

Sleep Guide for Health Promotion 2023

February 2024

Review Committee on the Revision of
Sleep Guideline for Health Promotion

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1. Introduction

(1) The Significance of Sleep in Health Promotion

Sleep is an essential restorative activity for promoting and maintaining health across all age groups, including children, adults, and older adults. Sleep deprivation (sleep debt) results not only in daytime sleepiness or fatigue but also in increased physical and mental complaints such as headaches, emotional instability¹, as well as lower work efficiency or academic performance due to reduced attention and judgment². These effects may lead to serious consequences such as traffic and occupational accidents³. It has also been established that when various sleep problems, including sleep deprivation, become chronic, they are associated with an increased risk of developing or worsening obesity⁴, hypertension⁵, type 2 diabetes⁶, cardiac disease⁷, and cerebrovascular disorders⁸, and have been implicated in increased mortality⁹. Furthermore, sleep problems appear from the early stages of onset and increase the risk of relapse in mental disorders such as depression. Sleep disorders have also been reported to increase the risk of developing mental disorders¹⁰. Therefore, ensuring sufficient sleep each day, in terms of both quality (sleep restfulness) and quantity (sleep duration), is extremely important for maintaining physical and mental health and improving quality of life.

In contrast, the 2019 National Health and Nutrition Survey¹¹ reported that 37.5% of men and 40.6% of women had an average daily sleep duration of less than 6 hours. When broken down by gender and age group, men in their 30s to 50s and women in their 40s to 50s accounted for more than 40%. In addition, the 2021 OECD (Organization for Economic Cooperation and Development) survey¹² reported that the average sleep duration of Japanese people was the shortest among the 33 countries surveyed.

Given this situation, "ensuring sufficient sleep" and "improving sleep restfulness" are important challenges for all persons from a health promotion perspective, and are also meaningful for extending the healthy life expectancy of Japanese people.

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11 Ministry of Health, Labour and Welfare of Japan. Health Japan 21 (the second term) Final Evaluation. <https://www.mhlw.go.jp/content/10900000/000687163.pdf>

12 OECD Gender data portal. https://www.oecd.org/gender/data/OECD_1564_TUSupdatePortal.xlsx

(2) Purpose of the Revision of the Sleep Guideline

Sleep guidelines in Japan began with the establishment of the “Sleep Guideline for Health Promotion: Seven Principles for Good Sleep” in 2003, followed by the “Sleep Guideline for Health Promotion 2014” in 2014. These guidelines have been utilized to advance initiatives in the rest and sleep field under the “second term of the National Health Promotion Movement in the twenty-first century (Health Japan 21 [the 2nd term])”.

Approximately 10 years have passed since the establishment of the “Sleep Guidelines for Health Promotion 2014,” and novel scientific findings regarding sleep have accumulated. Meanwhile, the “Final Evaluation of Health Japan 21 (the 2nd term)”¹² set a target to reduce the indicator for the rest and sleep field, “Percentage of people not getting sufficient rest through sleep,” from the baseline value of 18.4% (FY2009) to 15% (FY2022). However, at the time of the final evaluation, the rate had increased to 21.7% (FY2018), resulting in a D rating (worsening). Analysis by age group revealed a significant increase among middle-aged adults (in their 50s). Given this situation, to further advance initiatives in the field of rest and sleep, the “Sleep Guideline for Health Promotion 2014” was revised based on the latest scientific findings. The purpose of the revision is to clearly explain to the public the characteristics of sleep that contribute to health promotion and to provide tools for more people to adopt the lifestyle habits necessary to maintain good sleep. This led to the establishment of the “Sleep Guide for Health Promotion 2023.”

The major difference from the “Sleep Guideline for Health Promotion 2014” is that the “Sleep Guide for Health Promotion 2023” compiles recommendations for ensuring sufficient sleep and sleep restfulness –goals set forth in the “third term of National Health Promotion Movement in the twenty-first century (Health Japan 21 [the 3rd term])”¹³, a national health promotion campaign starting in 2024– by age group: “adults,” “children and adolescents,” and “older adults.” In addition, because environmental factors such as light, temperature, and sound; lifestyle habits, including diet and exercise; and the management of caffeine, alcohol, and nicotine all affect sleep, key points requiring attention in these areas were compiled as reference information based on scientific findings. Furthermore, as some sleep-related symptoms may be caused by “sleep disorders,” the guide also provides an overview of these conditions. It also addresses the impact of fluctuations in female hormones on sleep from the perspective of women's health, as well as the health risks

and lifestyle factors associated with shift work—an essential work pattern in modern society.

The overall structure was designed to enable individuals to achieve good sleep tailored to their own lifestyles while also considering the usability of the tool. Furthermore, this guide includes not only quantitative recommendations, such as ensuring “at least 6 hours of sleep,” but also qualitative recommendations, such as reviewing sleep environments and lifestyle habits to achieve good sleep. Because the term “Guideline” may imply requirements that all people must equally follow, the name “Guide” was adopted.

12 Ministry of Health, Labour and Welfare of Japan. Health Japan 21 (the 2nd term) Final Evaluation.
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13 Ministry of Health, Labour and Welfare of Japan. Healthy Japan 21 (the 3rd term).
https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryuu/kenkou/kenkounippon21_00006.html

2. Goals of “Health Japan 21 (the 3rd term)” and Strategies for Utilizing this Guide

(1) Sleep-Related Goals in “Health Japan 21 (the 3rd term)”

The Ministry of Health, Labour and Welfare of Japan announced the basic policy for “Health Japan 21 (the 3rd term)” in May 2023.

“Health Japan 21 (the 3rd term)” sets the following goals related to rest and sleep: “Increase the number of people who feel rested from sleep” and “Increase the number of people who get sufficient sleep.” Target values were established for each goal and efforts will be advanced accordingly (Figure 1).

Goals	Indicators	Current values (2019)	Target values (2032)
Increase the number of people who feel rested from sleep	Average number of people who feel rested from sleep	78.3% *70.4%: Age 20–59 86.8%: Age 60 and over	80% *75%: Age 20–59 90%: Age 60 and over
Increase the number of people who get sufficient sleep	Average number of people who get 6–9 hrs (6–8 hrs; for those aged 60 and over) of sleep	54.5% *53.2%: Age 20–59 55.8%: Age 60 and over	60% *60%: Age 20–59 60%: Age 60 and over

Figure 1. “Health Japan 21 (the 3rd term)” Goals and Indicators for the Field of Rest and Sleep

(2) How to Utilize this Guide

Ensuring good sleep for the public requires the participation of various stakeholders. This guide was developed on the basis of scientific evidence to promote initiatives in the field of rest and sleep. It is intended to ensure good sleep for lifestyle guidance practitioners (such as public health nurses, registered dietitians, and physicians), policymakers (such as health promotion and community development departments), workplace managers, and other stakeholders in the health, medical, and care fields. Because the sufficient amount of sleep varies by age, this guide provides age-specific recommendations and organizes various reference information on sleep. This enables lifestyle guidance practitioners to tailor their efforts according to individual circumstances and needs.

Health Japan 21 (the 3rd term) emphasizes "Implementation of More Effective Measures." Accordingly, the national government presents concrete action plans to support local governments and other entities in achieving their goals. Additionally, promoting these initiatives should involve collaboration with stakeholders across various fields, including private companies and educational institutions. Therefore, it is necessary to explore effective methods to publicize and raise awareness of the guide's content among the public and relevant stakeholders.

In this context, given the rapid progress in establishing environments that enable individuals to access and utilize their own health information such as the expansion of ICT (Information and Communication Technology)-based services including PHR (Personal Health Records) driven by the widespread penetration of smartphones and wearable devices, it is important to advance further initiatives in the field of sleep while utilizing such digital technologies for the objective assessment of sleep.

3. Recommendations

Overview of Recommendations in this Guide

Sleep is an essential restorative activity that promotes and maintains one's health. Poor sleep has been shown to increase the risk of developing various diseases and to shorten life expectancy. Sufficient sleep duration varies among individuals and changes with age; therefore, initiatives that account for these characteristics are required.

Health Japan 21 (the 3rd term) emphasizes health promotion based on life stages (referring to each phase of a person's life, such as infancy, young adulthood, and old age) and the life course approach (referring to health promotion that considers a person's entire life, from the fetal stage to old age, over time).

Accordingly, this guide summarizes sleep-related recommendations for each life stage (adults, children and adolescents, and older adults) and organizes reference information by theme to ensure sufficient sleep quality and quantity.

It also recommends reviewing lifestyle habits and sleep environments to “ensure sufficient sleep duration” and implementing measures to “enhance sleep restfulness.”

The recommendations presented in this guide are based on scientific evidence from numerous academic papers and current data on the Japanese population. However, when implementing these recommendations, it is necessary to consider individual differences (e.g., health status, physical function, and living environment) and to begin with what is feasible.

Overall directionality

Considering individual differences, ensure sufficient sleep in both quality and quantity regularly to maintain physical and mental health.

Subjects*	Recommendations
Older Adults	• Given that spending a long time in bed is a health risk, get the sleep you need and ensure that the time spent in bed does not exceed 8 hours. • Re-evaluate lifestyle habits, such as diet and exercise, and sleeping environments in the bedroom to facilitate sleep restfulness. • As long naps interfere with good sleep at night, avoid long naps during the day and stay active.
Adults	• Although sufficient sleep varies from person to person, aim for 6 hours or more to get the required amount of sleep. • Re-evaluate lifestyle habits such as diet and exercise, as well as the sleeping environment in the bedroom, to improve sleep restfulness. • In cases of poor sleep and decreased sleep restfulness, it is important not only improving lifestyle habits and other factors but also considering the possibility of an underlying disease.
Children and Adolescents	• Elementary school students should sleep for 9 to 12 hours, whereas middle and high school students should sleep for 8 to 10 hours. • Get sunlight in the morning, eat breakfast, exercise during the day, and avoid “night owl” habits.

※Due to individual differences in physical condition influenced by lifestyle habits and environmental factors, it is considered inappropriate to categorize individuals as “older adults,” “adults,” or “children and adolescents” based solely on specific age thresholds. Instead, it is important to implement measures tailored to individual circumstances.

Figure 2: List of Sleep Recommendation

Basics of Sleep Health

1 Relationship between sleep and health

• Sleep is an essential restorative activity that promotes and maintains good health in children, adults, and older adults. Good sleep is important for the improvement and maintenance of cerebral, cardiovascular, metabolic, endocrine, immune, cognitive, and mental health¹. Poor sleep increases the risk of developing various diseases and shortens life expectancy²⁻⁶. On the other hand, good sleep also helps reduce the risk of accidents and injuries caused by sleepiness and fatigue, such as occupational injuries and motor vehicle accidents⁷. Given that sleep facilitates recovery from physical and mental fatigue caused by daytime activities and improves the ability to adapt to the environment by enhancing growth and consolidating memory (learning)⁸, sleep deprivation can impair growth and these adaptive abilities⁹.

- Sleep duration reflects sleep quantity, whereas sleep restfulness (feeling rested from sleep) reflects sleep quality. Sleep restfulness is affected not only by insufficient sleep duration, but by various factors such as the sleep environment, lifestyle habits, including daily intake of caffeine, alcohol, and nicotine, and sleep disorders. In addition, sleep restfulness upon awakening in the morning is an indicator of good sleep, as well as a guide to understanding individual differences in levels of sufficient sleep required.
- Good sleep is ensured by getting a sufficient amount (sleep duration) and quality (sleep restfulness) of sleep, which can be impaired by an inappropriate sleep environment, lifestyle habits, including daily intake of caffeine, alcohol, and nicotine, and the development of sleep disorders¹⁰.

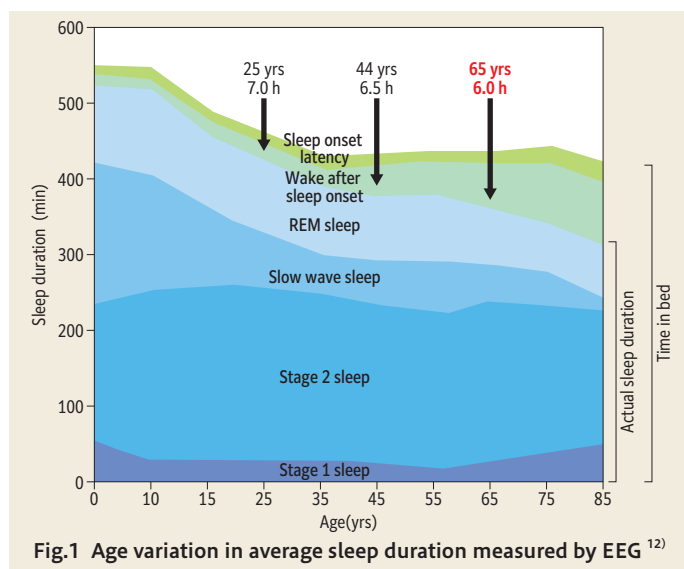
2 Basic nature of sleep

There is a limit to how long you can sleep

- There is a limit to how much sleep one can get in a single night. Many people have experienced the difficulty of trying to sleep longer than usual just because they have an important event the next day. Spending more time in bed trying to get more sleep than physiologically needed can increase the risk of issues such as "taking longer to fall asleep," "waking up more often during midnight," and "inability to get sound sleep," all of which decrease sleep quality¹¹.

Sleep needs vary with age

- The optimal duration of nighttime sleep has been objectively evaluated in some studies using electroencephalography (EEG). These studies have shown that sleep duration in a single night gradually decreases with age. Since adulthood, the average sleep duration in a single night gradually decreases at a rate of approximately 30 minutes every 20 years: approximately 8 hours around age 15, 7 hours at age 25, 6.5 hours at age 45, and 6 hours at age 65¹².

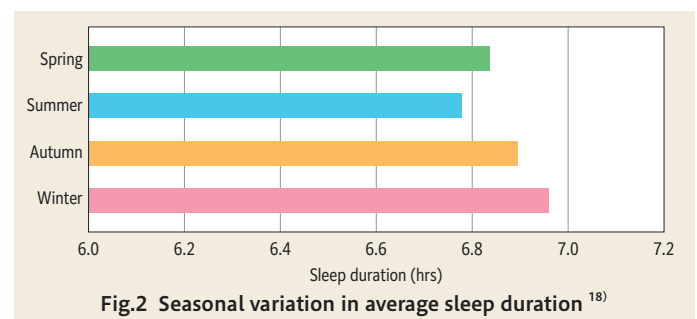


older than 75 years old¹². Based on these findings, it can be concluded that younger adults are more likely to experience sleep deprivation due to insufficient time spent in bed, whereas older adults are more likely to have excessive time in bed compared to the amount of sleep they need.

- It has been reported that bedtime gradually become earlier with increasing age, with most adults becoming early birds as they get older^{13,14}. As this tendency is particularly strong among men, application of age- and sex-specific considerations is necessary when assessing appropriate sleep habits.

Sleep needs vary with the seasons

- Sleep duration varies with seasons and has been shown to be 10–40 minutes longer in winter than in summer¹⁵⁻¹⁹. This variation is believed to be caused by a reduction in daylight hours (the time from sunrise to sunset). Conversely, sleep duration is shorter in the summer than in other seasons. In addition, falling and staying asleep has been shown to be more difficult in summer than in other seasons. In addition to longer days, the hot and humid bedroom environment during summer is believed to be a contributing factor to these findings¹⁹.



Sleep varies from person to person

- On the contrary, previous studies have indicated that the time spent in bed in a single night is approximately 7 hours for people in their 20s and 30s, gradually increases after age 45, and tends to exceed 7.5 hours for people

- Sleep varies considerably from person to person. Sleep conditions may change depending on various personal factors, including preexisting medical conditions. Therefore, the issues described in this guide may not apply to all individuals. For example, for people who need more than 10 hours of sleep (long sleepers)²⁰, following the recommendations in this guide and reducing sleep duration to 8 hours may lead to sleep deprivation (insufficient sleep).

3 Decreased sleep restfulness due to illness

- The presence of sleep disorders such as obstructive sleep apnea could decrease the feeling of restfulness after sleep, even after improving the sleep environment, adjusting lifestyle habits, and avoiding intake of caffeine, alcohol, and nicotine²¹. Mental disorders, such as depression, may chronically affect sleep restfulness by shortening or lengthening sleep owing to their strong association with comorbid insomnia or hypersomnia²². In

Short column

Limitations of subjective assessment of sleep duration

Most studies on the influence of sleep duration on health involved estimating the association between self-reported subjective sleep duration and health outcomes. Findings from these studies indicate that too short or too long sleep is associated with poor health outcomes^{23,24}.

Short sleep duration objectively evaluated using EEG or actigraphy is similarly associated with poor health outcomes; however, there is no significant association between objective long sleep duration and health outcomes^{25,26}.

Objective long time in bed, rather than objective long sleep duration, appears to be associated with poor health outcomes²⁵. In older adults, the gap between subjective and objective sleep duration has been shown to

individuals with a chronic wasting disease, it can be difficult to distinguish whether the lack of sleep restfulness is caused by a sleep problem or an illness that affects sleep. Therefore, consult a physician if your sleep does not improve after applying the recommendations in this guide (see "About Sleep Disorders").

be a possible predictor of poor health outcomes²⁷.

It should be noted that perceived sleep duration is likely to reflect the time spent in bed and may be somewhat inaccurate²⁸. When sleep restfulness is reduced despite getting sufficient sleep, possible underlying causes should be comprehensively assessed in a medical institution. Recently, simple equipments (i.e., wearable devices) were developed to easily measure sleep duration at home²⁹. However, the accuracy of their measurements may not be sufficiently high considering that they are inexpensive. Nevertheless, future technological advancements could allow for sleep management using such simple equipments.

Short column

Primary prevention of sleep disorders

For early detection and treatment of inflammatory diseases, (e.g., infectious diseases), hypertension, and obesity, simple measuring devices such as thermometers, blood pressure monitors, and scales are very useful for evaluating physical status at home. These devices can be used for self-implementation of preventive and early improvement measures. In addition, public health nurses and other healthcare professionals will be consulted regarding health concerns (primary prevention) while referring to these devices.

Using these devices, you can effectively communicate your physical condition to your doctor during medical care and also monitor the effectiveness of your doctor's treatment at home.

Regarding sleep, it is expected that simple measuring devices³⁰, similar to thermometers, blood pressure monitors, and scales, that can easily assess sleep conditions at home could also be utilized for health and medical consultations and other purposes to promote good sleep health in the general population.

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RECOMMENDATION 1

Adults

Recommendations

- Although sufficient sleep varies from person to person, aim for 6 hours or more to get the required amount of sleep.
- Re-evaluate lifestyle habits such as diet and exercise, as well as the sleeping environment in the bedroom, to improve sleep restfulness.
- In cases of poor sleep and decreased sleep restfulness, it is important not only improving lifestyle habits and other factors but also considering the possibility of an underlying disease.

1 Getting sufficient sleep

Health risks associated with shorter sleep

- Recent studies have shown that an extremely short sleep duration increases the risk of obesity^{1,2)}, hypertension^{1,2)}, diabetes¹⁾, heart disease^{1,2)}, cerebrovascular disease²⁾, dementia³⁾, and depression²⁾.
- In a longitudinal survey of approximately 40,000 Japanese male workers who were followed up for seven years¹⁾, the participants who reported sleeping for less than 5 hours a day were 1.13 times more likely to become obese and 1.08 times more likely to develop metabolic syndrome over a seven-year period than those who slept for 5 hours or more.
- A longitudinal survey of 2,282 male Japanese workers followed for 14 years indicated that the participants who slept for less than 6 hours per day had a 4.95 times greater risk of developing cardiovascular diseases, such as myocardial infarction and angina pectoris, than those who slept between 7 and 8 hours per day⁴⁾.
- It has been reported that the risk of all-cause mortality increases with decreasing sleep duration. A systematic review of several studies conducted worldwide, which included the analysis of data from approximately 920,000 people, indicated that sleep duration of less than 6 hours is associated with a significant increase in the risk of all-cause mortality⁵⁾.
- Several self-reported surveys have shown that people who sleep for approximately 7 hours have the lowest risk for lifestyle diseases, depression, and all-cause mortality. In addition, the studies showed that both longer and shorter sleep durations increase the risks for lifestyle diseases, depression, and all-cause mortality¹⁻⁵⁾.
- In a study on objective sleep duration and bedtime measured using EEG, the rate of all-cause mortality increased with decreasing sleep duration in adults aged 40–64 years⁶⁾, an age group that shows a marked tendency toward insufficient sleep. This finding indicates that getting sufficient sleep

is important for maintaining and improving health with increasing age.

Current state of sleep duration

- According to the National Health and Nutrition Survey conducted in 2019⁷⁾, approximately 35–50% of the working-age population (20–59 years old) sleep for less than 6 hours per night. In addition, the survey indicated that the proportion of the working-age population who sleep for less than 5 hours per night ranges from approximately 5 to 12%, which is high (Figure 1).

Optimal amount of sleep

- Based on findings from studies conducted to date, approximately 6–8 hours of sleep is considered sufficient for adults. Specifically, it is recommended to get at least 6 hours of sleep per day.
- However, there are individual differences in the optimal amount of sleep required, with some people needing less than six hours and others requiring more than 8 hours of sleep per day⁸⁾. Considering these individual differences and correcting for activity levels during the day, a sleep duration that is approximately one hour longer than 8 hours is considered to be within the appropriate range for adults.

The U.S. Joint Consensus Statement on Recommended Amount of Sleep, which compiles the opinions of major sleep researchers who are members of the American Academy of Sleep Medicine and Sleep Research Society, states that 7–9 hours of sleep is ideal, but sleep duration shorter (from 6 hours) or longer (to 10 hours) than that are also acceptable⁹⁾. Each individual should explore his or her own sleep duration requirements depending on the levels of daytime sleepiness and sleep restfulness they feel.

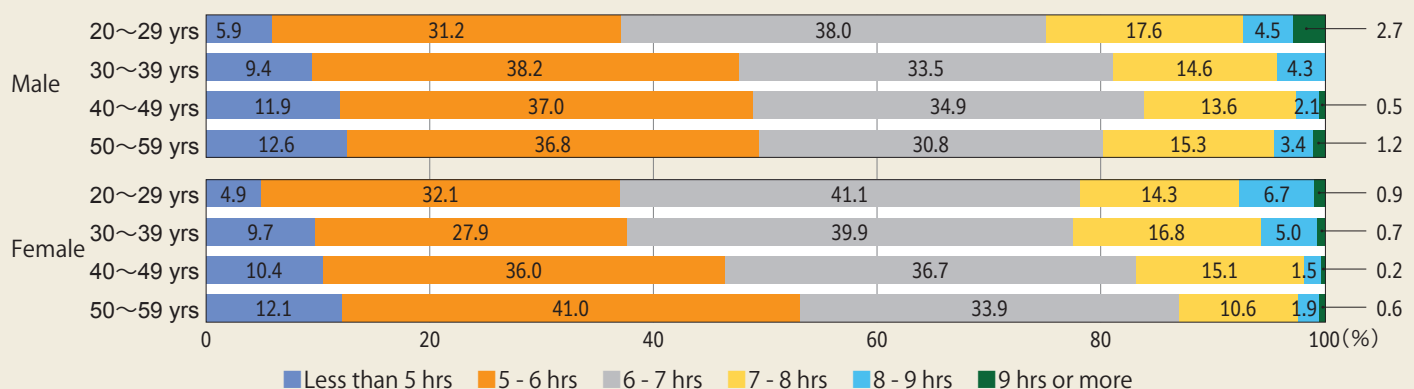


Fig.1 Percentage of sleep time for each age group of Japanese populations⁷⁾

Problems with "catch-up sleep" on weekends

- Many people have the habit of "Nedame" in order to catch up on weekday sleep deprivation (sleep debt) on weekends and holidays. However, such a habit actually "deposits" sleep for sleep loss in the coming weekdays.
- Internationally known as "weekend catch-up sleep"¹⁰⁾, this habit is also called "social jetlag" because it is similar to repeating travel across time zones every weekend (and during holidays)¹¹⁾.
- Social jetlag has negative effects on health due to both chronic sleep deprivation and frequent circadian misalignment, and is a risk factor for the development of lifestyle diseases such as obesity, diabetes, cerebrovascular disorders, cardiovascular diseases, and depression¹²⁾.
- Weekend catch-up sleep does not completely eliminate daytime sleepiness on weekdays, and its benefits are extremely limited¹³⁾. A recent study

of adults aged 40–64 years showed that weekend catch-up sleep for approximately one hour decreases the risk of all-cause mortality only in people who sleep for 6 hours or more on weekdays. However, weekend catch-up sleep significantly increases the risk of all-cause mortality in those who sleep for less than 6 hours on weekdays¹⁴⁾. Moreover, weekend catch-up sleep for more than two hours does not reduce the risk of all-cause mortality, even in people who sleep for more than 6 hours on weekdays¹⁴⁾.

- Needing long hours of sleep on weekends is a sign of insufficient sleep on weekdays. Therefore, it is important to revise sleep-wake habits to ensure that sufficient sleep is gotten on weekdays.
- Significant delay in wake-up time on weekends owing to sleep deprivation on weekdays confuses the circadian clock, resulting in a social jetlag similar to traveling across time zones, which may pose a risk to health.

2 Ensuring "sleep restfulness"

- As sleep plays an important role in recovering from fatigue and stress accumulated during the day's activities, it is also important to improve sleep restfulness (feeling rested from sleep).

Health risks associated with non-restorative sleep

- It has been shown that reduced sleep restfulness is associated with poorer health outcomes. In a follow-up study conducted in Japan, increased sleep restfulness was associated with a lower incidence of cardiovascular diseases such as myocardial infarction, angina pectoris, and heart failure. Notably, this association was more pronounced in young adults and women¹⁵⁾. Furthermore, a longitudinal study conducted in Japan showed that decreased sleep restfulness is associated with metabolic dysfunction, including obesity, diabetes, and dyslipidemia¹⁶⁾. A longitudinal study conducted in the US also showed that decreased sleep restfulness is associated with the development of hypertension¹⁷⁾.
- Sleep restfulness also affects mental health. A cross-sectional study conducted in the US indicated that the most frequent sleep-related complaint comorbid with mental disorders is non-restorative sleep (25.0%)¹⁸⁾. A longitudinal study of community residents in the US showed that decreased sleep restfulness is associated with the development of depression, independent of insomnia symptoms such as difficulty falling asleep and frequent awakenings in the night¹⁹⁾. A cross-sectional study of Japanese adults also showed that the lower the sense of sleep restfulness, the greater the severity of depression²⁰⁾.

- In another cross-sectional study, decreased sleep restfulness was most strongly associated with a decrease in the degree to which one feels healthy²¹⁾. In addition, sleep restfulness has been shown to be related to physical function, cognitive function, and emotional stability²²⁾.
- In a US survey, adults (working persons) aged 40–64 years with short sleep duration had an increased risk for all-cause mortality. However, the risk did not increase when sleep restfulness was ensured. In addition, the risk further decreased when sleep restfulness was ensured with increased sleep duration⁶⁾. Sleep restfulness is a subjective indicator that reflects one's health through sleep restoration (Figure 2).

Current state of sleep restfulness among Japanese people

- According to the recent National Health and Nutrition Survey⁷⁾, approximately 80% of Japanese people feel well restored through sleep. However, this proportion varies according to age group. Specifically, it is particularly low (70%) for adults aged 20 years or older, and decreasing every year.

Things to work on

- Although sufficient sleep is important for the promotion of health, it is equally important for sleep to provide a sense of restfulness. Factors that decrease sleep restfulness include shortened sleep duration²³⁾, and daytime stress from work and other activities²⁴⁾, poor eating habits such as eating dinner just before bedtime, eating a midnight snack, or skipping breakfast²⁵⁾, poor fitness habits such as lack of exercise and slow walking speed²⁵⁾, and chronic diseases such as diabetes, hypertension, cancer, and depression²⁶⁾. Lifestyle habits must be revised to improve sleep restfulness. Other factors that influence sleep restfulness include the sleep environment and habits such as relaxation before bedtime, bedroom comfort, and regular intake of caffeine, alcohol, and nicotine.
- It is important to revise and improve the sleeping environment, lifestyle habits, and regular intake of caffeine, alcohol, and nicotine, as well as strive for early detection and treatment of chronic diseases, to enhance sleep restfulness.

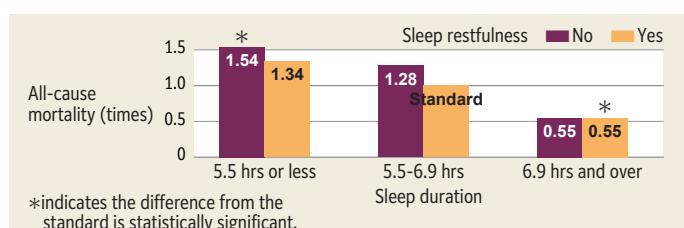


Fig.2 Relationships between sleep duration and sleep restfulness with all-cause mortality risk in adults⁶⁾

3 Sleep disorders and menopause that result in poor and non-restorative sleep

- When sleep disturbances (e.g., difficulty falling asleep or frequent awakening at night) or decreased sleep restfulness persist for a long time, the presence of a sleep disorder should be considered. Insomnia is often triggered by stress and can decrease the sense of sleep restfulness and cause insufficient sleep²⁷⁾. Obstructive sleep apnea and periodic limb movement disorder may have few subjective symptoms other than daytime sleepiness or catnaps and decreased sleep restfulness²⁸⁾. Both disorders require attention because their prevalence increases after the age of 50 (see

"About Sleep Disorders").

- In addition, as women enter menopause in the second half of their working life, they are more likely to experience various poor health conditions. It has been reported that 40–60% of menopausal women have sleep problems, which also affect their work²⁹⁻³¹⁾ (see "Pregnancy, Parenting, Menopause, and Good Sleep")

Short column

How to workers get more sleep

Working hours is an important factor in ensuring that workers get sufficient sleep. The longer the working hours, the shorter the sleep duration, leading to accumulation of fatigue (Figure 3). Some studies have revealed a strong relationship between working hours and sleep duration. In a large-scale survey of daily living hours among the US population, shorter sleep duration showed the strongest correlation with longer working hours, followed by longer travel time, including commuting time³²⁾. A survey on the relationship between working hours and sleep duration conducted in Japan also showed that the risk of getting less than 6 hours of sleep in men increases significantly by 2.76 times for those who work more than 9 hours and by 8.62 times for those who work more than 11 hours, compared to people who work between 7 and 9 hours per day. For women, those who work 9 or more hours have a 2.71-fold increased risk of getting less than 6 hours of sleep, whereas those who work 11 or more hours have a 5.59-fold increased risk³³⁾. Furthermore, it has been reported that sleep duration becomes markedly shorter when overtime work exceeds 5 hours per day³³⁾. Therefore, it is important to manage working hours by implementing measures such as correcting long working hours to ensure that workers get sufficient sleep.

As part of the "work style reform" promoted by the Japanese government, companies are required to make efforts to introduce the "work interval system," which ensures a certain amount of rest time between the time workers leave work and the next time they clock in. In a survey of Japanese workers, those who had less than 12 hours of this interval reported non-restorative sleep, increased fatigue, and more stress³⁴⁾.

Although the "work interval system" is useful for ensuring sufficient sleep among workers with long working hours and irregular work patterns, such as shift work, it is also important for workers to ensure that they have a regular sleep-wake schedule in order to get a healthy amount of sleep. Therefore, it is advisable to utilize the intervals between work hours to ensure that the sleep-wake schedule does not vary significantly from day to day.

According to the 2015 National Health and Nutrition Survey, work and childcare/housework are the top risk factors for insufficient sleep in men and women, respectively³⁵⁾. In addition to working at the office, childcare and housework should be shared appropriately within the family to ensure that both men and women get sufficient sleep.

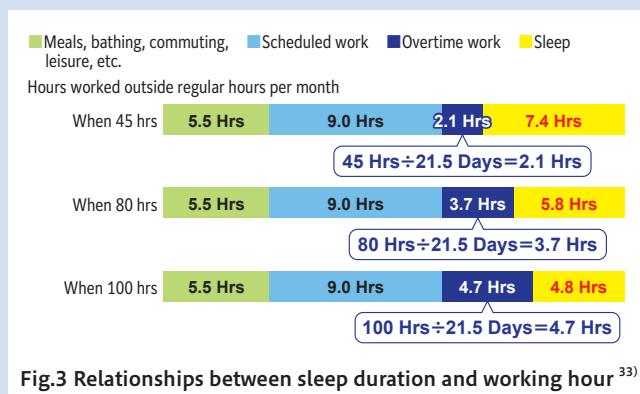


Fig.3 Relationships between sleep duration and working hour³³⁾

4 FAQs

Q. Is there an indicator of good sleep?

- A. Sleep restfulness, which means "feeling rested from sleep," is especially important. It is necessary to adjust lifestyle habits and sleep environments to achieve optimal sleep restfulness.

Q. Are there any sleep-related disorders that need attention?

- A. Obstructive sleep apnea is a common sleep-related disorder. If you feel a reduced sleep restfulness or strong daytime sleepiness, it is recommended that you undergo examination at a specialized medical institution.

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RECOMMENDATION 2

Children and Adolescents

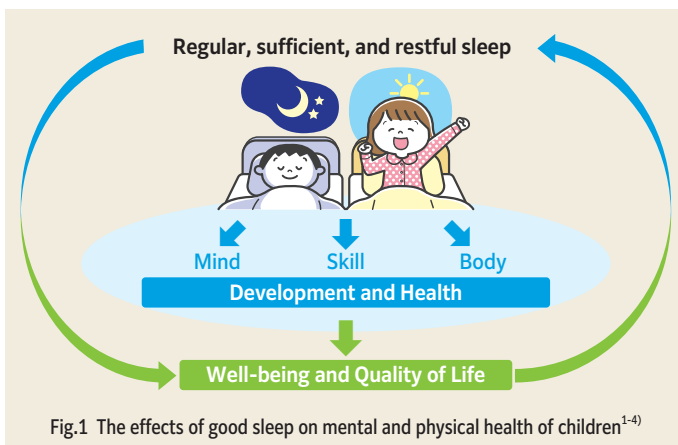
Recommendations

- Elementary school students should sleep for 9 to 12 hours, whereas middle and high school students should sleep for 8 to 10 hours.
- Get sunlight in the morning, eat breakfast, exercise during the day, and avoid “night owl” habits.

1 Getting sufficient sleep

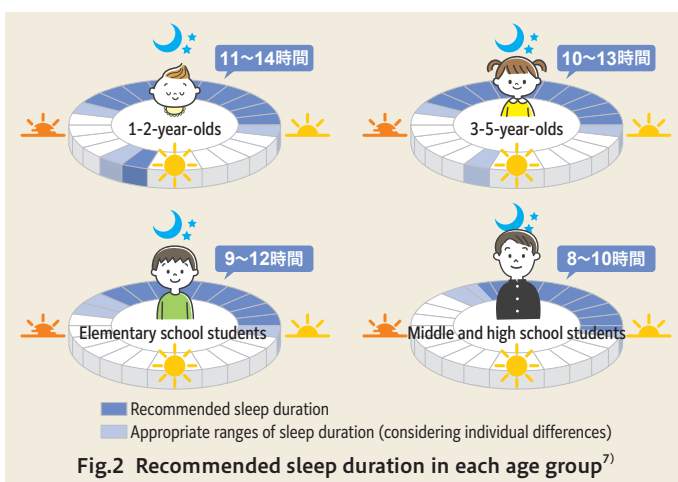
Sleep function and health risks associated with insufficient sleep

- Sleep plays a crucial role in mental and physical restoration and the development of the brain and body. Sufficient sleep is important for the mental and physical health of children. It has been reported that insufficient sleep increases the risk of obesity¹⁾, depression²⁾, and decreases academic performance³⁾, well-being, and quality of life⁴⁾ (Figure 1).



Approximate sleep duration for children

- The American Academy of Sleep Medicine (AASM) recommends that 1-2-year-olds sleep for 11-14 hours, 3-5-year-olds sleep for 10-13 hours, elementary school students sleep 9-12 hours, and middle and high school students sleep for 8-10 hours⁵⁾. These values, which are based on findings from epidemiological and physiological studies, were estimated by principal sleep researchers as the amount of sleep required for the recovery and growth of mental and physical functions during each growth period, and are used as reference values in many countries (Figure 2).



- From the perspective of preventing sleep deprivation (insufficient sleep) related to lifestyle habits such as staying up late, it is recommended that elementary school students get 9-12 hours of sleep, and middle and high school students get 8-10 hours of sleep.

How to get sufficient sleep across developmental stages

- Sleep-wake rhythms and sleep habits change dramatically as the developmental stages progress from birth through infancy, school age, adolescence, and young adulthood⁶⁾. For example, infants take naps; however, their napping habits decrease by the time they reach elementary school age. Elementary school students are often good at going to bed and getting up early, whereas adolescents and young adults are more prone to exhibit delayed sleep patterns and oversleeping⁷⁾. As students move on to the next grade, they may experience significant lifestyle changes, such as increased extracurricular activities and smartphone use, which can negatively impact sleep habits. Each developmental stage presents different sleep challenges and requires different approaches to getting a good night's sleep.
- During infancy, children's sleeping habits are easily influenced by their parents' sleeping habits. Therefore, it is recommended that the entire family collaborate to establish consistent early bedtime and wake-up routines. From elementary school onward, children are encouraged to maintain the habit of waking up early and decide what time they need to go to bed by working backward from the abovementioned recommended sleep durations. From this age, more children start to adjust their bedtime themselves; however, it is advisable for parents to help them set a bedtime that allows them to get enough sleep, while allowing time for socializing and playing with friends. It is also important for children not to miss breakfast in order to maintain appropriate sleep-wake habits (see "Lifestyle Habits, such as Exercise and Diet, and Sleep").
- The amount of sleep children need gradually decreases as they grow. It is known that children need more sleep than adults until they reach high school age. Notably, many people may be surprised to learn that they need more sleep than is generally recognized. Therefore, it is evident that maintaining a more regular daily routine is even more crucial for children than for adults in order to ensure sufficient sleep every day.

2 Caution against “night owl” habits and oversleeping

Causes of “night owl” habits

- The sleep–wake phase tends to be delayed around puberty. Secretion of melatonin, the hormone involved in sleep onset, is delayed, resulting in a tendency to go to bed later at night and difficulty waking up in the morning^{8,9}. Social factors also influence night owl habits. Extracurricular activities, studying, socializing with friends, and use of digital devices make children stay up later, even though they need to wake up early to avoid being late for school. Therefore, it is easy for children to become sleep-deprived¹⁰. On holidays, when school is not in session, children delay their waking time to reimburse sleep debt, which prevents them from receiving sunlight in the morning, and likely disrupts their sleep–wake rhythm. From adolescence to young adulthood, individuals are particularly prone to staying up late, experiencing insufficient sleep, and catch-up sleep on weekends.

Preventing night owls from developing a habit of staying up late

- If children continue staying up late or sleeping in the morning for a long time, it becomes difficult for them to get up on time in the morning, resulting in increased tardiness and difficulty attending school. This is called delayed sleep–wake phase disorder¹¹ (see “About Sleep Disorders”) and is considered the result of accumulated sleep deprivation (sleep debt) and the inability to resist the disruption (delay) of the sleep–wake rhythm by one’s will alone.
- Approximately 60% of individuals with delayed sleep–wake phase disorders experience orthostatic dysregulation¹². As this condition is likely to lead to falling behind in studies (secondary effect) and impaired social relationships, it is important to consult a physician as soon as possible if characteristic symptoms are observed. The following measures should be implemented to prevent the development of this disorder:

Exposure to sunlight upon waking

- In infancy, parents/guardians should set the time for children to get up in the morning and open the curtains to let sunlight into the room. After breakfast, children should go outside to perform activities. From elementary school onward, children should be sufficiently exposed to sunlight on their

way to and from school. On weekends and holidays, they should wake up at the same time as usual and get some sunlight^{13–16}.

Having breakfast

- It has been reported that the habit of skipping breakfast, as well as living environments that lack exposure to sunlight in the morning, promotes a delay in the sleep–wake rhythm¹⁷. Night owls and those who sleep in the morning are more likely to miss breakfast, which further contributes to their night owl habits and sleeping in. In children, night owl and oversleeping habits are often accompanied by chronic sleep deprivation, which is a risk factor for obesity^{18,19}. In addition, obesity is a risk factor for obstructive sleep apnea (see “About Sleep Disorders”). The poor sleep quality caused by this condition can easily form a vicious cycle that leads to poor morning awakening, which in turn leads to exacerbation of night owls and sleeping in the morning, further increasing the risk of obesity.

Establishment of exercise habits

- Avoid engaging in too many sedentary activities, especially prolonged screen time (e.g., watching TV, playing video games, using smartphones). It is recommended that elementary, middle and high school students be physically active for at least 60 minutes per day and have no more than 2 hours of screen time²⁰ (see “Lifestyle habits, such as Exercise and Diet, and Sleep”). Prolonged sedentary activities (and screen time) are associated with increased obesity and decreased sleep duration¹⁸, whereas moderate exercise leads to good sleep²¹. Moreover, exercise improves sleep quality at any time of the day²². However, strenuous exercise within an hour before bedtime could deteriorate sleep quality²³; therefore, it is best to avoid exercise right before bedtime.

Avoidance of digital device use before sleep

- Digital devices should not be brought into the bedroom but should be turned off and placed in another room²⁴. In particular, using digital devices while lying in bed can worsen sleep initiation and sleep quality because the close viewing distance of the display increases exposure to blue light²⁵ (see “Setting an Ideal Environment for Good Sleep”).

Short column

Bedtime Procrastination

Staying up late past one’s bedtime for no particular reason is called “bedtime procrastination”^{26,27}. The most common activities that lead to bedtime procrastination include watching TV, playing video games, and browsing social networking websites.

Bedtime procrastination not only shortens sleep duration, worsening sleepiness and fatigue the next day, but also causes difficulty falling asleep, leading to circadian rhythm sleep–wake disorders (see “About Sleep Disorders”), which makes waking up in time for school the next morning challenging for students^{28,29}. To effectively prevent bedtime procrastination, parents/guardians may set a sleep schedule target and

monitor whether the child can adhere to it on a daily basis³⁰ or establish rules regarding the use of digital devices at home³¹.

On the other hand, breaking away from bedtime procrastination may result in a decrease in leisure activities. It is important to note that reduced engagement in appropriate leisure activities can lead to increased stress and depression^{32,33}. Therefore, parents/guardians should ensure that leisure time around bedtime is adequately compensated for during the day. Furthermore, engagement in daytime leisure activities that allow for exercise will contribute to improved sleep quality³⁴.

3 FAQs

- Q.** My son, who is in elementary school, sometimes cries or talks in his sleep. Does he need to see a doctor?
- A.** Abnormal behaviors during sleep in children disappear spontaneously with age; therefore, there is no need to worry in most cases¹¹. However, if sleep deprivation or irregularities occur in daily life, abnormal behavior during sleep increases¹¹. Therefore, it is important for children to get

regular and sufficient sleep¹ (See “Pregnancy, Parenting, Menopause, and Good Sleep”).

Q. Do children need a nap?

- A.** The need for naps decreases after the age of 4–5 years. In addition, naps can actually cause insufficient sleep by making it harder to fall asleep at night and wake up in the morning³⁵. Therefore, it may be preferable for

children who have difficulty falling asleep to avoid taking naps. Notably, as children begin attending nursery schools, kindergartens, and schools, they may struggle to get enough sleep because of the set morning start time for school.

Q. Some high school students find it impossible to get 8–10 hours of sleep if they try to study extensively. What should we do?

A. Getting a sufficient amount of sleep increases concentration and learning efficiency³⁶⁾. Furthermore, as sleep also plays a role in consolidating memory, getting sufficient sleep makes it easier to establish what has been learned³⁷⁾. Therefore, it is important to strike a balance between study duration and sleep duration to improve academic performance and maintain good health.

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RECOMMENDATION 3

Older Adults

Recommendations

- Given that spending a long time in bed is a health risk, get the sleep you need and ensure that the time spent in bed does not exceed 8 hours.
- Re-evaluate lifestyle habits, such as diet and exercise, and sleeping environments in the bedroom to facilitate sleep restfulness.
- As long naps interfere with good sleep at night, avoid long naps during the day and stay active.

1 Health risks associated with prolonged sleep

- Although much attention has been paid to the negative health effects of short sleep duration (insufficient sleep) in adults, a systematic review of many studies showed that the health risk (all-cause mortality risk) associated with long sleep duration is more pronounced in older adults¹. The study indicated that a short sleep duration of less than 7 hours is associated with a 1.07-fold increase in all-cause mortality risk, whereas a long sleep duration of 8 hours or more is associated with a 1.33-fold increased risk of all-cause mortality.
- A recent large-scale survey indicated that sleeping for long periods (> 9 hours) increases the risk of developing Alzheimer's disease². Long sleep may not necessarily mean increased actual sleep duration; rather, it may entail taking longer to fall asleep (difficulty falling asleep) and increased nighttime awakenings (wake after sleep onset), thereby decreasing sleep efficiency³. The diminished sleep restfulness (feeling rested from sleep) caused by decreased sleep efficiency⁴ tends to lead to a vicious cycle that encourages longer sleep as the individual feels the need for more rest.
- According to the recent National Health and Nutrition Survey, older adults tend to sleep longer than adults (aged 40–60 years)⁵. The physiological need for sleep decreases with age, and day-night variation declines

owing to age-related changes in the function of the circadian clock, which controls the sleep-wake rhythm (Figure 1). It has been reported that a decrease in day-night variation leads to decreased daytime activity and increased daytime napping. Compared to taking no naps, taking naps for 30 minutes or longer is associated with a 1.27-fold increased risk of all-cause mortality¹. Longer and more frequent naps have also been reported to be associated with poorer sleep quality at night⁶ and an increased risk of cognitive decline⁷.

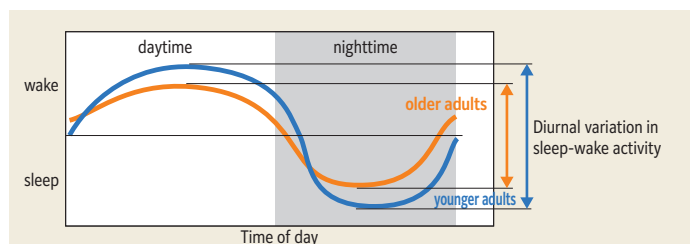


Fig.1 Diurnal variation during sleep-wake (day and night) cycle in young people and older adults⁸

2 Relationship between time in bed and health

- As older adults retire and spend more time at home, their domestic roles such as childcare, gradually decrease. Consequently, the amount of time they spend in bed tends to become relatively excessive compared to their actual sleep requirements^{3,8} (Figure 2).

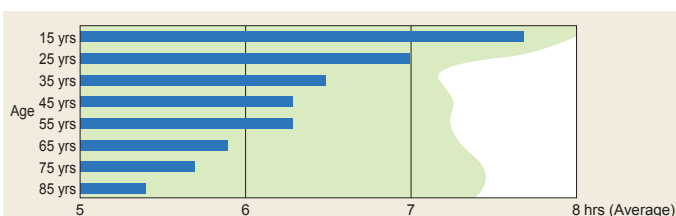


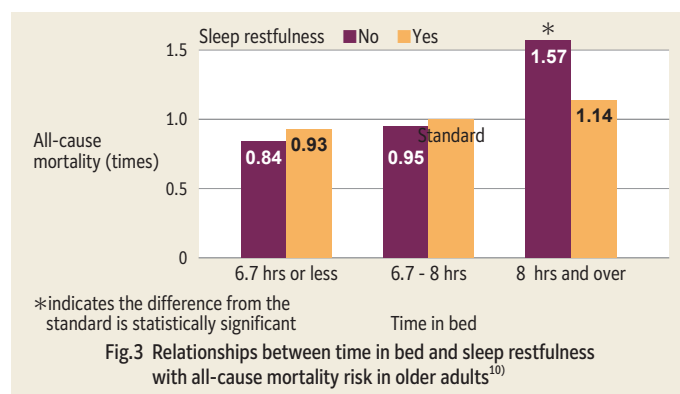
Fig.2 Changes in objectively measured sleep duration (blue) and time in bed (green) by age^{3,8}

- The relationship between sleep duration and all-cause mortality in older adults aged 65 years or older is not clear. However, it has been reported that spending approximately 8 hours or more in bed is associated with increased all-cause mortality risk⁴. In addition, another study in which time in bed was measured using actigraphy showed that longer time in bed is associated with increased all-cause mortality risk⁹. These findings indicate that for older adults, too much time in bed, rather than a very short sleep duration, can lead to poor health.
- Although various health issues (e.g., cardiovascular diseases, respiratory

diseases, and joint diseases, such as those of the hips and knees) may make it difficult for some older adults to reduce the amount of time spent in bed, the results of the aforementioned studies indicate that reducing activity and spending too much time in bed may increase the risk of long-term mortality.

3 Health risks associated with non-restorative sleep

- In a survey of US community cohort of individuals aged 65 years and older, longer time in bed (more than 8 hours) with a lack of sleep restfulness (feeling rested from sleep) was associated with an increased risk of all-cause mortality. Even after excluding those whose time in bed may have been inevitably increased due to imminent death within two years, the relationship between the risk of all-cause mortality, time in bed, and sleep restfulness remained similar¹⁰⁾ (Figure 3)



4 What we need to work on

Time in bed

- Spending a long time in bed poses a health risk to older adults. Therefore, they should focus on time in bed rather than actual sleep duration.
- As a general guide, the time spent in bed can be approximately 30 minutes longer than the weekly average sleep duration (the amount of time you actually sleep). Getting the amount of sleep needed without spending more than 8 hours in bed is recommended. Note that the amount of sleep needed can vary from person to person. Even among older adults, those who are active during the day could need a similar amount of sleep as younger adults. The amount of sleep needed to get sleep restfulness should be determined considering individual differences, using the guide of getting around 6 hours of sleep.

Ensuring sleep restfulness

- Implementation of the following measures may be helpful if you have low sleep restfulness despite getting sufficient sleep:

Bedtime

- Limiting the time spent in bed to less than 8 hours may help improve sleep quality for people with a habit of sleeping for long periods.
- Record your sleep status for one week. The key point is differentiating time in bed (time spent in bed) from sleep duration (the period when one is asleep).
- When reducing your own time in bed, limiting it to a maximum of 6 hours should be recommended¹¹⁾ and avoid thinking in bed. If you have trouble falling asleep, leave your bed and go to a quiet, dark, and safe place other than your bed, and stay there in a restful state until you feel sleepy. Return to your bed when you feel sleepy¹¹⁾. In addition, try to improve habits related to your bedroom environment, such as sleeping with the TV or radio on or with the lights on, as they may interfere with sleep (see "Setting an Ideal Environment for Good Sleep").

Nap

- Avoid taking long naps during the day as they can disrupt sleep at night.

Setting an alarm or having a roommate wake you up can be effective.

Daytime activities and day-night variation

- It is important not to spend more time in bed than necessary and to increase daytime activity to promote an enhanced day-night variation that improve your health.
- Daytime sleepiness and fatigue are more likely to occur as day-night variation declines¹²⁾. Therefore, older adults should exercise regularly and be exposed to sunlight for as long as possible during the day (see "Setting an Ideal Environment for Good Sleep").
- Sleep and physical activity may be promoted through social and interpersonal relationships (community activities and interpersonal relationships) and rapport. Taking advantage of local events such as yoga to develop exercise habits is also helpful in promoting good sleep¹³⁾.

Countermeasures if adjustment of sleep habits does not promote sleep restfulness

- Other factors such as the sleep environment or lifestyle habits may prevent the abovementioned measures from improving sleep restfulness. Consumption of stimulants (caffeine and nicotine), excessive alcohol consumption, and drinking alcohol in place of hypnotics can cause difficulty falling asleep and frequent awakening at night, thereby decreasing sleep restfulness (see "Sleep and Intake of Caffeine, Alcohol, and Nicotine"). In addition, excessive salt intake can cause nocturia and increase awakenings at night; therefore, a diet high in salt should be avoided (see "Lifestyle Habits, such as Exercise and Diet, and Sleep"). Furthermore, as the prevalence of various sleep disorders increases with age¹⁴⁾, sleep restfulness could be decreased by some sleep disorders. Notably, sleep disorders such as insomnia, obstructive sleep apnea, restless legs syndrome, and periodic limb movement disorder are more likely to gradually develop from the age of 50 (see "About Sleep Disorders"). If the abovementioned measures do not improve sleep restfulness, consult a physician to determine whether your poor sleep is associated with some sleep disorders.

5 FAQs

- Q. I have a cardiac disease, and my doctor has advised me against engaging in increased levels of exercise. Is there anything that I should apply to improve sleep restfulness?**
- A.** If cardiovascular, respiratory, or joint diseases, such as diseases that affect the hips and knees, do not permit exercising and force you to spend more time in bed, local exercise of moving parts can be a good alternative to walking and active exercise. Social interactions, such as talking to others,

can also promote good sleep.

- Q. I have a retinal disease, and my doctor has instructed me to avoid sunlight and strong artificial light. Are there any good alternatives to sunlight exposure that would help me enhance day-night variations?**
- A.** Sunlight has the strongest influence on the regulation of sleep-wake rhythms. However, if you are unable to receive sufficient sunlight due to certain retinal or skin diseases such as photosensitivity reaction, keep

regular timing of indoor exercise and eating during the day (see "Lifestyle Habits, such as Exercise and Diet, and Sleep") can also help regulate the sleep-wake rhythm.

Q. My parents, who have dementia, nap for a long time during the day and spend more time being active at night. Are there countermeasures for this?

A. It has been reported that 60–70% of patients with dementia experience disrupted sleep¹⁵. The function of the circadian clock, which controls sleep-wake rhythms, changes with age, and day-night variation is diminished. As a result, older adults tend to take more naps (daytime

sleepiness) and wake up more often at night than when they were younger⁸. Dementia has been reported to facilitate changes in the function of the circadian clock, further weakening day-night variations. Thus, some older adults completely reverse their activity patterns from day to night¹⁵. In addition, progression of dementia weakens the motivation to implement measures to correct the sleep-wake rhythm. Sunlight exposure, daytime exercise habits, and social interaction may help regulate sleep-wake rhythms; however, a physician should be consulted if these measures are not very effective.

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4. Reference Information on Sleep

Setting an Ideal Environment for Good Sleep

Points

- Sufficient sunlight exposure during the day helps regulate the circadian clock, making it easier to fall asleep.
- Smartphones or tablets should not be brought into the bedroom. The room should be kept as dark as possible to promote a good night's sleep.
- The bedroom should be at a temperature that is neither too hot nor too cold. It is easier to fall asleep after taking a bath to warm up the body about 1 to 2 hours before bedtime.
- Sleeping in a quiet environment with comfortable nightwear and bedding will lead to a good night's sleep.

1 Lighting-related factors to consider in setting an ideal sleep environment

- Exposure to strong morning sunlight after waking up resets the biological (circadian) clock, regulates the sleep-wake rhythm, and promotes brain arousal¹⁾. Exposure to more light during the day increases melatonin secretion at night, regulates the circadian clock, and promotes sleep. These effects are achieved through exposure to light of 1,000 lux or more during the day²⁾. Ensuring that morning sunlight gets into the room when you wake up and trying to get as much sunlight as possible during the day promotes quicker initiation of sleep at bedtime. Melatonin, a hormone that promotes sleep, begins to be secreted approximately 2 hours before bedtime. Exposure to strong light from room illumination or smartphones after this period inhibits the secretion of melatonin, which has a hypnotic effect. Thus, the sleep-wake rhythm is delayed, and sleep initiation is disrupted³⁾.
- Exposure to artificial light at night is unavoidable in modern society. However, it has been reported that exposure to more sunlight during the day reduces the negative effects of nighttime exposure to artificial light on the circadian clock⁴⁾. Therefore, it is important to maintain a well-lit environment throughout the day to promote a good night's sleep.
- It is essential to consider that even low-intensity light in the bedroom can increase the frequency of awakening after sleep onset and decrease sleep efficiency. A systematic review of observational studies indicated that light exposure at night is associated with sleep disturbances⁵⁾. As recent lighting

devices and smartphones use light-emitting diodes (LEDs), which contain a large amount of short-wavelength light (blue light) that has a strong effect on the circadian clock, keeping smartphones and tablets out of the bedroom and keeping the bedroom as dark as possible will promote a good night's sleep.

- As older adults often go to the restroom at night, it is important to reduce the light exposure at night by utilizing concealed illumination and footlights to prevent falls.

Short column

Wavelengths of Light and the Circadian Clock

The suprachiasmatic nucleus of the hypothalamus, the center of the biological (circadian) clock, is responsible for synchronizing the external and internal environment, mainly using light information for synchronization. The photosensitive retinal ganglion cells in the retina, as light receptor cells that regulate the circadian clock, were discovered in 2002⁶⁾. These cells contain a photosensitive pigment called melanopsin, which has a peak sensitivity to short-wavelength light around 460–480 nm. For this reason, it is known that blue light, which belongs to this wavelength range, has the most substantial effect on the circadian clock, even when its intensity is the same as those of light of other wavelengths⁷⁾.

2 Temperature-related factors to consider in setting an ideal sleep environment

- The core temperature of the human body (the temperature inside the body, including the brain and organs, not the skin temperature) fluctuates in a 24-hour cycle, rising during the day when we are awake and falling during the night when we sleep⁸⁾. When the blood flow in the limbs increases before sleep, the body temperature dissipates externally, and the core body temperature begins to decrease, making it easier to fall asleep⁹⁾. It is important to adjust the timing of bathing to set an optimal environment that facilitates smooth fluctuations in body temperature during sleep to achieve a good night's sleep.
- Bathing before bedtime is believed to promote heat dissipation by dilating the peripheral vessels in the limbs. In some experimental studies, warming up the body before bedtime shortened sleep onset latency (time from bedtime to falling asleep)¹⁰⁾. In a study of older adults with insomnia conducted in Japan, bathing before bedtime helped the participants fall asleep more quickly¹¹⁾. In addition, a study conducted in real-world situations indicated that bathing approximately 1 to 2 hours before bedtime shortens sleep onset latency compared to not bathing¹²⁾.
- A real-world study demonstrated that increased room temperatures in summer bedrooms shorten sleep duration and reduce sleep efficiency¹³⁾. It

is important to keep bedrooms cool in the summer using air conditioning. Few reports have shown that sleep worsens when bedroom temperatures decrease in winter; however, it is believed that the effect on sleep is minimal if the bed is kept warm using adequate comforters.

- Maintaining optimal temperatures in winter is important from the perspective of preventing heart disease and stroke. Sudden exposure to cold when going to the bathroom at night or waking up early in the morning can cause a sudden increase in blood pressure, which may lead to the onset of stroke or myocardial infarction¹⁴⁾. The WHO Housing and Health guidelines recommend maintaining a room temperature of at least 18°C in the winter¹⁵⁾.
- A survey conducted in winter showed that sleep onset latency is prolonged when the temperature in the room where one spends time before bedtime is low¹⁶⁾. Thus, it is also important to spend as much time as possible in a warm room before bedtime during winter.

3 Noise-related factors to consider in setting an ideal sleep environment

- A large international survey on the real-world effects of noise from roads, railroads, and aircraft on subjective sleep revealed that noise is associated with subjective sleep disturbances¹⁷. Furthermore, in a recent study, noise inside the bedroom was significantly associated with lower sleep efficiency, longer sleep onset latency, and wake after sleep onset, measured using actigraphy (an ultracompact and precise accelerometer)¹⁸. These findings suggest the importance of maintaining a quiet sleep environment.
- Experimental studies in which participants were exposed to noise during sleep have demonstrated that noise increases the frequency of awakening

and disrupts deep sleep¹⁹. However, the results of some studies indicated that the effects of noise on sleep decrease with habituation, suggesting that the impact of noise on sleep may have been overestimated in these studies.

- As sensitivity to noise varies from person to person, and from the perspective of protecting the health of children, older adults, and people with illnesses who are more susceptible to noise, the European WHO guidelines recommend that outdoor noise at night should be kept below 40 dB²⁰. If you are concerned about outdoor noise, it may be helpful to install windows and walls with adequate soundproofing.

4 FAQs

Q. What are some key lighting-related points to consider when setting an ideal environment for a good night's sleep?

- A.** It is important to consider "brightness (illuminance)," "wavelength (blue light)," and "time of day" when setting up your environment. Sufficient exposure to bright light during the day and avoiding bright light, including blue light, as much as possible before bedtime, will promote good sleep. However, as the tendency to go to bed and get up early increases with age, older adults who have trouble falling asleep early should apply these measure with caution as early morning exposure to sunlight may further strengthen their morning chronotype²¹.

Q. LEDs can change the color of light. Is it safe to turn them on at night if they are dimmed to a warmer color?

- A.** Most LEDs have blue light-emitting diodes, which contain a large amount of short-wavelength light (blue light) even when the light is dimmed. Thus, when used LEDs at night, it is necessary to adjust the light so that it is not overly bright. In addition, you should try to turn off the lights when you fall asleep.

Q. I heard that children are more sensitive to light. Is that true?

- A.** As we age, the lens of the eye become cloudy and white. It has been reported that the light transmittance of the lens in teenagers is almost five times higher than that of a 70-year-old who has not been diagnosed with cataracts. Thus, the effects of light are believed to be greater in younger people²².

Q. Which one affects the eyes more in terms of light, computers or smartphones?

- A.** Although this depends on the settings of the devices, smartphones are generally viewed directly with the screen at closer distance²³. Therefore, the amount of light entering the eye during smartphone use tends to be higher than that during PC use.

Q. My body becomes cold in the winter, so I try to soak in a hot bath for a long time.

- A.** Bathing approximately 1–2 hours before bedtime promotes heat dissipation after bathing, which can promote falling asleep. However, if the water temperature is extremely high, sympathetic nerve activity may increase, which in turn may disturb sleep.

Q. As I am not aware of any sounds while sleeping, does noise still affect my sleep?

- A.** It has been shown that auditory stimuli are transmitted to the brain even during sleep and may affect the autonomic nervous system and hormone secretion²⁴. Moreover, noise-induced stress is associated with the development of hypertension, cardiovascular diseases, and sleep disorders^{25,26}.

Q. I live along an arterial road, and the noise and lights from cars filter into my room at night. I feel like I do not sleep well. Do noise and lighting affect sleep?

- A.** Replacing curtains with soundproof and light-shielding alternatives and moving your sleeping position as far away from the window as possible could improve your sleep. Other effective measures include adjusting the temperature, humidity, and lighting intensity in the bedroom.

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INFORMATION 2

Lifestyle Habits, such as Exercise and Diet, and Sleep

Points

- Developing a moderate exercise routine promotes good nighttime sleep.
- Eating breakfast and refraining from eating snacks just before bedtime helps regulate the circadian clock and sleep–wake rhythm.
- Relaxing before bedtime, avoiding forcing yourself to sleep, and going to bed when you feel sleepy makes it easier to fall asleep.
- Sleep quality is enhanced by a regular lifestyle that balances daytime activity and nighttime sleep.

1 Develop a moderate exercise routine

- As sleep plays a role in the recovery of physical functions, which are depleted by daytime activities, the quantity and intensity of physical activity engaged in during the day influence the quantity and quality of sleep. It has been reported that people who do not have regular exercise habits experience reduced sleep restfulness (feeling rested after sleep)¹⁾. Therefore, engaging in moderate exercise habits and other physical activities during the day can increase sleep duration and improve sleep quality by promoting sleep onset and reducing awakening after sleep onset²⁾. The effects of physical activities vary depending on their type, intensity, duration, timing, and frequency. In addition, the total amount of daily physical activity (lifestyle activities and exercise) and age also affect sleep.

Types of exercise

- Aerobic exercise, such as walking and jogging, facilitates sleep initiation^{3,4)}, promotes deep sleep, increases sleep duration, and enhances sleep restfulness^{3,5)}. Strength training, such as exercises performed with dumbbells, has also been reported to effectively improve sleep⁶⁾.

Table 1. Classification of physical activity

Daily activity	Exercises
Activities of daily living such as labor, housework, and commuting to and from work or school Housework such as shopping, laundry, cleaning, dog walking, babysitting, and work-related activities such as commuting, climbing stairs, carrying packages, and farm work	Activities that are planned and performed deliberately to improve and maintain physical fitness Aerobic exercise such as walking, aerobics, jogging, cycling, tai chi, yoga, sports, strength training, and leisure-time walking

Intensity and duration of exercise

- Moderate-to-high intensity exercise improves subjective sleep quality, sleep-onset latency, sleep duration, and sleep efficiency⁷⁾. Moderate-intensity exercise, such as outdoor walking, light strength training, or vacuuming, is just enough to make one breathless and sweaty⁷⁾. In contrast, high-intensity exercise can interfere with sleep and increase the risk of injury. Therefore, it is recommended to start with light exercise that is not too strenuous, depending on age and physical condition, and gradually increase the intensity of the exercise.
- From the perspective of promoting health and maintaining and improving sleep, it is ideal to form a habit of achieving approximately 60 minutes of physical activity a day. However, one should not give up due to lack of time to exercise for 60 minutes in one go. First, establish a regular routine of exercising for less than 60 minutes a day, and then gradually increase the amount of time you exercise (see “Physical Activity Guide for Health Promotion 2023”).

Table 2. Intensity and type of physical activities⁷⁾

Intensity	Type
Low	Walking in the house, stretching, yoga, storing laundry, shopping, watering plants
Moderate	Walking at a quick pace, light strength training, walking underwater, tai chi, power yoga, pilates, vacuuming, car washing
High	Jogging, swimming, aerobics, playing soccer, mountain climbing

Timing and frequency of exercise

- Sleep is closely related to core body temperature rhythms. After the core body temperature increases during exercise, blood circulation increases throughout the body and heat dissipation is promoted, leading to a decrease in core body temperature⁸⁾. The key to improving sleep is to take advantage of this mechanism of decreasing core body temperature. Regarding the timing of exercise, exercising during the day helps ensure adequate physical activity while avoiding prolonged arousal right before bedtime. Even exercising in the evening or nighttime (up to approximately 2–4 hours before bedtime) can effectively improve sleep⁹⁾. Exercise is more effective when done multiple times a week than when done once a week. The first step is to establish a routine exercise program.

Recommendation for age groups, pregnant women, and insomniacs

- Children should avoid prolonged sitting for long periods and engage in daily outdoor play and moderate- to high-intensity physical activity as much as possible to reduce sleep deprivation, delayed bedtime, and waking after sleep onset^{10,11)}. The WHO and the health guidelines of various countries, including Japan, recommend at least 60 minutes of physical activity per day for children^{12,13)}, which is also beneficial for maintaining good sleep.
- For adults, engaging in moderate- or higher-intensity physical activity (e.g., aerobic exercise and strength training) as long as possible effectively improves sleep²⁾. Active physical activity during leisure can reduce the risk of insomnia¹⁴⁾.
- Moderate-to-vigorous aerobic exercise, strength training, and yoga, which involves moving the body while maintaining balance, can help improve sleep in older adults. Even if one exercises for less than 60 minutes a day, habitual exercise multiple times a week can shorten sleep onset latency²⁾, increase sleep duration²⁾, and improve subjective sleep quality¹⁵⁾.
- It has been reported that engaging in low- to moderate-intensity walking, maternity swimming, yoga, and other low-intensity activities that require low physical strain for 20–60 minutes per day, one to three times per week, can improve subjective sleep quality in pregnant women¹⁶⁾. However, it is important to consult a physician before developing an exercise routine during pregnancy.

- Exercises such as yoga have been reported to improve subjective sleep quality in menopausal women¹⁷.
- Aerobic exercise, yoga, and Pilates improve insomnia, whereas aerobic exercises and strength training can improve obstructive sleep apnea.

2 Eat breakfast and refrain from eating snacks just before bedtime

- Eating breakfast, as well as exposure to sunlight in the morning, helps regulate the circadian clock. Skipping breakfast for approximately one week can delay the circadian clock (sleeping and waking up later)²⁰ and may lead to sleep deprivation by impairing sleep initiation²¹. In addition, recent studies have shown that skipping breakfast is associated with decreased sleep restfulness²².
- It has been reported that eating a nighttime meal or snacks before bedtime, as well as skipping breakfast, can delay the circadian clock²³ and decrease sleep restfulness and subjective sleep quality²⁴. Furthermore, excessive consumption of meals and snacks at night has been reported to cause

Habitual moderate or high intensity exercise, including aerobic exercise, yoga, and Pilates, in addition to consultation with a physician, can increase sleep duration¹⁸ and improve subjective sleep quality in insomnia patients^{2,19}.

diabetes and obesity²⁵, and increase the risk of developing obstructive sleep apnea²⁶.

- Excess salt ingested during the day is excreted during sleep, which leads to increased frequency of nocturnal urination²⁷. Reducing daily salt intake can reduce nocturia²⁸ and decrease the frequency of awakening at night after sleep onset.
- For more information on the relationship between sleep and consumption of caffeine-containing beverages, such as coffee, tea, and energy drinks, see "Sleep and Intake of Caffeine, Alcohol, and Nicotine".

3 Relaxation before bedtime

- Relaxation and reduced brain arousal are important for facilitating sleep initiation²⁹. Therefore, it is beneficial to allow at least one hour of relaxation time, free from work and study, before going to bed³⁰. In addition, excessive focus on sleep duration or bedtime and attempting to force oneself to sleep when sleepiness has not yet occurred may increase brain arousal and disrupt sleep initiation³¹. Moreover, forcing sleep initiation, even when not sleepy, may lead to increased worrying about the inability to fall asleep or carrying over worries during the day into the nighttime, making it even more difficult to fall asleep. If you have trouble falling asleep, leave your bed for a while, stay in a quiet, dark, and comfortable place other than your bed until you feel sleepy, and then return to your bed³².
- Various relaxation methods have been proposed to promote falling asleep prior to bedtime³³. Not only clinical methods (autogenic training and imagery training) for treating insomnia, but also general meditation methods, silent yoga, abdominal breathing, progressive muscle relaxation techniques, music³⁴, and aromas³⁵ have been shown to promote falling

asleep and may enhance sleep quality^{34,35}. Notably, no relaxation method is guaranteed to be effective for everyone. A method that is extremely effective for some people may increase arousal and disrupt sleep in others. Therefore, it is important to determine the optimal relaxation method for each individual.

- The effects of bathing on sleep are explained in "Setting an Ideal Environment for Good Sleep." Taking a slightly warm bath before going to bed warms up the whole body, improves blood circulation, improves subjective sleep quality, and promotes falling asleep more easily and sleeping more deeply³⁶. This is believed to result from bathing promoting heat dissipation from peripheral blood vessels in the hands and feet, which decreases the core body temperature and facilitates sleep³⁶, as well as the relaxation effect of the parasympathetic nervous system, which becomes dominant in the autonomic nervous system^{37,38} and relieves strain on the mind and body.

4 A regular daily lifestyle, and good balance between daytime activity and nighttime sleep, improves sleep quality

- The first step ensuring good nighttime sleep is to maintain a regular lifestyle. A regular lifestyle not only improves subjective sleep quality³⁹, but also daytime sleepiness⁴⁰. On the other hand, lifestyle disruptions such as night owl habits, irregular bedtimes, and irregular mealtimes cause sleep deprivation, delay, disrupt the circadian clock⁴¹, and reduce subjective sleep quality²⁴. In addition, it has been reported that an irregular lifestyle

may increase the risk of developing various mental disorders, including depression⁴², and all-cause mortality⁴³. Let's maintain a regular lifestyle, spend as much time as possible in a brightly lit environment during the day, and relax in a slightly dark environment at night to balance the sleep-wake rhythm throughout the day.

5 FAQs

Q. I usually go to the gym after work at night and work out; will it affect my sleep?

A. Strenuous exercise within an hour before bedtime can affect nighttime sleep⁴⁴. Exercising at the gym should be concluded 2-4 hours before bedtime, allowing for time to relax before going to bed.

Q. Can I get exercise just by walking to and from shops and doing housework?

A. Walking is a good aerobic exercise. However, it is recommended to get into the habit of walking slightly faster outside, not just moving indoors. Increasing overall physical activity levels, including daily activities such as shopping, laundry, and cleaning, will promote a good night's sleep⁴⁵.

Q. What type of exercise is most effective for improving sleep?

A. The most effective type of exercise for improving sleep has not yet been identified. Aerobic exercise, strength training, and yoga are all effective for improving sleep⁴⁶. Combining different types of exercises, while focusing on exercises that you enjoy and can do consistently, is recommended.

Q. My work/part-time job makes eat late dinners.

A. A late dinner interferes with sleep and leads to skipping breakfast, a vicious cycle that disrupts the sleep-wake rhythm²³. Dividing dinner into two portions⁴⁷ (eating a main meal such as rice balls in the evening and a light side dish later in the night) is reported to be less likely to disrupt the circadian clock and has a relatively small effect on nighttime sleep.

Q. Are there any dietary recommendations for improving sleep?

- A.** There have been several reports on dietary patterns and sleep quality⁴⁸⁾. The Mediterranean diet (consisting mainly of foods such as fish, vegetables, fruits, nuts, and legumes) has been presented a representative example in many studies. However, there are currently no specific foods that contribute to improving sleep quality. Therefore, establishing a well-balanced dietary pattern that incorporates a variety of foods, mainly staple meals, main dishes, and side dishes, is recommended to ensure optimal nutrient intake.

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Sleep and Intake of Caffeine, Alcohol, and Nicotine

Points

- Caffeine intake of over 400 mg daily (about 700 cc of coffee) could negatively affect nighttime sleep.
- Caffeine consumption later in the evening is likely to affect nighttime sleep.
- Heavy drinking in the evening or drinking alcohol to sleep (nightcap) may worsen sleep quality.
- Smoking (cigarettes, heated tobacco, and other nicotine-containing products) may worsen sleep quality.

1 Intake of stimulants that affect sleep

- Habitual intake of stimulants such as caffeine can affect sleep. Relaxation of the mind and body is an important factor in getting a good night's sleep; however, the consumption of stimulants, particularly in excessive amounts and inappropriate times, can worsen sleep and health¹⁻³.
- Here, we explain the effects of common stimulants that typically affect sleep: (1) caffeine, (2) alcohol, and (3) nicotine and introduce some measures for managing intake.

2 Caffeine

Total daily caffeine intake should not exceed 400 mg

- Caffeine has a stimulating effect that may worsen sleep, increase wake after sleep onset, and decrease sleep quality. Studies conducted using EEG to objectively evaluate sleep have indicated that an increase in the amount of caffeine consumed per day (in a dose-dependent manner)⁴ decreases deep sleep, increases awakening after sleep onset, decreases sleep efficiency, and decreases total sleep duration^{4,5}. Furthermore, caffeine has been reported to cause or aggravate sleep disorders, such as restless legs syndrome^{6,7} and sleep bruxism^{1,8}.
- The metabolism of caffeine varies from person to person. For Japanese people, the half-life of caffeine in the blood (the time it takes for the caffeine concentration in the blood to halve) varies from 3 to 7 hours⁹. When the half-life of caffeine is 5 hours, for example, 400 mg of caffeine at 9:00 am reduces to 200 mg by 2:00 pm, and 100 mg by 7:00 pm. Consumption of more than 100 mg of caffeine in the evening or later leads to difficulty falling asleep, decreases slow-wave sleep (deep sleep), and increases wake after sleep onset; therefore, consumption of more than 400 mg of caffeine at any point in the day (even in the morning⁴) is likely to have a negative effect on sleep^{10,11}. Four cups (700 mL) of drip coffee or 1.5 bottles (750 mL) of commercially available PET-bottled coffee contain 400 mg of caffeine.
- The US Food and Drug Administration (FDA), European Food Safety Authority (EFSA), and the Canadian government recommend an upper daily caffeine intake of 400 mg for adults¹².
- Many people consume caffeine to stay awake; however, chronic intake of caffeine can decrease its effectiveness and lead to dependence¹³. As

chronic sleep deprivation or sleep disorders can lead to daytime sleepiness, sleep duration, sleeping environments and lifestyle habits should be optimized to reduce daytime sleepiness. If daytime sleepiness persists, it is advisable to consult a physician.

Moderate caffeine intake in the evenings and later in the day

- In addition to the amount of caffeine consumed, the effect of caffeine on sleep depends on the time of consumption (timing). Based on the aforementioned half-life of caffeine in the blood, the consumption of 100 mg caffeine at 7 pm can have a negative impact on sleep because 50 mg of caffeine remains in the body at 12 am. A systematic review of adults aged 18 to 65 years indicated that caffeine intake in excess of 107 mg affects nighttime sleep, even when consumed approximately 9 hours before bedtime, whereas caffeine intake in excess of 217.5 mg affects nighttime sleep even when consumed approximately 13 hours before bedtime¹⁰.
- Reducing the total amount of caffeine consumed and refraining from consuming caffeine-containing foods and beverages after the evening is recommended for ensuring a good night's sleep. As the caffeine in tea is contained in the tea leaves (chanoki; *Camellia sinensis*), traditional tea may be replaced with barley tea, buckwheat tea, black bean tea, corn tea, or other caffeine-free herbal teas that do not contain tea leaves.

Children, older adults, and pregnant women should further reduce caffeine consumption

- In children, a caffeine intake of more than 1–3 mg/kg per day can adversely affect sleep (30–90 mg for a child weighing 30 kg)¹⁴. It is important to

Table 1. Caffeine Content in Beverages

Beverage	Caffeine Concentration	Notes
Coffee	60 mg/100 mL	Brewing method: 10 g ground coffee / 150 mL hot water ³⁶⁾
Instant Coffee (powdered product)	57 mg/100 mL	Brewing method: 2 g instant coffee / 140 mL hot water ³⁶⁾
Gyokuro (Japanese green tea)	160 mg/100 mL	Brewing method: 10 g tea leaves / 60 mL water at 60°C, 2.5 min ³⁶⁾
Black Tea	30 mg/100 mL	Brewing method: 5 g tea leaves / 360 mL water, 1.5–4 min ³⁶⁾
Sencha (Japanese green tea)	20 mg/100 mL	Brewing method: 10 g tea leaves / 430 mL water at 90°C, 1 min ³⁶⁾
Oolong Tea	20 mg/100 mL	Brewing method: 15 g tea leaves / 900 mL water at 90°C, 1 min ³⁶⁾
Energy Drinks or Sleepiness-reducing Beverages (carbonated or non-carbonated soft drinks)	32–300 mg/100 mL (equivalent to approx. 36–150 mg per bottle)	Caffeine concentration and volume vary depending on the product ^{4,31,36)}

note that children are affected by caffeine at lower levels of consumption than adults. Children may consume caffeine from tea, coffee, and cola beverages¹⁵; therefore, the caffeine content of these beverages should be carefully considered. In addition, it should be noted that the caffeine content of energy drinks varies from product to product, with some products containing nearly five times as much caffeine as coffee. Therefore, consumption of energy drinks should be minimized, and ideally limited to the morning.

3 Alcohol

Limit drinking in the evening and refrain from drinking in bed

- Alcohol (ethanol) temporarily promotes sleep and increases deep sleep during the first half of sleep. However, the quality of sleep in the second half is significantly worse and the frequency of wake after sleep onset increases with increase in the amount of alcohol consumed¹⁸.
- Alcohol is metabolized and converted into acetaldehyde. Acetaldehyde, which is the causative agent of hangovers, has strong sympathomimetic effects and increases levels of catecholamines (excitatory substances) in the blood that inhibit sleep^{19,20}.
- Alcohol exacerbates various sleep disorders, including obstructive sleep apnea²¹. Recent reports indicate that a decreased amount of REM sleep at night increases the risk of all-cause mortality²², but it has been suggested that consumption of alcohol in large amounts (>0.75 g/kg) can pose a long-term health risk because it markedly reduces REM sleep¹⁸. Therefore, alcohol should be consumed cautiously.

4 Nicotine

Try to quit smoking

- Nicotine contained in cigarettes has stimulant effects. Smoking before sleep leads to prolonged sleep onset latency (worsening of falling asleep), increased wakefulness after sleep onset, decreased sleep efficiency, and decreased deep sleep²⁷. In addition, as nicotine has a blood half-life of approximately 2 hours, its effects may persist until before sleep, even if the cigarettes were smoked in the evening.
- Habitual nicotine users have more severe difficulty falling asleep, wakefulness after sleep onset, decreased sleep duration, decreased deep sleep, and increased daytime sleepiness than nonsmokers²⁸. When habitual smokers abstain from cigarettes, they experience anxiety, depression, and

- The ability to metabolize caffeine declines with increasing age. Therefore, even small amounts of caffeine can affect sleep in older adults, just as in children.
- There is no strong evidence of the effect of caffeine intake during pregnancy on the fetus. However, several countries and academic societies recommend that caffeine intake during pregnancy should be avoided as much as possible because of potential risks such as inhibition of fetal growth^{16,17}.

- Individual differences in the ability to metabolize alcohol are influenced by the level of aldehyde-degrading enzyme (aldehyde dehydrogenase: ALDH) activities²³. People with low ALDH activity tend to have a red face after drinking. It is well known that Asians, including the Japanese, tend to exhibit lower ALDH activity than Westerners or people of African descent. Consumption of even a small amount of alcohol can have a strong impact on people with low ALDH activity.
- Alcohol dependence and tolerance can develop through continuous consumption. Withdrawal effects can lead to an inability to sleep well without alcohol^{24,25}. Therefore, consuming large amounts of alcohol (heavy drinking) or daily drinking, including the so-called "nightcap," are not recommended for good sleep²⁶. Notably, habitual nightcaps are also associated with poor sleep quality². Consultation with a physician is recommended if you have insomnia symptoms that may lead to the need for nightcaps.

insomnia owing to withdrawal symptoms²⁹. Hence, habitual smoking may lead to a state in which sleep worsens whether one smokes cigarettes or not. Therefore, smoking should be avoided to improve sleep quality.

- Heated and electronic cigarettes have become popular in recent years. It should be noted that these products that contain nicotine may have similar effects on sleep as traditional cigarettes.
- Passive smoking is known to affect sleep in the same way as active smoking, with particularly strong negative effects on the sleep of pregnant women and children³⁰. Therefore, it is important to avoid smoking to protect the sleep and health of people living with you.

5 FAQs

Q. I can drink coffee at night and still sleep fine. Does caffeine affect my sleep?

- A.** The ability to metabolize caffeine varies widely among individuals^{31,32}, ranging from those in whom even small amounts affect sleep to those in whom large amounts have little effect. Even when caffeine intake does not affect sleep initiation, many people experience shortened sleep duration and decreased deep sleep. Therefore, caution should be exercised in caffeine consumption.

Q. I often drink alcohol at night for work-related reasons, but I have never had trouble sleeping. Can I continue drinking?

- A.** Much of the alcohol and acetaldehyde in light drinking can be metabolized before sleep. However, heavy drinking has a high rate of adverse effects on sleep quality. In addition, there are sex-specific and individual differences in the ability to metabolize alcohol^{23,33,34}. Furthermore, the ability to metabolize alcohol declines with age³⁵. Therefore, excessive consumption of alcohol should be avoided.

Q. I sleep after drinking alcohol every night, but when I stop, I cannot sleep. What should I do?

- A.** Drinking alcohol to sleep (nightcap) has a strong negative effect on sleep. If one continues to drink in bed every night, abrupt cessation may result in insomnia due to withdrawal or other factors. It is advisable to gradually reduce the amount of alcohol consumed on a weekly basis, or abstain from alcohol while seeking medical advice.

Q. I heard that cola beverages contain caffeine.

- A.** Typical beverages that contain caffeine include coffee, black tea, green tea, oolong tea, cola drinks, energy drinks, and some soft drinks. Children are more sensitive to caffeine and more care should be taken with their caffeine intake than adults. For example, Health Canada limits caffeine intake to a maximum of 45 mg per day for 4–6 year-olds and no more than 2.5 mg/kg of caffeine per day for young persons aged 13 years or older³⁶. Do not consume too many caffeinated beverages throughout the day, not just at night. Some energy drinks that have recently become popular contain nearly five times more caffeine than coffee. Therefore, consumption of decaffeinated barley tea and water is a better option.

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About Sleep Disorders

Points

- Sleep-related symptoms can be caused by "sleep environment, lifestyle, and intake of stimulants such as caffeine, alcohol, and nicotine" or by "sleep disorders".
- Sleep-related symptoms caused by the sleep environment, lifestyle, and intake of stimulants may be improved by implementing the recommendations in this guide.
- If sleep-related symptoms persist after applying these recommendations, a sleep disorder could be suspected.
- Seek medical attention immediately if you suspect a sleep disorder.

1 Sleep disorders associated with sleep deprivation and decreased sleep restfulness

- Sleep-related symptoms, such as difficulty falling asleep or frequent awakening after sleep onset (insomnia symptoms), non-restorative sleep (decreased sleep restfulness), daytime sleepiness, or catnaps (hypersomnolence), could be caused by "sleep environment, lifestyle, and intake of stimulants" or by "sleep disorders." If the former is the cause, the sleep-related symptoms can be improved by implementing the recommendations described in this guide and correcting the abovementioned habits that may affect sleep.
- If these corrective measures do not improve sleep-related symptoms, sleep disorders could be the cause of the symptoms. If these symptoms, such as

inability to get sufficient sleep, not feeling rested after sleeping, or feeling sleepy during the day, persist and seriously affect daily life, even after applying the tips in this guide, you should consult a doctor immediately.

- The "About Sleep Disorders" section provides an overview of typical sleep disorders that present with symptoms such as (1) shortened sleep duration, (2) decreased sleep restfulness, (3) daytime sleepiness and catnaps, and (4) inability to fall asleep and get up at socially desirable times (e.g., inability to get up in the morning or getting up too early in the morning). It also includes advises for patients with various sleep disorders when using this guide.

2 Sleep-related symptoms and sleep disorders

Shortening of sleep duration

- Shortened sleep duration means that an individual's sleep duration is significantly shorter than before and shorter than the standard sleep duration, even though he/she has adequate opportunities to sleep. Insomnia is a representative sleep disorder characterized by shortened sleep duration¹⁾.
- Other conditions, such as restless legs syndrome, periodic limb movement disorder, and obstructive sleep apnea, may also shorten sleep duration. Restless legs syndrome is a condition that causes discomfort in the extremities (especially the lower limbs) during rest, which interferes with falling asleep (presenting as difficulty falling asleep)¹⁾. It is often misdiagnosed as insomnia of the "difficulty-initiating-sleep" type. Periodic limb movement disorder is a disease characterized by repetitive involuntary movements of the extremities (especially the lower limbs) during sleep, causing micro-awakenings¹⁾. Periodic limb movement disorder has few subjective symptoms; however, as the symptoms progress, daytime fatigue and sleepiness may lead to poor sleep or be misinterpreted as a "difficulty-maintaining-sleep" type of insomnia. Obstructive sleep apnea is a respiratory failure caused by repeated upper airway obstruction during sleep, followed by an arousal response resulting in frequent micro-awakenings¹⁾. Obstructive sleep apnea may also be misdiagnosed as "difficulty-maintaining-sleep" type of insomnia, as well as periodic limb movement disorder.

by increased waking after sleep onset, decreased sleep efficiency, and shortened sleep duration³⁾. Other factors such as daytime sleepiness⁴⁾ and depressive symptoms^{3,5,7)} have also been associated with decreased sleep restfulness. These complex factors are believed to contribute to decreased sleep restfulness.

Daytime sleepiness and catnaps

- Common sleep disorders primarily characterized by daytime sleepiness or catnaps include insufficient sleep syndrome, obstructive sleep apnea, periodic limb movement disorder, and hypersomnia⁸⁾. Insufficient sleep syndrome results in sleep deprivation and sleepiness owing to inadequate opportunities for sleep¹⁾. Obstructive sleep apnea and periodic limb movement disorder manifest as sleepiness or catnaps as a result of unmet sleep needs during the day due to insufficient rest from nighttime sleep, despite having adequate opportunities for sleep⁸⁾. In hypersomnia, sleepiness or catnaps occur during the day, despite the fact that nighttime sleep performs its resting function to some extent¹⁾.
- The sleepiness that occurs during the day in many sleep disorders is usually chronic and persistent. However, sudden catnaps may occur in cases of severe obstructive sleep apnea⁹⁾. In addition, narcolepsy, a hypersomnia disorder, can cause sudden episodes of strong sleepiness and catnaps; however, recovery occurs within a very short time (within a few minutes), with the sleepiness having apparently disappeared¹⁾.

Decreased sleep restfulness

- Sleep disorders that typically decrease sleep restfulness include insomnia²⁻⁴⁾, insufficient sleep syndrome⁵⁾, obstructive sleep apnea^{5,6)}, and restless leg syndrome⁶⁾. In any of these sleep disorders, a decreased sleep restfulness is thought to reflect an inability to get sufficient rest from sleep, as indicated

Others

- An individual who is unable to fall asleep and wake up at socially desirable times may have sleep disorders, such as delayed sleep-wake phase disorder and advanced sleep-wake phase disorder¹⁾. Delayed sleep-wake phase disorder is often seen in adolescents and young adults. Falling asleep

extremely late and waking up late can lead to disruptions in social life, such as being late for school or work¹¹. Advanced sleep-wake phase disorder is more common in older adults and is characterized by extremely early sleeping and waking¹¹. Sleepiness occurs in the evening or early evening,

with the affected individual waking up at midnight or early in the morning. In addition, the individual's daily sleep-wake rhythm does not match those of his/her family members.

3 Various sleep disorders

Insomnia

- Insomnia is a condition in which, despite having adequate opportunity and environment for sleep, symptoms such as difficulty falling asleep, waking up several times in the night (frequent awakening after sleep onset), and waking up too early in the morning occur, causing problems in daily life (fatigue, impaired concentration, daytime sleepiness, decreased work efficiency and academic performance, and strong anxiety about sleeping)¹¹.
- As insomnia persists, the affected individual gradually becomes anxious and nervous about the inability to sleep, fearful of the bedroom, and obsessive about sleeping¹⁰. People with insomnia often try to sleep by staying in bed longer; however, even if they change their sleeping patterns, there is a limit to the amount how long they can sleep in a night, and getting into bed early does not always help them fall asleep quickly. This leads to a vicious cycle of less efficient sleep, more time spent in bed without sleeping, further aggravation of insomnia symptoms, and resulting distress¹⁰.
- Insomnia often presents an initial symptom or comorbidity of various mental disorders, including depression and anxiety¹¹. In patients with comorbid psychiatric disorders, treatment focused solely on insomnia often does not provide sufficient improvement. Thus, consultation with a physician is recommended to prevent the worsening of comorbid mental disorders.

★Points to keep in mind when using this guide

Patients with insomnia often estimate their subjective sleep duration to be shorter than their actual sleep duration (objective sleep duration)¹². Objective sleep duration cannot be measured without devices (e.g., EEG, actigraphy, wearable devices). If subjective sleep duration is much shorter than objective sleep duration, sleep can be compressed by adjusting waking time and bedtime and shortening the time spent in bed. This will make it easier to fall and stay asleep¹³.

If insomnia symptoms, decreased sleep restfulness, daytime sleepiness, and difficulties in daily living due to these symptoms do not improve after practicing this guide, you should consult a medical professional.

Obstructive sleep apnea

- Sleep apnea is a sleep disorder characterized by cessation of breathing during sleep. It can be divided into two types: obstructive sleep apnea, which is typically accompanied by an increased effort to breathe (breathing with large movements of the thorax due to breathing difficulties) during apnea, usually results in snoring; and central sleep apnea, which is not accompanied by increased breathing efforts during apnea. The most common type of sleep apnea is obstructive sleep apnea¹⁴; however, central sleep apnea is frequently associated with heart failure, atrial fibrillation, and stroke¹⁵.
- In obstructive sleep apnea, the airway narrows during sleep, making breathing difficult or pausing it entirely, resulting in a lack of oxygen in the blood. The lack of oxygen causes an arousal response to resume breathing; however, breathing stops again when the patient falls asleep again. In obstructive sleep apnea, these episodes occur repeatedly throughout the night. As a result, actual deep sleep duration drastically decreases, and symptoms such as daytime sleepiness, catnaps, non-restorative sleep, and insomnia occur¹⁶.
- Obesity is the greatest risk factor for the development of obstructive sleep apnea. Therefore, it is important to prevent and improve obesity to

ensure good sleep¹⁷. However, physical characteristics such as a small mandible, mandibular retrusion, or a short neck can also cause obstructive sleep apnea, even if the patient is not obese. Therefore, the possibility of developing obstructive sleep apnea cannot necessarily be ruled out just because the patient is not obese. Obstructive sleep apnea can also trigger cardiovascular diseases such as hypertension, stroke, myocardial infarction, and heart failure, as well as metabolic diseases such as diabetes. The frequency of obstructive sleep apnea in patients with these diseases is high, and even higher among the patients with obesity¹⁸. The prevalence of obstructive sleep apnea is higher in men, but in women, its prevalence increases rapidly after menopause¹⁹. Although this is believed to be related to the accelerated decrease in female hormone secretion after menopause¹⁹, several factors involved in the relationship between menopause and sleep apnea remain unclear²⁰.

★Points to keep in mind when using this guide

If obstructive sleep apnea is not being treated with continuous positive airway pressure (CPAP) or other therapies, alcohol consumption and hypnotics classified as benzodiazepine receptor agonists could worsen it; therefore, it is generally recommended to avoid using these²¹. Even if CPAP is being administered, alcohol can negatively affect sleep and should not be consumed in cases of insomnia, decreased sleep restfulness, or daytime sleepiness.

People with obstructive sleep apnea may overestimate their sleep. Therefore, even if they feel they have slept for a sufficient amount of time, their actual sleep duration could be short or their sleep may be not deep enough^{12,22,23}. In addition, as sleepiness is habitual, awareness of sleepiness may be difficult for people with obstructive sleep apnea. Therefore, even if you are getting adequate hours of sleep, consult your physician if you experience a decreased sleep restfulness or persistent daytime sleepiness that interferes with your daily activities.

Restless legs syndrome and periodic limb movement disorder

- Restless legs syndrome causes uncomfortable sensations in the extremities (mainly in the lower limbs) at rest, such as itching, burning, tingling, or a "creepy-crawly" feeling, all of which make the individual feel the urge to move the limbs^{1,24}. It is characterized by a diurnal variation in symptoms, with symptoms being more severe in the evening and at night. Symptoms are alleviated by moving the extremities or applying sensory stimulation to the site of the unpleasant sensation; however, symptoms reappear when movement or stimulation is stopped¹. This causes insomnia symptoms, typically difficulty falling asleep, because the patient cannot sleep well despite feeling sleepy.
- Periodic limb movement disorder causes repetitive jerking (involuntary movements) of the muscles in the limbs (mainly the lower limbs) during sleep, which increases micro-awakenings at night and interferes with deep sleep. Periodic limb movement disorder is known to be strongly associated with restless legs syndrome²⁴.

★Points to keep in mind when using this guide

Caffeine, alcohol, and nicotine can aggravate restless legs syndrome and should be avoided as much as possible²⁵. Habitual moderate exercise, moderate walking before bedtime, and warm baths or cold showers may

sometimes be helpful^{25,26}. If the symptoms, including difficulty falling asleep, abnormal sensations in the extremities (mainly in the lower limbs), or need to move, persist applying the recommendations in this guide, or if sleep is disturbed by involuntary movements of the lower limbs at night, consult a physician.

Insufficient sleep syndrome

- Insufficient sleep syndrome is chronic sleep deprivation that results in daytime sleepiness and catnaps. Individuals require different amounts of sleep for various reasons. People who need long sleep may develop insufficient sleep syndrome even if they get 6–8 hours of sleep each day. They usually wake up using an alarm clock or by having someone else wake them up. Without these measures, most will sleep longer than usual.

★Points to keep in mind when using this guide

Apply the recommendations in this and ensure you get enough sleep. Sleep deprivation may not resolve in a few days. If symptoms do not improve, consult a physician.

Hypersomnia (narcolepsy, idiopathic hypersomnia)

- Hypersomnia is characterized by excessive daytime sleepiness despite the absence of sleep deprivation or a condition/illness that disrupts sleep²⁷. Narcolepsy is sometimes accompanied by cataplexy, which involves sudden and brief muscle weakness triggered by strong emotions such as loud laughter¹. Specifically, the head may drop slightly without any strength in the neck, speech may become slurred, or the entire body may lose strength and the individual may collapse.

★Points to keep in mind when using this guide

Although medication is the main treatment for hypersomnia, it is also important to get a sufficient amount of sleep. If daytime sleepiness persists even applying the recommendations in this guide and getting sufficient sleep, consult a physician.

Circadian rhythm sleep–wake disorders

- Circadian rhythm sleep–wake disorders interferes with social life due to a

Short column

Chronic diseases associated with pain (including cancer)

Most people with chronic pain in any part of the body also experience sleep problems. In a study at a pain treatment center of 121 patients (32 men and 89 women, age range = 18–65 years old, average age = 49±9 years) who had been in pain for more than 3 months, 38.8% required more than 30 minutes to fall asleep, 63.6% woke up frequently in the night, 30.6% slept for less than 5 hours, and 60.3% did not feel rested³⁰. Chronic pain worsens sleep, and the worsened sleep has a negative effect on pain, suggesting a bidirectional relationship between pain and sleep³¹. Although following the recommendations in this guide may help alleviate

mismatch between the socially desirable timing of sleeping and waking and the actual timing of them^{1,28}. Abnormalities in sleep–wake timing occur when the circadian clock does not match the day–night or light–dark cycle (e.g., delayed sleep–wake phase disorder, advanced sleep–wake phase disorder) or when sleep–wake timing is artificially shifted due to shift work (repeated day and night shifts) or travel across time zones.

- Delayed sleep–wake phase disorder is common in adolescents and young adults, and is characterized by extremely late sleeping and waking²⁸. People with this disorder are unable to fall asleep when they should be asleep and also unable to wake up when they should be awake, which makes showing up for school or work on time difficult. Even if they force themselves to get up, they experience physical and mental symptoms such as severe sleepiness and fatigue.
- Advanced sleep–wake phase disorder is more common in older adults and is characterized by extremely early sleeping and waking²⁸. Sleepiness occurs in the evening or early evening hours, and the individual wakes up at midnight or early in the morning. As affected persons are unable to participate in after-dinner gatherings and typically wake up in the morning while their family members are still asleep, many are distressed by the discrepancy between their lives and those of their families and friends.
- Delayed sleep–wake phase disorder is often misdiagnosed as insomnia because of the characteristic severe difficulty in falling asleep. Advanced sleep–wake phase disorder may also misdiagnosed as insomnia because of severe early morning awakenings²⁸.

★Points to keep in mind when using this (Delayed sleep–wake phase disorder)

It is important to get enough sunlight in the morning. If the individual cannot get up in the morning, family members should open the curtains to let in as much sunlight as possible²⁹. In severe cases, the individual may fall asleep at dawn and wake up around dusk. In such cases, exposure to light during this time should be avoided, as the dawn light may further delay falling asleep²⁹. If symptoms do not improve, consult a physician.

★Points to keep in mind when using this (Advanced sleep–wake phase disorder)

Exposure to bright light in the evening and at night and wearing sunglasses to avoid early morning light may be helpful²⁹.

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INFORMATION 5

Pregnancy, Parenting, Menopause, and Good Sleep

Points

- Sleep is affected by the menstrual cycle.
- Sleep patterns change over the course of pregnancy and may affect the health of the fetus.
- Sleep during child-rearing years is also important for improving and maintaining health.
- Sleep problems tend to increase during menopause.

1 Menstrual cycle-related sleep changes

- After menarche, the female body begins to prepare for pregnancy approximately every month, in a process known as the menstrual cycle. Progesterone and estrogen, the primary female sex hormones that regulate and maintain the menstrual cycle, potentially affect sleep.
- Sleep changes related to the menstrual cycle are commonly experienced by most women¹⁾. The figure shows the relationship between the menstrual cycle and blood concentrations of each primary female sex hormone. Compared with the estrogen-dominant follicular phase, the progesterone-dominant luteal phase is associated with poor sleep and increased daytime sleepiness²⁾. This tendency is more pronounced in women, especially those who tend to experience physical and mental discomfort before menstruation¹⁾. In addition, restless legs syndrome is more likely to occur or worsen, and sleep may be disturbed in cases of severe iron deficiency due to heavy menstrual bleeding³⁾.
- To address these sleep problems, it is helpful to record your menstrual cycle to identify when you are most likely to experience sleep changes. Adjusting

the daily sleep environment, lifestyle, and intake of alcohol, caffeine, and nicotine could alleviate sleep problems associated with the menstrual cycle. Menstruating women should consider taking iron to prevent restless legs syndrome⁴⁾, a sleep disorder characterized by restless legs and discomfort during rest, which disturb sleep (see "About Sleep Disorders").

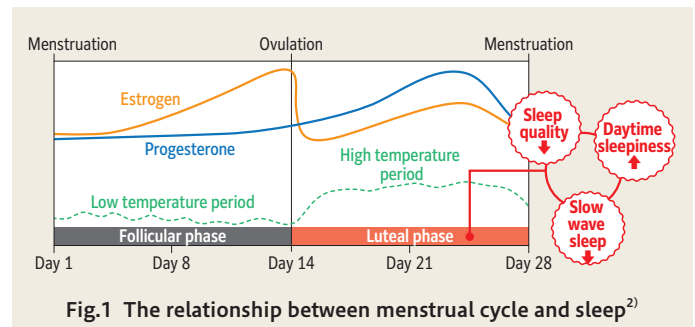


Fig.1 The relationship between menstrual cycle and sleep²⁾

2 Sleep variability during pregnancy and its effects on the fetus

- Pregnancy causes significant changes in hormone secretion patterns. In particular, the secretion of estrogen and progesterone temporarily declines in early pregnancy, subsequently increasing as the pregnancy progresses. These hormonal variations may disrupt sleep in early pregnancy⁵⁾. In addition, hyperemesis gravidarum and other pregnancy-related concerns during the first trimester can affect sleep. Sleep temporarily stabilizes in the second trimester (14–27 weeks of gestation); however, as the fetus grows and fetal movements increase toward the end of the second trimester, sleep becomes poorer and awakening after sleep onset becomes more frequent⁶⁾. In the third trimester (from 28 weeks of gestation), discomfort in the legs (restless legs syndrome), leg cramps in the calf muscles, and obstructive sleep apnea are more likely to occur.
- Approximately 80% of women experience sleep disturbances and the

accompanying daytime sleepiness, fatigue, irritability, and difficulty in concentration throughout pregnancy⁷⁾. Sleep duration during pregnancy tends to be longer than that before pregnancy owing to poor sleep and decreased sleep restfulness⁵⁾. Pregnant women should be aware of significant changes in hormonal secretion during pregnancy and their effects on sleep. These changes are normal, and it is important for women to manage them by engaging in relaxing activities such as going for walks, stretching, and finding a comfortable sleeping position as their fetus grows⁷⁾.

- Poor sleep quality due to sleep deprivation or sleep disorders (e.g., obstructive sleep apnea) during pregnancy can pose a health risk to the fetus⁸⁾. Pregnant women are encouraged to get sufficient sleep and to prevent sleep disorders for a safe delivery and good health of their babies.

3 Sleep and its impact on health during child-rearing years

- Newborn babies sleep and wake up several times every few hours⁹⁾. Feeding and dealing with night-time crying can also affect caregivers' sleep patterns. Getting sufficient sleep is important for maintaining the physical and mental health of caregivers.
- Newborns, who sleep and wake every few hours, gradually sleep longer at night and stay awake longer during the day a few weeks after birth, approaching the sleep-wake rhythm of adults⁹⁾. To establish a sleep-wake rhythm, the baby's room should be darkened at night, and curtains should be opened in the morning to let natural light into the room. Nighttime

crying can make it difficult for caregivers to get sufficient sleep. Research conducted in the US has indicated that nighttime crying decreases and the frequency of babies sleeping through the night without waking up increases when parents wait for a while without responding to their cries¹⁰⁾. In Japan, it is common for caregivers to pick up a crying baby and soothe them. It may be beneficial to take a short break if the baby does not fall asleep easily, even after soothing; however, this may be difficult owing to housing conditions.

- Until the baby is about one year old and can roll over by him/herself, avoid

using bedding that is too soft. In addition, ensure that the baby is lying on their back when putting him/her to sleep. There have been reports of sudden infant death syndrome, which refers to infants who have no previous history of suffocation or illness suddenly dying during sleep without warning¹¹. The abovementioned measures are recommended for preventing sudden death syndrome¹². Smoking by caregivers is also reported to be a risk factor for sudden death syndrome; therefore, caregivers should avoid smoking^{11,12}.

- It has been reported that 10 to 20% of women experience postpartum depression¹³. Particularly, those who experience significant sleep deprivation and frequent nighttime awakenings have an increased risk for postpartum depression¹³. Recently, fathers, as well as mothers, are now more involved in childcare. This involvement has been shown to be

Short column

Ensuring good sleep for children and caregivers

The sleep pattern of children matures progressively in accordance with their physical and mental growth, and the maturation process being generally complete in late adolescence. Sleep is often unstable from birth to infancy, and various sleep problems are likely to occur, which may affect child's physical and mental growth. In addition, caregivers' sleep tends to be disturbed as a result of coping with and worrying about their children's

beneficial to the health of both the mother and baby¹³.

- From infancy to elementary school age, children are prone to sleep problems, such as sleepwalking and sleep enuresis, which often cause concern among caregivers¹⁴. In most cases, sleep instability and sleep-related symptoms often appear temporarily during the process of sleep maturation and spontaneously disappear with age¹⁴. For example, the incidence of confusional arousal is 17% at age 3-13 but approximately 3% at age 15 years or older. Moreover, sleepwalking is reported to peak at 8-12 years of age¹¹. However, because such sleep symptoms increase when sleep duration is extremely short or lifestyle is irregular¹⁴, it is advisable to maintain a regular and secure sleeping environment and ensure that children get sufficient sleep.

unstable sleep.

In Japan, a Sleep-related questionnaire was added to the Maternal and Child Health Handbook in 2023 to understand and appropriately address the sleep-related concerns of children and caregivers. Further enhancement of health services is expected with this development.

4 Menopause and promoting good sleep

- The five years before and after menopause (the average age of menopause in Japan is approximately 50 years) is referred to as climacterium. The risks of insomnia and obstructive sleep apnea increase during this period. This is thought to be related to a decrease in female sex hormones; however, the underlying mechanism has not been fully elucidated (see "About Sleep Disorders"). Severe vasomotor symptoms such as "hot flashes," a common symptom during menopause, can significantly disrupt deep sleep and cause sleep fragmentation (frequent awakening during sleep)^{15,16}.
- In men, the secretion of androgen, a male sex hormone, decreases during climacterium¹⁷. Although there is insufficient evidence to suggest that

decreased androgen levels directly impair sleep, insomnia and other sleep disorders increase during this period. It has been reported that decreased secretion of androgens may contribute to depression¹⁸, which is associated with the occurrence of insomnia symptoms.

- Insomnia symptoms that occur during climacterium may be improved or alleviated by treatment of other related symptoms. Hormone replacement therapy for the management of typical vasomotor symptoms of menopause may help reduce sleep symptoms in women. However, there is some concern that the therapy may increase the risk of certain cancers and coronary artery disease; therefore, consultation with a physician is crucial¹⁵.

5 FAQs

Q. I have severe cramps (menstrual pain) and cannot sleep. Are there any countermeasures for this?

- A.** Cramps are known to adversely affect sleep. Therefore, pain relief can help alleviate insomnia symptoms¹⁹. Consult your doctor for appropriate treatment of cramps.

Q. Since I became pregnant, I have started snoring. Is this okay?

- A.** Pregnant women snore more than nonpregnant women, and the proportion of habitual snorers increases over the course of pregnancy⁵. The increased secretion of estrogen and progesterone during pregnancy facilitate swelling of the airways with an increase in fat deposition, which can narrow the pharynx²⁰. If snoring is loud and frequent or if respiratory arrest during sleep is observed, consult a physician to confirm whether obstructive sleep apnea is present.

Q. I have an uncomfortable itching sensation in my legs at night, which makes it difficult for me to fall asleep.

- A.** Menstruating women are prone to developing restless legs syndrome because of serum iron deficiency. During pregnancy, the consumption of serum iron is further increased, and with the addition of factors such as large hormonal fluctuations, folic acid deficiency, sleep deprivation, anxiety, stress, and fatigue, pregnant women become especially susceptible to the development of restless legs syndrome²¹. Stretching, lower-extremity massage, fomentation (hot or cold), use of body warmers,

moderate exercise, and walking can relieve symptoms²¹. Avoid the intake of stimulants (caffeine, alcohol, and nicotine) as much as possible, which aggravates the symptoms²¹. These symptoms tend to gradually improve after delivery. However, consult if sleep is still affected by leg discomfort after delivery.

Q. I have entered menopause, and my snoring has gotten worse.

- A.** Obstructive sleep apnea is relatively common in older men; however, women are more likely to develop obstructive sleep apnea after menopause²². Consult a physician if snoring is loud and frequent or if you observe cessation of breathing during sleep.

Q. Since I became pregnant, I have been experiencing leg cramps when I sleep at night. Is there a suitable way of addressing this issue?

- A.** Occurrence of leg cramps during sleep can cause sudden awakening and pain, making sleep difficult. The incidence of leg cramps increases as pregnancy progresses, with 70% of pregnant women experiencing them in the second trimester of pregnancy²¹. No effective treatment for leg cramps in pregnancy has been established right now. However, massaging, warming, or stretching the affected part can provide relief²¹. Consult a physician if symptoms do not improve.

Q. My son is in elementary school. He occasionally cries or talks in his sleep at night. Do I need to consult a doctor?

A. In most cases, abnormal behaviors during sleep in children disappear spontaneously with age; therefore, there is no need to worry too much. However, if sleep deprivation or irregularities in daily life occur, abnormal behaviors during sleep can increase. Thus, it is important to maintain sufficient sleep and a regular sleep-wake rhythm.

Q. Is there anything that I should consider when breastfeeding at night or when my baby is crying at night?

A. When a baby wakes up in the night, it may take longer for him/her to fall back to sleep if the room is brightly lit or the baby is held and rocked. Babies and children are more sensitive to light than adults²³⁾. Although there may be cases in which small children are afraid to sleep in total darkness, it is advisable to reduce the intensity of light in the bedroom²⁴⁾.

Q. Every month, I feel sleepy before menstruation. Are there any sleep problems that are unique to women?

A. The secretion of progesterone, a female hormone, increases immediately before menstruation, causing sleepiness. Thus, sleep is affected by fluctuations in female hormones during the menstrual cycle. In addition, sex hormones have a greater effect on sleep in women (during pregnancy and menopause) than in men.

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INFORMATION 6

Working Patterns (Shift Work) and Sleep Challenges

Points

- Shift work requires attention to health risks such as poor sleep.
- If insomnia, decreased sleep restfulness, or sleepiness at work persists and interferes with daily life, promptly seek medical attention.

1 Shift work that strains the circadian clock

- Modern society operates 24 hours a day, and shift work is essential to maintaining the convenient modern lifestyle. However, shift work puts a strain on the body because it forces workers to live against the biological function of their circadian clock. In addition, it has become clear that shift work carries various health risks.
- Therefore, some shift workers may not fully benefit from the measures

recommended in this guide.

- Here, we summarized the points to consider when shift workers use this guide. However, consult a medical professional if you are still experiencing problems, such as insomnia, decreased sleep restfulness, or sleepiness when awakening (at work), that interfere with your daily life.

2 Shift work and health risks

- Shift work refers to a work schedule in which the start and end times (work schedule) are not fixed, and the work schedule changes from day to day or period to period. Work schedules that have only one pattern from night to morning are not considered shift work. According to the Survey on the State of Employees' Health conducted by the Ministry of Health, Labour, and Welfare of Japan, 10–20 percent of Japanese workers are shift workers, with proportions being particularly high in the manufacturing industry⁽¹⁾. Shift work is associated with the onset of sleep-related symptoms, including insomnia⁽²⁾, sleepiness⁽³⁾, decreased sleep restfulness⁽⁴⁾, and decreased work efficiency⁽⁵⁾, all of which increase the risk of accidents and injuries⁽⁵⁾ during work and commuting.
- Shift workers have 1.06 times⁽⁶⁾ and 1.15 times⁽⁷⁾ higher risks of developing

metabolic syndrome and cardiovascular disease, respectively, compared to those not engaged in shift work. Furthermore, shift workers have an increased risk of developing malignant tumors such as breast⁽⁸⁾ and prostate⁽⁹⁾ cancers, depression⁽¹⁰⁾, and dementia^(11,12). A recent large-scale survey conducted in the UK indicated that shift work may be associated with a risk of developing dementia^(13,14). Further studies are needed to determine whether similar associations are observed in different racial and cultural groups. It is believed that various physical and mental disorders associated with shift work involve discrepancies between the sleep-wake rhythm regulated by the circadian clock and the actual sleep-wake schedule, sleep deprivation, stress, and other psychosocial factors⁽⁵⁾.

3 Points to note for shift workers

- Strategic napping and caffeine intake may alleviate sleepiness during shift work and improve work efficiency⁽⁵⁾.

Nap

- Napping during the night shift improves work efficiency^(15,16). A 20- to 50-minute nap starting between 12 am to 4 am has been reported to improve sleepiness, work efficiency, and fatigue⁽¹⁵⁾. However, a study conducted using a longer nap time of 60 minutes indicated that napping decreases work efficiency^(17,18). This may be because napping for too long deepens sleep and tends to produce strong sleepiness after awakening (sleep inertia).
- Napping after caffeine intake facilitates awakening after napping and prevents sleep inertia owing to the arousal effect of caffeine⁽¹⁹⁾. Several studies have demonstrated that napping during the night shift has minimal effect on sleep after the night shift⁽¹⁶⁾.
- Napping before the night shift can effectively reduce sleepiness and increase work efficiency during the night shift^(20,21). In addition, napping after the night shift may compensate for sleep deprivation, and increase alertness, and improve work efficiency on off-duty days⁽⁵⁾.
- Creating rest periods and providing quiet and comfortable places for rest should be considered so that workers can take appropriate naps during night shifts.

Caffeine

- Caffeine improves sleepiness and fatigue, and may be effective against sleepiness during night shifts⁽⁵⁾. On the other hand, excessive caffeine intake can have a negative influence on health and sleep⁽⁵⁾ (see "Sleep and intake of caffeine, alcohol, and nicotine").

Light shielding

- Light can regulate the circadian clock. In general, exposure to light in the morning advances the circadian clock (causing people to go to bed earlier and get up earlier), whereas exposure to light in the evening or later delays the circadian clock (causing people to go to bed later and get up later)⁽²²⁾ (see "Setting an Ideal Environment for Good Sleep"). Attempts have been made to adapt the circadian clock to shift work by intentionally exposing individuals to light or shielding them from light using sunglasses⁽²³⁾. However, in real world settings, the circadian clock can be adjusted (advanced or delayed) per day by only a few minutes to a few hours⁽⁵⁾. Therefore, using this method to adapt the circadian clock to shift work is difficult. In addition, this method should be applied with caution as it may have a negative impact on the daily routine the following day and beyond.
- For shift workers who work night shifts once or twice a week, it is possible to adjust the circadian clock to that of the day shift (to avoid any misalignment due to the night shift as much as possible) by getting sunlight

in the morning after the night shift, just as on the day shift²⁴⁾. In this case, it is advisable not to go to sleep immediately after the night shift but to sleep slightly longer than usual in the evening, and to wake up the next morning at the same time as the day shift. If possible, try to avoid strong lighting in

the workplace during the night shift²⁵⁾. However, for work schedules that include more frequent night shifts, these methods may lead to more severe sleep deprivation issues.

4 FAQs

Q. I have been working irregular night and day shifts for many years. Recently, I have been unable to sleep well and have become irritable. Are there measures to improve this?

A. It is becoming increasingly clear that shift work is a challenging condition for maintaining good sleep and overall health. However, shift workers can apply certain tips to maintain good sleep. For example, they can take adequate rest between the day and night shifts, take naps during the night shift, use caffeine to prevent sleepiness, and avoid intense lighting.

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5. Conclusions

This guide was established based on the scientific findings available as of 2023. At the time of its development, scientific evidence in Japan regarding the influence of remote work—widely adopted in many workplaces owing to lifestyle changes accompanying the spread of COVID-19—on sleep was considered insufficient. Consequently, it is impossible to provide reference information on this topic. Furthermore, it was not possible to provide reference information on objective sleep assessment methods utilizing ICT or on the effects of diversifying work styles on sleep. Going forward, it is desirable to continue verifying evidence on these topics and to periodically review this guide and add information based on the interim and final evaluations of “Health Japan 21 (the 3rd term),” and the accumulation of other scientific findings and changes in social structures.

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International Trends in Sleep Research

Sleep research is advancing globally and its findings are increasingly being utilized in international frameworks and national policies. The key international trends in the sleep field include the following:

● Healthy Sleep Project¹⁴ (United States)

A healthy sleep awareness project was conducted by the American Academy of Sleep Medicine (AASM), a U.S. sl society; the Centers for Disease Control and Prevention (CDC), a central U.S. agency for disease control and health promotion activities; and the Sleep Research Society (SRS), a society composed of U.S. sleep researchers.

With the long-term goal of promoting improved sleep in the United States, this project provides content on ensuring sufficient sleep, recommendations for shift workers, the relationship between sleep and stimulants, sleep disorders, etc. It aims to raise public awareness about sleep through ongoing outreach and educational activities.

● Promoting Sleep Health using Sleep Health Index¹⁵ (United States)

A sleep awareness project by the National Sleep Foundation (NSF), which provides expert information on health issues.

Using the Sleep Health Index (SHI), which comprehensively evaluates multiple subjective indicators of sleep duration, sleep quality, and sleep complaints, this project examines the associations between sleep-related environmental factors and sleep disorders. Efforts are underway to generate evidence to promote healthy sleep.

These efforts represent a shift from the previous single-indicator awareness model focused solely on sleep duration to a multi-indicator model that incorporates sleep disorders, alcohol consumption, caffeine intake, and other lifestyle habits. This is also related to the reference information outlined in this guide for ensuring good sleep.

¹⁴ Healthy Sleep Project <https://sleepeducation.org/get-involved/campaigns/>

¹⁵ Knutson KL, Phelan J, Paskow MJ, Roach A, Whiton K, Langer G, et al. The National Sleep Foundation's Sleep Health Index. *Sleep Health*. 2017;3(4):234-240.

Other Relevant Information

● About “e-Health Net (e-ヘルスネット)”

Public health information website for the general population in Japan. In conjunction with the implementation of specific health checkups and health guidance systems, it provides the public with accurate information based on scientific evidence to promote lifestyle improvements.

(URL)

<http://www.e-healthnet.mhlw.go.jp/>

● About “e-Health Promotion Net (e-健康づくりネット)”

Website providing health promotion information for health promotion personnel at local governments and other institutions. It introduces key points for health promotion, reference cases, learning materials, and support tools, with explanatory guides. Its purpose is to support the work and human resource development of those considering or implementing health promotion initiatives in local governments, companies, and organizations.

(URL)

<https://e-kennet.mhlw.go.jp/>

Member List of the "Review Committee on the Revision of Sleep Guideline for Health Promotion"

(Honorifics omitted; listed in Japanese alphabetical order)

○Naohisa Uchimura	President, Kurume University; Chairman, Japan Society of Sleep Research
Ayumi Ogami	President, Ogami Occupational Health Consulting Office
Toru Oga	Chief Professor, Department of Respiratory Medicine, Kawasaki Medical School
Akiko Ozaki	Professor, Department of Gerontological and Home Healthcare Nursing, Tohoku University Graduate School of Medicine
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Iwao Kurose	Permanent Member of the Council, Japan Medical Association
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Hirokazu Horikoshi	Member of the Council, Japan Pharmaceutical Association
Takuya Yoshiike	Chief, Department of Sleep-Wake Disorders, National Institute of Mental Health, National Center of Neurology and Psychiatry
Takahiro Yoshizaki	Associate Professor, Department of Food and Life Sciences, Faculty of Food and Nutritional Sciences, Toyo University

(○: Chair)

History of the "Review Committee on the Revision of Sleep Guideline for Health Promotion"

	Date	Topics
First Meeting	July 31, 2023	• Review of past initiatives related to sleep • Summary of the research team's findings for standard revision • Key issues for the revision
Second Meeting	October 2, 2023	• Revision of Sleep Guidelines (Draft) • Others
Third Meeting	December 21, 2023	• Summary of the Sleep Guide for Health Promotion 2023 (Draft) • Others