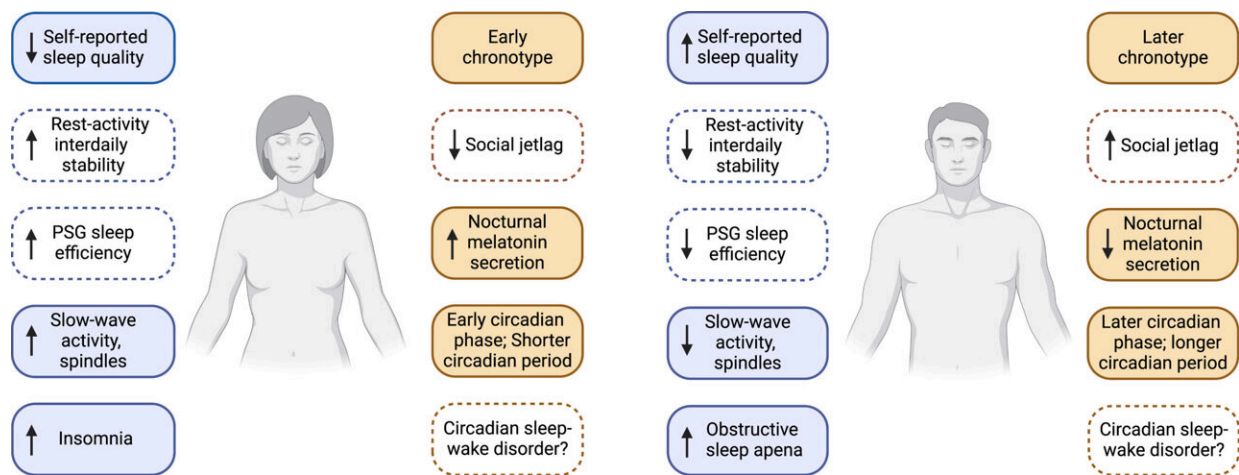


Research uncovers differences between the sexes in sleep, circadian rhythms and metabolism

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Conceptual framework of sex differences in sleep and circadian rhythms. Credit: *Sleep Medicine Reviews* (2024). DOI: 10.1016/j.smrv.2024.101926

A new review of research evidence has explored the key differences in how women and men sleep, variations in their body clocks, and how this affects their metabolism.

Published in *Sleep Medicine Reviews*, [the paper](#) highlights the crucial role sex plays in understanding these factors and suggests a person's biological sex should be considered when treating sleep, circadian rhythm and [metabolic disorders](#).

Differences in sleep

The review found women rate their [sleep quality](#) lower than men's and report more fluctuations in their quality of sleep, corresponding to changes throughout the menstrual cycle.

"Lower sleep quality is associated with anxiety and depressive disorders, which are twice as common in women as in men," says Dr. Sarah L. Chellappa from the University of Southampton and senior author of the paper.

"Women are also more likely than men to be diagnosed with insomnia, although the reasons are not entirely clear. Recognizing and comprehending sex differences in sleep and [circadian rhythms](#) is essential for tailoring approaches and treatment strategies for sleep disorders and associated mental health conditions."

The paper's authors also found women have a 25% to 50% higher likelihood of developing restless legs syndrome and are up to four times as likely to develop sleep-related eating disorder, where people eat repeatedly during the night.

Meanwhile, men are three times more likely to be diagnosed with obstructive sleep apnea (OSA). OSA manifests differently in women and men, which might explain this disparity. OSA is associated with a heightened risk of heart failure in women, but not men.

Sleep lab studies found women sleep more than men, spending around 8 minutes longer in non-REM (Rapid Eye Movement) sleep, where brain activity slows down. While the time we spend in NREM declines with age, this decline is more substantial in older men. Women also entered REM sleep, characterized by high levels of brain activity and vivid dreaming, earlier than men.

Variations in body clocks

The team of all women researchers from the University of Southampton in the UK, and Stanford University and Harvard University in the United States, found differences between the sexes are also present in our circadian rhythms.

They found melatonin, a hormone that helps with the timing of circadian rhythms and sleep, is secreted earlier in women than men. Core body temperature, which is at its highest before sleep and its lowest a few hours before waking, follows a similar pattern, reaching its peak earlier in women than in men.

Corresponding to these findings, other studies suggest women's intrinsic circadian periods are shorter than men's by around six minutes.

Dr. Renske Lok from Stanford University, who led the review, says, "While this difference may be small, it is significant. The misalignment between the central body clock and the sleep/wake cycle is approximately five times larger in women than in men. Imagine if someone's watch was consistently running six minutes faster or slower. Over the course of days, weeks, and months, this difference can lead to a noticeable misalignment between the internal clock and external cues, such as light and darkness.

"Disruptions in circadian rhythms have been linked to various health problems, including [sleep disorders](#), mood disorders and impaired cognitive function. Even minor differences in circadian periods can have significant implications for overall health and well-being."

Men tend to be later chronotypes, preferring to go to bed and wake up later than women. This may lead to social jet lag, where their circadian rhythm doesn't align with social demands, like work. They also have less

consistent rest-activity schedules than women on a day-to-day basis.

Impact on metabolism

The research team also investigated if the global increase in obesity might be partially related to people not getting enough sleep—with 30 percent of 30- to 64-year-olds sleeping less than 6 hours a night in the United States, with similar numbers in Europe.

There were big differences between how women's and men's brains responded to pictures of food after sleep deprivation. Brain networks associated with cognitive (decision-making) and affective (emotional) processes were twice as active in women than in men. Another study found women had a 1.5 times higher activation in the limbic region (involved in emotion processing, memory formation, and behavioral regulation) in response to images of sweet food compared to men.

Despite this difference in [brain activity](#), men tend to overeat more than women in response to sleep loss. Another study found more fragmented sleep, taking longer to get to sleep, and spending more time in bed trying to get to sleep were only associated with more hunger in men.

Both women and men nightshift workers are more likely to develop type 2 diabetes, but this risk is higher in men. Of women nightshift workers, 66% experienced emotional eating and another study suggests they are around 1.5 times more likely to be overweight or obese compared to women working day shifts.

The researchers also found emerging evidence on how women and men respond differently to treatments for sleep and circadian disorders. For example, weight loss was more successful in treating women with OSA than men, while women prescribed zolpidem (an insomnia medication) may require a lower dosage than men to avoid lingering sleepiness the

next morning.

Dr. Chellappa added, "Most of sleep and circadian interventions are a newly emerging field with limited research on sex differences. As we understand more about how [women](#) and men sleep, differences in their circadian rhythms and how these affect their metabolism, we can move towards more precise and personalized health care which enhances the likelihood of positive outcomes."

More information: Renske Lok et al, Sex differences in sleep, circadian rhythms, and metabolism: Implications for precision medicine, *Sleep Medicine Reviews* (2024). [DOI: 10.1016/j.smrv.2024.101926](https://doi.org/10.1016/j.smrv.2024.101926)

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