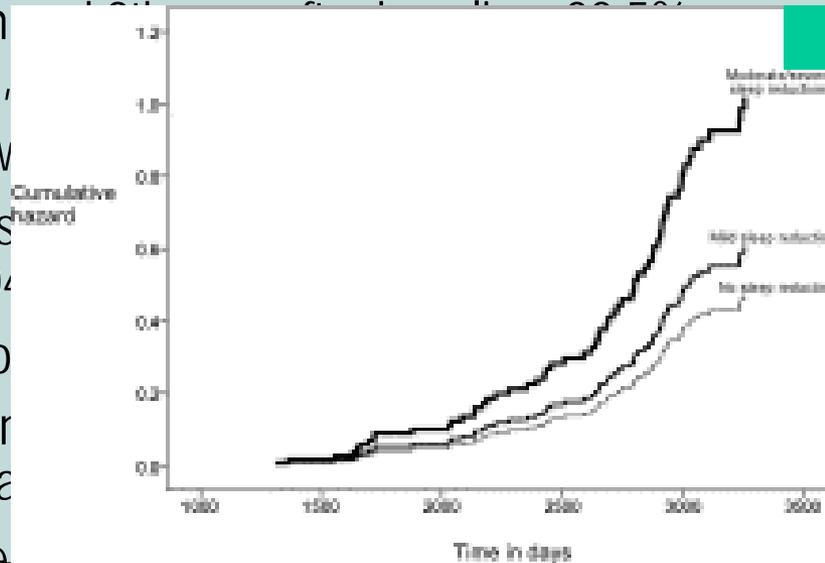
- Reduced sleep v

- 75% increase
  - interval: 1.04

- 2x the risk o

- adjusting
    - significa

- Conclusions: Se
- depressive



Moderate/severe sleep reduction

Mild sleep reduction

No sleep reduction

interval: 1.12-5.01,  $p = 0.019$ )

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Compared with no sleep reduction, moderate/severe sleep reduction was associated with statistically significant greater risk of all-cause dementia; mild sleep reduction was not associated with risk of dementia

# Report of Poor Sleep Associated with Dementia and Mortality

- Secondary analyses of sleep-related measures collected through the Survey of Health, Ageing and Retirement in Europe (SHARE; i.e., sleeping problems, fatigue, taking sleeping medication, and trouble sleeping or a change in pattern)
  - conducted on those who reported the absence of AD or dementia at baseline.
- A 'sleep disturbance index' (SDI) using sleep-related measures was created and compared to a frailty index reflecting overall health status.
- Each sleep measure independently predicted self-reported AD or dementia and mortality within ~4 years.
  - Combined, the SDI was associated with an increased risk of
    - developing AD or dementia (OR= 1.23, 95%CI = 1.11-1.36)
    - mortality (OR = 1.18, 95% CI = 1.12-1.24),
  - remained a strong factor for dementia when overall health status was added to the risk model ( $p = 0.054$ ).
- Conclusion: These findings indicate that sleep disturbance may exist prior to the manifestation of other typical symptoms observed in AD (e.g., memory loss).

# Is Poor Sleep Related to Cognition?

- Subjective complaints of sleep
- Objective measures of sleep



# Objective Measures of Poor Sleep Associated with Decreased Cognitive Performance in Normal Older Adults

- <sup>1</sup>Cross sectional study (n=78; mean age 72.2±5.9y) objectively measured (actigraphy) TST and SE related to significantly decreased cognitive performance
  - TST<5h compared to >7h
  - SE<85% compared to >85%
- <sup>2</sup>Cross sectional Study (SOF n=2932 women, mean age 83.5y) objectively measured (5-days actigraphy) disturbed sleep was consistently related to poorer cognition
  - SE<sub>≤</sub>70% (MMSE: HR 1.61; 95% CI 1.20–2.16; Trails B HR1.96; 95% CI 1.43–2.67)
  - SOL>30m (MMSE: HR 1.23, 95% CI 1.13–1.33; Trails B: HR 1.13; 95% CI 1.04–1.24)
  - WASO >30m (MMSE: 1.15, 95% CI 1.06–1.23; Trails B 1.24, 95% CI 1.15–1.34)

# Is Poor Sleep Related to Cognition?

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# Association between Sleep Apnea and Cognition

SOF (n = 400; age 82.8y)

- Cross sectional study of older women
- Sleep apnea associated with cognitive impairment (MMSE)
  - AHI $\geq$ 15
    - OR 1.4, 95% CI 1.03-1.9
  - AHI $\geq$ 30
    - OR 3.4, 95% CI 1.4-8.1
  - SaO<sub>2</sub> nadir < 80%
    - OR 2.7, 95% CI 1.1- 6.6].14
- Each standard deviation increase in AHI was associated with 70% greater odds of cognitive impairment.

# Older women with sleep apnea have an increased risk of developing cognitive impairment – Prospective Study

- Compared women
  - with sleep apnea (n=105; 35.2%)
  - without sleep apnea (n=193)
- At 5-year follow-up, those with sleep apnea were more likely to develop MCI or dementia
  - 31.1% [n=60] vs 44.8% [n=47]; adjusted OR, 1.85; 95% CI, 1.11-3.08
- Elevated SaO<sub>2</sub> (>15 events/hour) and high % of TST (>7%) with apnea or hypopnea were associated with risk of developing
  - MCI (AOR, 1.71 [95% CI, 1.04-2.83])
  - dementia (AOR, 2.04 [95% CI, 1.10-3.78])
- Measures of sleep fragmentation (arousal index and wake after sleep onset) or sleep duration (total sleep time) were not associated with risk of cognitive impairment

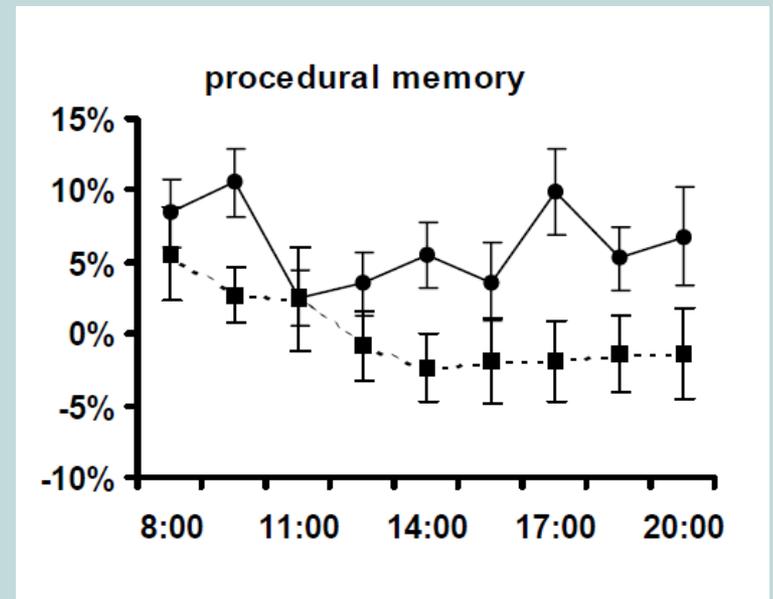
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# Daily social and physical activity increases daytime neuropsychological performance in the elderly

- Enforced schedule of structured social and physical activity (0:900-10:30 and 19:00-20:30 daily for two weeks)
  - 14 elderly residents of continued-care retirement facilities
  - 9 elderly residents controls
- Group exposed to structured activities had *increased amounts of deep sleep (slow wave sleep)* and demonstrated improvement in memory-oriented tasks following intervention.



Solid line = exercise  
Dashed line = control

# Benefits of Treating Sleep Apnea in Older Patients: Effect on Cognition

- 12 older adults (mean age 55 years) with sleep apnea
- 3 months of *compliant* use of CPAP resulted in improvements in:
  - attention
  - psychomotor speed
  - executive functioning
  - non-verbal delayed recall

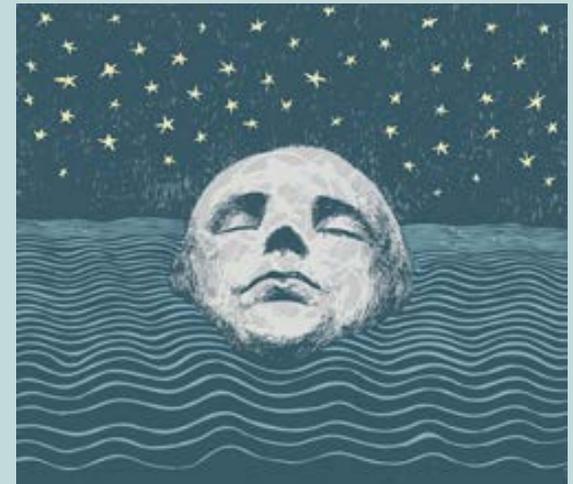


# Effect of CPAP in Alzheimer's Disease

- 3-weeks of CPAP in AD results in improvement in
  - AHI levels and  $\downarrow$ SpO<sub>2</sub>; Epworth Sleepiness scores; Deeper Sleep ( $\downarrow$ N1,  $\uparrow$ N2,REM;  $\downarrow$ WASO,  $\downarrow$ Arl)
  - Cognitive functioning
- Preliminary results also showed longer use slowed dementia progression
- The results of this study lend support to the hypothesis that
  - Sleep apnea might be a reversible cause of cognitive loss and dementia
  - Treatment of sleep apnea, especially in the early stages of dementia when patients are still largely independent, may slow dementia progression.
- Further studies will need to determine whether CPAP treatment of sleep apnea in AD patients might actually slow dementia progression.

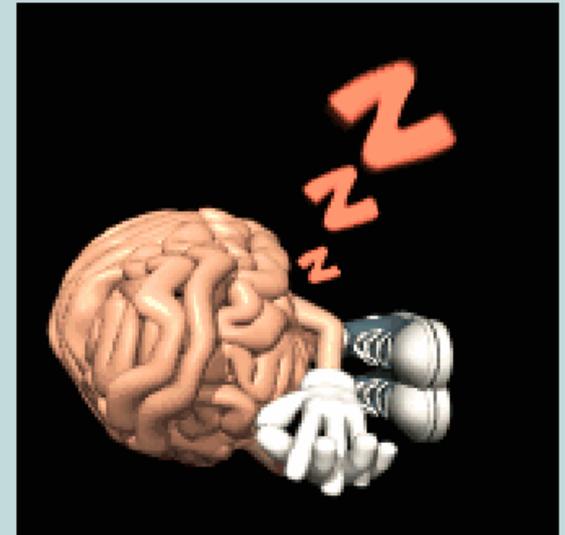
# Is Poor Sleep Related to Cognition?

- Studies so far in non-demented elderly suggest
  - Poor sleep
    - Is associated with worse cognitive function
    - Predicts worse cognitive function
    - Treatment improves cognition
  - Sleep apnea
    - Associated with worse cognitive function
    - Increases risk of dementia
    - ?Treatment improves cognition



# Studies Needed

- Larger longitudinal studies are needed to replicate findings of poor sleep/sleep disorders being associated with subsequent decline in cognitive function
- Treatment studies to confirm whether improving sleep/sleep disorders results in improved or slower deterioration of cognitive function
- Studies on cognition should include a measure of sleep (subjective or actigraphy)
  - results are likely influenced by amount and quality of sleep for the week before testing



# Mindfulness

- A particular way of paying attention to the present moment
- The state of mindfulness has frequently been described as a state of “presence of mind” which concerns a clear awareness of one's inner and outer worlds, including thoughts, sensations, emotions, actions or surroundings as they exist at any given moment



# Mindfulness: Effects on Cognitive Function

- Five databases were searched.
  - 23 studies providing measures of attention, memory, executive functions and further miscellaneous measures of cognition were included
    - 15 were controlled or randomized controlled studies and 8 were case-control studies.
- Reviewed studies suggested that:
  - Early phases of mindfulness training, which are more concerned with the development of focused attention, could be associated with significant improvements in selective and executive attention
  - Later phases of mindfulness training, which are characterized by an open monitoring of internal and external stimuli, could be mainly associated with improved sustained attention abilities
- However, many of the included studies show methodological limitations and negative results have also been reported
  - differences in study design, study duration and patients' populations.

# Effects of Meditation/Mindfulness on Cognition: Review

- 12 studies were reviewed
  - 6 randomized controlled trials
  - Different types of meditation, some mindfulness
  - Mean age ranged from 37-83 years
- Studies involved a wide variety of meditation techniques
- Preliminary positive effects on attention, memory, executive function, processing speed, and general cognition
- The clearest significant finding in a more specific cognitive domain was improved attention related to mindfulness meditation
- BUT most studies had a high risk of bias and small sample sizes
- Conclusion: Meditation/mindfulness interventions for older adults are feasible, and preliminary evidence suggests that it may offset age-related cognitive decline

# Mindfulness: Effects on Cognitive Function

- Conclusion:
  - Preliminary support for the notion that mindfulness could provide significant benefits on several measures of cognition
  - BUT, available evidence should be considered with caution
    - High quality studies investigating more standardized mindfulness meditation programs are needed
      - to replicate available findings
      - to more deeply explore the effects of mindfulness training on further domains of cognition
      - to reduce discrepancies of findings deriving from systematic differences in mindfulness protocols.

# Future Studies on Mindfulness

- Need rigorous RCT designs with active control groups
- Sufficiently large samples
- Long-term follow-up



# Public Health Dimensions of Cognitive Aging: Sleep / Mindfulness

- Sleep
  - Studies are very suggestive of a strong relationship between poor sleep/sleep disorders and poor cognitive function
    - Poor sleep/sleep disorders increase risk of cognitive decline
  - Studies also suggestive that treatment of sleep problems will improve cognition
    - Too few studies; too small sample sizes
  - More studies needed
- Mindfulness
  - Studies are encouraging
    - Too few studies; too small sample sizes
  - More studies needed

