Proceedings of ICBioMed 2025 Symposium: Computational Modelling and Simulation for Biology and Medicine
DOI: 10.54254/2753-8818/2025.LD24907

Factors Influencing Sleep Quality and Gender Differences: A Literature Review

Wenyun Zhao

Department of Psychology, University of California, La Jolla, USA
wez069@ucsd.edu

Abstract. Sleep is an essential process for mental and physical health. However, a substantial proportion of individuals report sleep disturbances, which exhibit significant gender differences. This literature review aims to examine the biological, psychological, social, and environmental factors that influence sleep quality, with a focus on gender-based differences. Women are found to have longer sleep latency, higher psychological distress, and a greater prevalence of insomnia symptoms, while men more frequently experience short sleep duration and are at higher risk for sleep apnea. Despite women showing longer total sleep durations and greater amounts of slow-wave sleep in objective measures, they report lower subjective sleep satisfaction. Drawing upon numerous peer-reviewed studies, this review identifies key gender disparities in sleep latency, duration, efficiency, psychological distress, and vulnerability to sleep disorders. It also highlights the role of hormonal variation, stress, lifestyle, and cultural expectations in shaping sleep experiences. Findings suggest that tailored, gender-specific approaches may be critical for improving sleep health in various populations.

Keywords: sleep quality, gender differences, circadian rhythms, insomnia, hormonal influence

1. Introduction

Sleep plays a crucial role in maintaining physiological balance, cognitive function, and emotional well-being. Despite its universality, sleep quality is not uniform across populations. The research aims to synthesize empirical findings from recent literature and propose an integrated understanding of biological, psychological, and environmental influences on sleep across genders. As shown in Figure 1, sleep characteristics such as time in bed, total sleep time, sleep latency, and wake after sleep onset(WASO) differ significantly between males and females across the lifespan, with females generally showing lower sleep efficiency and longer WASO [1].

Increasing evidence has shown that gender significantly impacts how individuals experience and cope with sleep disturbances. For instance, older women living alone are particularly vulnerable to poor sleep, as shown in Chu, Oh, and Lee's study [2], where living arrangements significantly predicted Pittsburgh Sleep Quality Index (PSQI) scores. Similar patterns have been observed in younger populations as well. Fatima et al. [3], analyzing over 3,000 young adults, reported that 65.1% of females and 49.8% of males experienced poor sleep, with the disparity persisting even

© 2025 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-8818/2025.LD24907

after adjusting for depressive symptoms and behavioral variables. These findings imply that gender-specific biological and psychosocial mechanisms may underlie sleep problems. Lok, Chellappa, and Dijk [4] further emphasized the impact of sex hormones and circadian rhythm differences, showing that sleep quality, metabolism, and chronotype differ consistently across biological sexes. Understanding the gendered nature of sleep can inform more nuanced and effective interventions. This review synthesizes interdisciplinary research to identify patterns, causes, and clinical implications of gender-based differences in sleep quality.

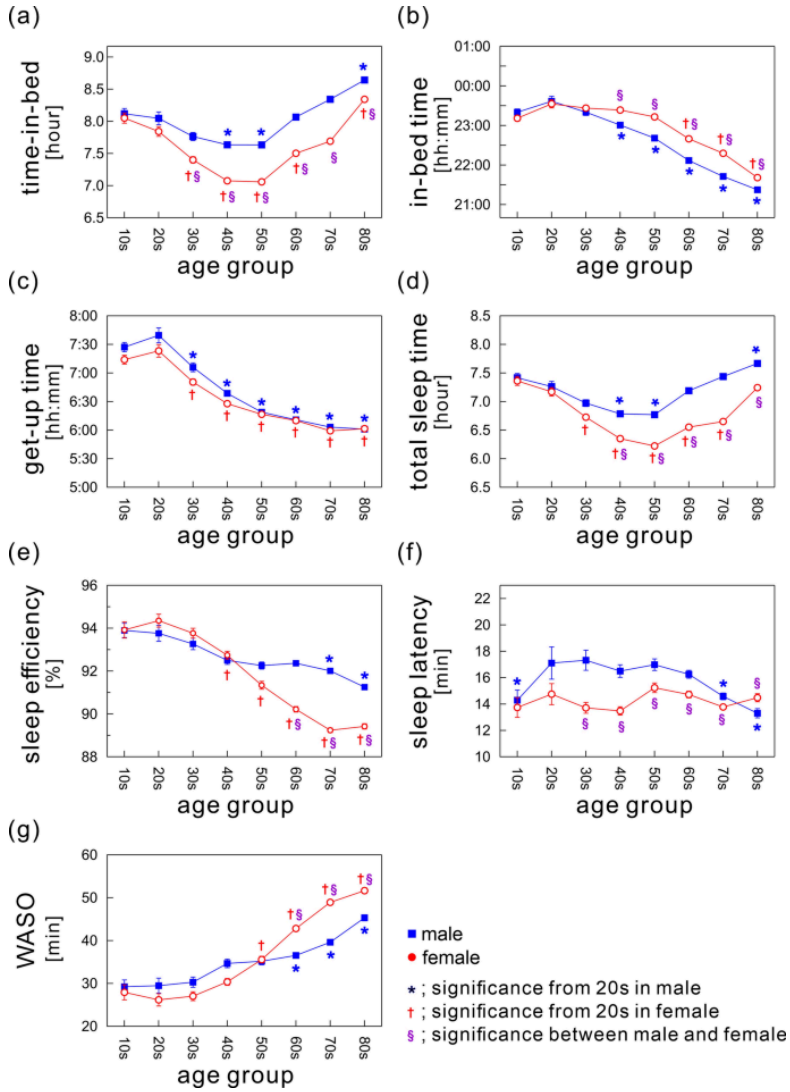

Figure 1: Gender differences in sleep parameters across age groups [1]

2. Biological and physiological factors

A primary biological determinant of gender differences in sleep is hormonal fluctuation. Lok et al. demonstrate that estrogen and progesterone, which vary throughout the menstrual cycle, pregnancy, and menopause, influence women's sleep by altering neurotransmission and thermoregulation [4]. For example, during the luteal phase, elevated progesterone is associated with increased sleep latency and more frequent awakenings, while declining estrogen during menopause contributes to night sweats and insomnia. In contrast, men experience more stable hormonal cycles, while age-related declines in testosterone have been associated with decreased sleep duration and increased

DOI: 10.54254/2753-8818/2025.LD24907

nocturnal awakenings [5]. These hormonal effects interact with other biological processes to amplify gender-specific sleep experiences.

Circadian rhythm and individual chronotype also demonstrate sex-linked patterns. Fatima et al. found that males are more likely to exhibit evening chronotypes, which are associated with irregular schedules, reduced sleep duration, and poor academic performance [3]. Lok et al. further noted that women tend to have slightly shorter circadian cycles, which may result in earlier sleep-wake preferences but also increased vulnerability to insomnia when environmental schedules conflict with biological timing [4]. These internal clocks regulate melatonin secretion and body temperature, both of which affect sleep initiation and maintenance.

Sleep architecture—the structure and sequence of sleep stages—also varies by gender. Using objective sleep measurement tools, Silva and Tempaku reported that women have longer durations of slow-wave sleep (SWS) and rapid eye movement (REM) sleep but also exhibit higher sleep fragmentation [6]. Lok et al. echoed these findings, highlighting that although women score better on many objective sleep parameters, they report worse subjective sleep [4]. This discrepancy may stem from higher arousal thresholds, hormonal sensitivity, or psychosocial stressors. These results complicate the notion that longer or deeper sleep always equates to better perceived rest. As visualized in Figure 2, these physiological trends are supported by empirical data showing that females exhibit longer WASO, lower sleep efficiency, and greater age-related decline in sleep quality compared to males across nearly all age groups. [7]

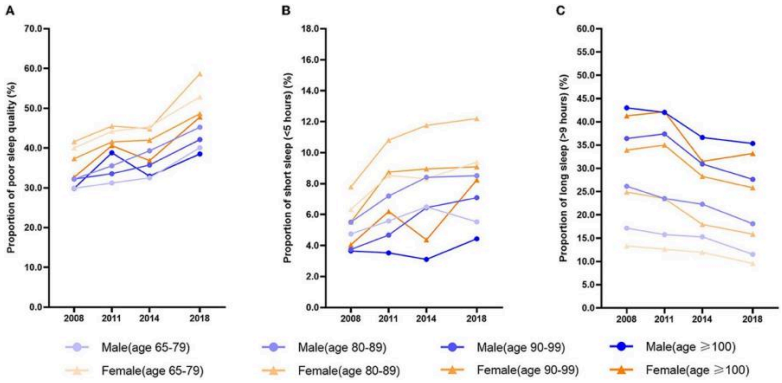

Figure 2: Trends of sleep quality and duration in different gender and age groups [7]

3. Psychological and social factors

Gender differences in stress response and emotional regulation substantially influence sleep quality. Madrid-Valero et al., analyzing a large twin cohort, observed stronger associations between psychological distress and poor sleep among women [8]. Women often exhibit higher cortisol responses and more persistent rumination, both of which impair sleep continuity. Additionally, caregiving burdens and life role expectations disproportionately placed on women contribute to elevated stress levels. Chu et al. found that older women living alone not only reported higher PSQI scores but also used sleep medication more frequently [2], suggesting both higher sleep disturbance and a greater tendency to seek pharmaceutical solutions.

Unhealthy behaviors such as smoking, excessive screen time, and sedentary lifestyles also differentially impact sleep across genders. Fatima et al. showed that although both men and women who engaged in these behaviors had poorer sleep, the effect was more pronounced among females [3]. Conversely, health-promoting behaviors like regular exercise show greater benefits for women. In a study by Glavin, Matthew, and Spaeth, physically active women reported significant

DOI: 10.54254/2753-8818/2025.LD24907

improvements in both mood and sleep quality compared to less active women and to men with similar activity levels [9]. These findings suggest that behavioral interventions may yield unequal results depending on sex, and public health programs should consider these nuances.

Mental health disorders further mediate the relationship between gender and sleep. Fatima et al. and Madrid-Valero et al. reported that women experience higher rates of anxiety and depression,two of the most common comorbid conditions with insomnia [3,8]. Notably, even when controlling for depressive symptoms, women continued to reported worse sleep, suggesting the contribution of additional factors such as biological predispositions and societal pressures. Chronic mental health challenges also increase sleep fragmentation, delay REM onset, and reduce overall sleep efficiency.

4. Environmental and cultural factors

External environments and living conditions shape sleep differently across genders. Tang et al., conducting a large-scale survey in Hunan Province, China, found that rural women exhibited the poorest sleep quality, with scores significantly worse than their urban counterparts [10]. Environmental disadvantages like higher noise exposure, shared living spaces, and financial stress can disproportionately affect women, particularly in settings where they may also shoulder greater domestic responsibilities. These contextual stressors create barriers to restorative sleep that compound biological and psychological vulnerabilities.

Cultural and social expectations further define sleep experiences. According to Chu et al., caregiving and household responsibilities fall disproportionately on women, especially those in mid-life or later adulthood [2]. These roles often require night-time vigilance, limit recovery time, and increase stress. Mallampalli and Carter emphasized that while men may be less likely to report sleep problems, they may underreport due to societal norms discouraging vulnerability [5]. Consequently, men may go undiagnosed for conditions like sleep apnea or insomnia, despite exhibiting clear physiological signs.

5. Gender-specific sleep disorders

Sleep disorders manifest with gender-specific prevalence and symptomatology. Fatima et al. and Chu et al. documented higher rates of insomnia among women, including difficulty falling and staying asleep [2,3]. Hormonal transitions such as pregnancy and menopause exacerbate these issues. Women also have higher risks for restless leg syndrome, especially during pregnancy, due to iron deficiency and vascular changes. While treatment strategies for insomnia, including cognitive behavioral therapy, have demonstrated promising results, they may require gender-specific adaptations to optimize efficacy.Sleep apnea is more prevalent in men but is underrecognized in women. Zhang et al. observed that while men often report typical symptoms like snoring and gasping, women are more likely to present with atypical complaints such as fatigue and disrupted sleep, which may lead to misdiagnosis [11]. Mallampalli and Carter suggested that sleep clinics need improved screening protocols to account for these differences [5]. Glavin et al. found that women responded better to behavioral interventions, while men showed higher reliance on pharmacological options [9], highlighting the need for gender-specific treatment paths.

6. Conclusion

This literature review draws on numerous high-quality studies to provide a comprehensive account of how gender shapes sleep quality through intertwined biological, psychological, and social

DOI: 10.54254/2753-8818/2025.LD24907

mechanisms. Hormonal regulation, circadian rhythm, stress reactivity, behavioral habits, and environmental pressures interact in gender-specific ways, influencing both subjective and objective measures of sleep. Women are more susceptible to insomnia, fragmented sleep, and emotional distress, while men face higher risks for underdiagnosed conditions like sleep apnea. These disparities underscore the necessity for gender-informed sleep research and treatment development. Interventions should extend beyond generic approaches to include diagnostic criteria, behavioral therapy, and public health messaging tailored by gender. While this literature review provides a broad synthesis, its reliance on secondary data limits the exploration of causal mechanisms. Future studies should employ longitudinal and intersectional approaches to uncover causal pathways and inform equitable healthcare strategies.

References

[1] Li, L., Nakamura, T., Hayano, J., & Yamamoto, Y. (2021). Age and gender differences in objective sleep properties using large-scale body acceleration data in a Japanese population. Scientific Reports, 11, 10289. https: //doi.org/10.1038/s41598-021-89797-7

[2] Chu, H. S., Oh, J., & Lee, K. (2022). The relationship between living arrangements and sleep quality in older adults: Gender differences. Int J Environ Res Public Health, 19(7), 3893. https: //doi.org/10.3390/ijerph19073893

[3] Fatima, Y., Doi, S. A. R., Najman, J. M., & Al Mamun, A. (2016). Exploring gender difference in sleep quality of young adults. Clin Med Res, 14(3-4), 138-144. https: //doi.org/10.3121/cmr.2016.1338

[4] Lok, R., Chellappa, S. L., & Dijk, D.-J. (2024). Sex differences in sleep, circadian rhythms, and metabolism. Sleep Med Rev, 71, 101751. https: //doi.org/10.1016/j.smrv.2024.101751

[5] Mallampalli, M. P., & Carter, C. L. (2006). Gender differences in sleep disorders. Curr Opin Pulm Med, 12(6), 383-389. https: //doi.org/10.1097/01.mcp.0000245705.69440.6a

[6] Silva, R. S., & Tempaku, P. F. (2023). The influence of sex on sleep characteristics in the adult and older adult population: Findings from the EPISONO sleep study. Sleep, 47(Suppl 1), A326. https: //doi.org/10.1093/sleep/zsad059.0761

[7] Tao, Z., Feng, Y., Liu, J., & Liyuan, T. (2023). Trends and disparities in sleep quality and duration in older adults in China from 2008 to 2018: A national observational study. Scientific Reports, 13, 12345. https: //doi.org/10.1038/s41598-023-39005-2

[8] Madrid-Valero, J. J., et al. (2022). Sex differences in sleep quality and psychological distress: Insights from a middle-aged twin sample from Spain. J Sleep Res, 31(6), e13714. https: //doi.org/10.1111/jsr.13714

[9] Glavin, E. E., Matthew, J., & Spaeth, A. M. (2021). Gender differences in the relationship between exercise, sleep, and mood in young adults. Health Educ Behav, 49(1), 128-138. https: //doi.org/10.1177/1090198120986782

[10] Tang, J., et al. (2017). Gender and regional differences in sleep quality and insomnia: A general population-based study in Hunan Province of China. Sci Rep, 7, 43690. https: //doi.org/10.1038/srep43690

[11] Zhang, G., Li, Y., Zhang, Q., & Zhang, L. (2022). Gender differences in the prevalence of and trends in sleep patterns and prescription medications for insomnia among U.S. adults: 2005 to 2018. Sleep Health, 8(5), 463–470. https: //doi.org/10.1016/j.sleh.2022.06.002