International Psychogeriatrics (2022), 34:8, 683–685 © International Psychogeriatric Association 2022
doi:10.1017/S1041610222000217

COMMENTARY

The importance of diversity in aging studies

The World Health Organization projects the total number of people with dementia worldwide to reach 82 million in 2030, nearly doubling to 152 million by 2050 (Jia, 2020). The estimated 2015 total global cost of dementia was a staggering 1.1% of global gross domestic product (World Health Organization, 2019). Dementia substantially impacts patients and their individual support systems as well as the broader community and societal structures. With approximately 25% of the world's patients with dementia living in China, dementia poses a significant challenge for Chinese policymakers, public health and healthcare professionals, and communities (GBD 2016 Dementia Collaborators, 2019). The incidence of dementia and mild cognitive impairment in older Chinese adults (65+ years old) ranges from 17.7 to 24.0 per 1000 person-years (Jia, 2020). The 2010 estimated cost of dementia in China was $47.2 billion (USD) and is projected to reach $114.2 billion in 2030 (Xu, 2017). Without curative treatments for cognitive decline, better prevention strategies and early detection methods are key for reducing the impact of dementia. With recent evidence supporting a possible causal link with dementia, sleep-related factors are increasingly popular treatment and research targets.

Zhang and colleagues' (2021) article in the current issue examined links between sleep and cognitive impairment among 3,692 community-dwelling older Chinese participants from a 3-year longitudinal study. The authors reported that excessive sleep ($\geq$ 10 hours/night) increased the risk of cognitive impairment by 30% (OR = 1.309, 95% CI: 1.019–1.683) relative to sleeping between 5-10 hours/night adjusting for sociodemographic, type of residence, lifestyle factors, and comorbidity covariates. Among those with long sleep duration, factors including being male, being 75+ years old, having at least primary education, and living in a rural area were associated with cognitive impairment at follow-up. Short sleep duration ($\leq$ 5 hours/day) was not associated with cognitive impairment.

These findings contribute to a body of inconsistent evidence on the relationship between sleep duration and cognitive decline. The disparate findings may be linked to the heterogeneity of study samples related to sleep and cognitive functioning. For example, a 2007 US study found that black adults were more likely to have short and long sleep duration and Hispanic adults were more likely to have short sleep duration, relative to white respondents (Hale and Do, 2007). A 2016 US study found that black, Hispanic, and Asian adults were more likely to have short sleep compared to white adults (Cunningham, 2016). Thus, diverse populations of older adults are warranted for greater generalizability.

One particular challenge of studying older adults in China is geographic and socioeconomic heterogeneity. The Zhang *et al.* (2021) study included participants from the majority of China's province and considered the diversity of environment and education in their analyses. Zhang and colleagues found education and rural living to be associated with cognitive impairment for long sleepers in this study. Given the differences across provinces, the study participants likely spoke different languages or dialects. Individuals with Alzheimer's Disease often have worse cognitive performance in their nondominant language, compared to their dominant language (Ivanova *et al.*, 2014). Thus, whether the language used for the cognitive testing is the participant's dominant language should be considered in the data analysis.

Level of education may also affect the validity of the cognitive measures used. The original Chinese version of the Mini-Mental State Exam (MMSE) was evaluated in a cohort of community-dwelling elderly in Shanghai (Katzman, 1988). Within the sample, 26.7% of the participants had not attended school and had a higher proportion of low scores as well as a different error pattern (Katzman, 1988). Other Chinese studies have established differential cut-offs based on years of education, rural residence, age, and sex – with dementia cut-offs of 16/17 for illiterate individuals, 19/20 for individuals with 1–6 years of education, and 23/24 for individuals with 7 or more years of education (Li, 2015).

The current study noted that among individuals with primary and above education, excessive sleep duration was linked to cognitive impairment (Zhang *et al.*, 2021). Education may contribute to 'cognitive reserve' or the capacity of the brain to buffer against age-related decline and pathologic damage – thus delaying the onset of noticeable clinical symptoms (Stern, 2012). For example, while brain pathology (such as decreased glucose metabolism and cortical

https://doi.org/10.1017/S1041610222000217 Published online by Cambridge University Press

thinning) may be worse among a group of individuals with higher education – performance on cognitive testing would be similar to individuals with less formal education (Jung, 2018; Perneczky, 2006). A cross-country comparison found formal education to have a large effect on cognitive function in most countries (Rodriguez *et al.*, 2021). A meta-analysis by Meng *et al.* showed that older adults with education had significant reduction both in prevalence and incidence dementia, but they had accelerated cognitive decline (Meng and D'Arcy, 2012). This supports the concept of a 'threshold effect,' wherin higher education may aid in masking clinical symptoms initially, but as the brain pathology reaches a clinical level, performance declines more rapidly (Meng and D'Arcy, 2012). A 2014 study by Amieva and colleagues found that the first subtle signs of cognitive decline occurred 15–16 years (before the dementia diagnosis) in highly educated people, compared to 7 years in adults with less education (Amieva, 2014). The higher cognitive reserve and threshold effects could contribute to excessive sleep duration as a key modifiable factor for cognitive impairment among highly educated people, but not among less-educated older adults.

Future studies of cognitive trajectories in diverse populations could consider unique test items as well as assessing rate of decline rather than a threshold. A 2003 study adapted the Chinese version of the MMSE by substituting literacy-dependent items with equivalent non literacy-dependent items for illiterate older adults and established differential cut-offs for each group (Xu, 2003). A 2019 study examined rates of cognitive decline and reported that those with rapid cognitive decline (greater than average reduction of MMSE scores) had a higher risk of death than those with stable cognitive function (Lv, 2019).

Similar to tracking cognition, future studies may benefit from tracking sleep over a longer period of time or over individual's lifespan. Like most large cohort studies, the Zhang *et al.* (2021) study used self-report measures of sleep duration at baseline, and did not capture sleep duration across the lifespan – thus it is unclear if sleep duration during childhood, young adulthood, or middle age would be linked to future cognitive decline as well. Alterations in sleep may also be linked to aging milestones – such as having young children or retirement. Thus, both physiological and lifestyle changes linked to aging contribute to sleep habits.

In conclusion, the Zhang *et al.* (2021) study and the diverse cohort of older Chinese study participants provide an important contribution to the growing knowledge regarding sleep duration and cognitive impairment. However, further exploration of education, language, and lifespan changes are warranted to establish these causal factors and identify which individuals would be most likely to benefit from potential preventative sleep-related interventions or use of sleep as an early risk factor for future cognitive impairment.

Source of funding

This work was supported by the National Institute on Aging T35 grant AG26757 (PI: Dilip V. Jeste, MD, and Alison Moore, MD, MPH), National Institute of Mental Health K23 grant MH119375-01 (PI: EEL), the Stein Institute for Research on Aging and the Center for Healthy Aging at the University of California, San Diego; and the Desert-Pacific Mental Illness Research Education and Clinical Center, Veterans Affairs San Diego Healthcare System, San Diego, CA.

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References

Amieva, H. *et al.* (2014). Compensatory mechanisms in higher-educated subjects with Alzheimer's disease: a study of 20 years of cognitive decline. *Brain*, 137, 1167–1175.

Cunningham, T. J. *et al.* (2016). Racial/ethnic disparities in self-reported short sleep duration among US-born and foreign-born adults. *Ethnicity & Health*, 21, 628–638.

GBD 2016 Dementia Collaborators (2019). Global, regional, and national burden of Alzheimer's disease and other dementias, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology*, 18, 88–106.

Hale, L. and Do, D. P. (2007). Racial differences in self-reports of sleep duration in a population-based study. *Sleep*, 30, 1096–1103.

Ivanova, I., Salmon, D. P. and Gollan, T. H. (2014). Which language declines more? Longitudinal versus cross-sectional decline of picture naming in bilinguals with Alzheimer's disease. *Journal of the International Neuropsychological Society*, 20, 534–546.

https://doi.org/10.1017/S1041610222000217 Published online by Cambridge University Press

Jia, L. *et al.* (2020). Dementia in China: epidemiology, clinical management, and research advances. *The Lancet Neurology*, 19, 81–92.

Jung, N. Y. *et al.* (2018). The impact of education on cortical thickness in amyloid-negative subcortical vascular dementia: cognitive reserve hypothesis. *Alzheimer's Research & Therapy*, 10, 103.

Katzman, R. *et al.* (1988). A Chinese version of the Mini-Mental State Examination; impact of illiteracy in a Shanghai dementia survey. *Journal of Clinical Epidemiology*, 41, 971–978.

Li, N. *et al.* (2015). Prevalence of dementia-associated disability among Chinese older adults: results from a national sample survey. *The American Journal of Geriatric Psychiatry*, 23, 320–325.

Lv, X. *et al.* (2019). Cognitive decline and mortality among community-dwelling Chinese older people. *BMC Medicine*, 17, 63.

Meng, X. and D'Arcy, C. (2012). Education and dementia in the context of the cognitive reserve hypothesis: a systematic review with meta-analyses and qualitative analyses. *PLoS One*, 7, e38268.

Perneczky, R. *et al.* (2006). Schooling mediates brain reserve in Alzheimer's disease: findings of fluoro-deoxy-glucose-positron emission tomography. *Journal of Neurology, Neurosurgery & Psychiatry*, 77, 1060–1063.

Rodriguez, F. S., Hofbauer, L. M. and Röhr, S. (2021). The role of education and income for cognitive functioning in old age: a cross-country comparison. *International Journal of Geriatric Psychiatry*, 36, 1908–1921.

Stern, Y. (2012). Cognitive reserve in ageing and Alzheimer's disease. *The Lancet Neurology*, 11, 1006–1012.

World Health Organization (2019). *Risk reduction of cognitive decline and dementia: WHO guidelines*. World Health Organization.

Xu, G. *et al.* (2003). Adapting mini-mental state examination for dementia screening among illiterate or minimally educated elderly Chinese. *International Journal of Geriatric Psychiatry*, 18, 609–616.

Xu, J. *et al.* (2017). The economic burden of dementia in China, 1990-2030: implications for health policy. *Bulletin of the World Health Organization*, 95, 18–26.

Zhang, M. *et al.* (2021). Excessive sleep increased the risk of incidence of cognitive impairment among older Chinese adults: a cohort study based on the Chinese Longitudinal Healthy Longevity Survey (CLHLS). *International Psychogeriatrics*, 34, 725–734.

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