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Editorial

Sleep and Health in Older Adulthood: Recent Advances and the Path Forward

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Substantial evidence has accrued in recent years linking disturbed sleep to poor health outcomes commonly experienced by older adults. Excessively short and long sleep duration have been linked to hypertension (1), diabetes and glucose intolerance (2), and even mortality (3). Insomnia symptoms have been tied to depressive disorders (4) and cognitive decline (5), and studies suggest that insufficient sleep promotes the development of Alzheimer's disease pathology (6–8). The rapid aging of the population, the high prevalence of sleep disturbances in later life, and their growing recognition as risk factors for poor health outcomes make disturbed sleep a critical public health issue. Recent articles in the *Journals of Gerontology* simultaneously provide new insights into possible determinants and outcomes of later-life sleep and reveal important gaps remaining in later-life sleep research.

Epidemiology of Napping

Later-life napping is more complicated to study than it superficially appears, in part because naps occur for varied reasons. Some older adults may nap due to excessive daytime sleepiness resulting from disordered nighttime sleep, sedating medications, or medical comorbidities, whereas others may nap because they find it boosts their functioning later in the day, or is simply enjoyable (9). Further, many different aspects of napping can be studied (eg, frequency, duration, whether naps are intentional or unplanned), and napping can be quantified by questionnaires or objective measures (10). The heterogeneity among naps, nappers, and napping measures likely accounts for the rather mixed results concerning napping as a health promoter vs. health threat (10). Three new studies in the *Journal of Gerontology: Medical Sciences* provide new perspectives on later-life napping and its correlates.

Two of these studies focused on associations of napping with aspects of daytime functioning. Li et al. studied prospective associations between self-reported afternoon napping and cognition in a sample of over 3,000 Chinese community-dwelling older adults (11). Among other findings, extended nappers (>90 minutes) had greater cognitive decline compared to non-nappers, short (<30 minutes), and moderate nappers (30–90 minutes). Intermediate nappers (who napped but for <90 minutes) at both baseline and follow-up had better cognitive trajectories over that time than non-nappers and long nappers. In a recent cross-sectional study I coauthored, Owusu et al. examined associations of varied dimensions of self-reported napping, and engagement in valued activities among more than 2,500 older adults in the National Health and Aging Trends Study (12). Results indicated that unintentional and intentional napping, frequent napping, and longer-duration naps were all associated with a greater odds of restriction in one or more valued activities after adjustment for multiple confounders. Like many studies of napping and health, these two are not easily reconciled. One suggests that intermediate-duration naps benefit cognition (11) and another links any naps with greater odds of restricted activity (12). A nap-duration threshold effect may exist for cognition that does not apply to social participation, but the results linking both unintentional and intentional napping to poor outcomes in the Owusu et al. study may be driven by long nappers. Indeed, both studies suggest long naps have negative implications for cognition and social participation. However, these observational studies cannot demonstrate whether napping characteristics cause these outcomes or serve as markers of other disease processes that drive them. An addition limitation of these studies is their exclusive use of self-report sleep measures, rather than objective measures such as wrist actigraphy or polysomnography. This is important because discrepancies between objective and subjective sleep measurement are common (13), and can be driven by cognitive and functional status (14). Although polysomnography is labor intensive and potentially uncomfortable, actigraphy is a relatively unobtrusive, less expensive

and scalable sleep measure (15) and would have increased these studies' potential impact.

The third napping study, by Leng et al., makes a significant contribution by comparing characteristics of nappers and non-nappers, defined by self-report and by wrist actigraphy, in over 2,600 older women (16). In illustration of the aforementioned subjective-objective sleep discrepancies, 14% were nappers according to both self-report and objective (actigraphic) criteria; 7% took regular naps per self-report only, and 29% only met objective criteria for napping. Numerous variables were associated with a greater odds of meeting napping criteria by both actigraphy and self-report (eg, older age, smoking, drinking less alcohol, depressive symptoms, obesity, medical conditions). Importantly, a distinct pattern of correlates emerged for those who met napping criteria according to self-report but not actigraphy, and *vice versa*. This large study demonstrates the value of both objective and subjective sleep measures to quantify napping, and that discrepancies between them are not simply measurement error, but are in fact informative. A significant limitation, however, is its entirely White and female sample.

Sleep and Mental Health

Two studies in the *Journal of Gerontology: Psychological Sciences* examined links of later-life sleep and mental health. Blaxton et al. investigated connections of self-reported sleep quality with next-day reports of stress and affect in midlife and older cohorts (17). The authors observed interactions of sleep, stress, and age, such that associations between sleep quality and positive affect were stronger in the context of low-stress periods in midlife, but among older adults, this effect was more pronounced in high-stress periods. Further, although anxiety disorders are the most common mental disorders among older adults (18), few studies have examined links between disturbed sleep and anxiety in older people, especially compared to the number of studies of associations between sleep and depressive symptoms. In a study of which I am a coauthor, Gould et al. examined how somatic, affective, and cognitive dimensions of anxiety are associated with self-report measures of sleep quality and excessive daytime sleepiness in a community-based sample of cognitively normal older adults (19). Greater affective and somatic anxiety were associated with poorer sleep quality after accounting for potential confounders, and there was a trend-level link between somatic anxiety and daytime sleepiness but no independent associations of cognitive anxiety with either sleep measure.

These studies reveal that complex sleep X stress interactions exist with respect to affect and that these differ between midlife and older adulthood (17), and that disturbed sleep is linked only to particular facets of anxiety (19). However, Gould et al.'s cross-sectional data preclude us from evaluating whether the anxiety and sleep quality reciprocally influence each other, or whether one is driving the other (19). Moreover, neither of these studies included an objective measure of sleep.

Sleep in Married Dyads

Two recent studies in the *Journal of Gerontology: Psychological Sciences* address sleep in married couples, an important and neglected aspect of sleep and aging. In one paper, Chen articulates good reasons for considering and measuring sleep in a dyadic context, rather than solely an individual one (20). Chen points out that desynchronous sleep patterns in couples may be a source of stress and ultimately mental health outcomes, and that while large epidemiological studies have measured sleep using questionnaires or even actigraphy, these measures neglect the dyadic context in which sleep occurs, reducing it to a "purely individual behavior." (p. 3) Using data from older married couples enrolled in the Disability and Use of Time supplement to the Panel Study of Income Dynamics, Chen constructed several variables representing between-partner differences in bedtimes and times of waking. Dyadic discrepancies in sleep characteristics were associated with greater psychological distress, even after adjusting for individual-level sleep parameters and other potential confounders, including marital quality. In another study, Yorgason et al. investigated links among daily sleep parameters, mood, and the quality of marital interactions in 191 married couples of which one member was aged 60–64 years (21). Using data from 14 consecutive daily surveys of sleep quality, restfulness, and duration, mood, and perceptions of spousal support and related positive and negative behaviors, they found positive associations between sleep quality and marital interactions for husbands and wives, and positive associations for longer than usual sleep duration and next-day marital satisfaction for wives only. Moreover, mood accounted for links between sleep variables and marital outcomes, particularly among wives. These studies demonstrate the implications of the dyadic synchrony of sleep for mental health (20) in married couples, and the implications of sleep for their mood and marital satisfaction (21). As the authors suggest, it is plausible that a bidirectional link exists in which poor sleep leads to psychological distress or decreased marital satisfaction in couples, leading to worsening sleep or avoidance of a spouse and subsequent desynchrony in sleep behavior. This dyadic context warrants greater research attention than it currently receives, as a cause and consequences of poor sleep in later life. Studies with objective assessment of sleep and circadian rest/activity rhythms in both partners, in same-sex older couples, and in nonmarried cohabitating couples, would advance this research area.

Conclusion

Taken together, the above studies are emblematic of the cutting-edge research on sleep and aging that is appearing in the *Journals of Gerontology*. I encourage my colleagues in sleep and aging research to submit their excellent work to these journals. Although a growing body of research suggests sleep is a keystone of healthy aging, much more work must be done to understand the determinants and outcomes of poor sleep, and the mechanisms linking disturbed sleep to those outcomes in later life.

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Conflict of Interest

A.P.S. is a member of the Editorial Board of the *Journal of Gerontology: Medical Sciences*. He agreed to serve as a consultant to Awarables, Inc. in support of a National Institute on Aging grant.

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