Public Health Dimensions of Cognitive Aging:
Sleep
Mindfulness

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## Disclosures: Sonia Ancoli-Israel

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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; ≥ 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; ≥75y/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

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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 Morality

• 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

1. 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%

2. 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<70% (MMSE: HR 1.61; 95% CI 1.20–2.16; Trails B HR 1.96; 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?

- Subjective complaints of sleep
- Objective measures of sleep
- Sleep disorders
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 $>$ 15
    • OR 1.4, 95% CI 1.03-1.9
  – AHI $\geq$ 30
    • OR 3.4, 95% CI 1.4-8.1
  – SaO2 nadir $<$ 80%
    • OR 2.7, 95% CI 1.1-6.6
• 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 SaO₂ (>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

Yaffe, K et al. JAMA. 2011;306(6):613-619
Is Poor Sleep Related to Cognition?

- Subjective complaints of sleep
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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.

Naylor et al, Sleep 2000, 23:87-95
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

Aloia et al, J Psychosom Res, 2003, 54:71-76
Effect of CPAP in Alzheimer’s Disease

• 3-weeks of CPAP in AD results in improvement in
  – AHI levels and ↓SpO₂, Epworth Sleepiness scores; Deeper Sleep (↓N1, ↑N2,REM; ↓WASO, ↓ArI)
  – 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

Gard T. et al. The potential effects of meditation on age-related cognitive decline: a systematic review Ann. N.Y. Acad. Sci. ISSN 0077-8923
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