

The Science of Sleep #1

Life is short. _____ life is already short _____, we are unconscious for a _____, _____ a significant impact on the condition and well-being of the other two _____. Despite its importance, sleep _____ a mystery to many. For example, _____ a widely _____ the 90-minute sleep cycle. _____ that Non-rapid eye movement or non-REM sleep and REM sleep take _____ 90-minute cycle, so we should sleep _____ 90 minutes. However, the sleep cycle _____ fluctuates _____ of 60 to 110 minutes, _____ individual differences and daily conditions. Also, REM sleep and non-REM sleep are completely _____ the _____ conditions of the body and brain, _____ characteristics and functions are not _____ understood by the public. Sleep is _____ unknown. What happens to the body and brain _____ a _____? How will scientific knowledge on sleep _____ its quality and quantity?

Life is short. Though life is already short enough, we are unconscious for a third of it, which has a significant impact on the condition and well-being of the other two thirds. Despite its importance, sleep remains a mystery to many. For example, there is a widely accepted notion of the 90-minute sleep cycle. It says that Non-rapid eye movement or non-REM sleep and REM sleep take turns within every 90-minute cycle, so we should sleep for multiples of 90 minutes. However, the sleep cycle actually fluctuates within a range of 60 to 110 minutes, depending on individual differences and daily conditions. Also, REM sleep and non-REM sleep are completely different states in terms of the physiological conditions of the body and brain, and their characteristics and functions are not widely understood by the public. Sleep is essential yet unknown. What happens to the body and brain during a slumber? How will scientific knowledge on sleep help us optimize its quality and quantity?

unconscious	無意識の、意識がない	fluctuate	変動する、揺れ動く
despite	にも関わらず	physiological	生理学的な
notion	概念、考え	slumber	まどろみ
multiple	倍数	optimize	最適化する

The Science of Sleep #2

Majority of sleep researchers agree that the quality of sleep is most important, and _____ the regular _____ of the sleep cycles. In a healthy sleep, non-REM sleep and REM sleep _____ exclusively in this order _____ a 90-minute cycle, and we _____ this cycle 3 to 5 times a night. The overall _____ of non-REM and REM is about 3 to 1, but the _____ a cycle _____ the night. Non-REM sleep _____ the majority of the sleep cycle in the first _____ the night, _____ the ratio of REM sleep increases _____ . Non-REM sleep is _____ into 3 stages. Stages 1 and 2 are often called “light sleep”, and stage 3 is generally understood as "deep sleep.” Stage 1 is sort of a _____ wakefulness to deeper sleep, and _____ for less than 10 minutes. Stage 2 _____ important _____ refining our memory related to _____ skills, such as practicing sports, riding a bike, and playing a musical instrument. It is generally the _____, accounting for 50 to 60 percent of the entire sleep. In stage 3 or deep sleep, the brain _____ showing slow and powerful brain wave activity, and the body recovers its _____ function and _____ system. As we fall asleep, we quickly _____ stage 1 to stage 3 _____ stage 2. We stay in stage 3 for a while, undergo stage 2 _____, and finally reach REM sleep. _____, _____ is that this cycle _____ takes place. For example, _____ two individuals who get 7 hours of sleep. _____ sleeps 7 hours _____ in bed, _____ the other sleeps 5 hours in bed and 2 hours on the _____. Both of them have 7 hours of sleep _____, but the _____ case _____ in terms of the quality because the sleep cycle does not _____.

Majority of sleep researchers agree that the quality of sleep is most important, and it is a lot about the regular occurrence of the sleep cycles. In a healthy sleep, non-REM sleep and REM sleep occur exclusively in this order within a 90-minute cycle, and we repeat this cycle 3 to 5 times a night. The overall proportion of non-REM and REM is about 3 to 1, but the ratio within a cycle varies across the night. Non-REM sleep accounts for the majority of the sleep cycle in the first half of the night, while the ratio of REM sleep increases as it gets closer to dawn. Non-REM sleep is further subdivided into 3 stages. Stages 1 and 2 are often called “light sleep”, and stage 3 is generally understood as "deep sleep.” Stage 1 is sort of a transition period from wakefulness to deeper sleep, and it lasts for less than 10 minutes. Stage 2 plays an important role in refining our memory related to motor skills, such as practicing sports, riding a bike, and playing a musical instrument. It is generally the longest stage, accounting for 50 to 60 percent of the entire sleep. In stage 3 or deep sleep, the brain rests while showing slow and powerful brain wave activity, and the body recovers its immune function and cardiovascular system. As we fall asleep, we quickly move from stage 1 to stage 3 via stage 2. We stay in stage 3 for a while, undergo stage 2 again, and finally reach REM sleep. Again, what matters is that this cycle properly takes place. For example, consider two individuals who get 7 hours of sleep. One of them sleeps 7 hours straight in bed, while the other sleeps 5 hours in bed and 2 hours on the commuter train. Both of them have 7 hours of sleep in total, but the latter case falls far short in terms of the quality because the sleep cycle does not properly occur.

occurrence	発生	transition	移り変わり
exclusively	～に限って、独占的に	refine	洗練させる、精錬する
proportion	比率、割合	motor skill	運動技能
ratio	比率	immune	免疫に関する
vary	変化する、違う	cardiovascular	心血管系の、循環器系の
account for	占める	undergo	経験する
dawn	夜明け	commuter	通勤者
subdivide	さらに分ける細分化する	fall short	達しない、及ばない

The Science of Sleep #3

During Japan's Heian Period, people believed that seeing someone in their dreams _____ the person was _____ them. In modern days, Sigmund Freud and other psychologists _____ dreams as _____ for psychological analysis, _____ that dreams _____ our deepest wishes, _____ non-scientific. Dreams have _____ been a mystery for humanity, _____ for sleep scientists in the last several decades. Most of the dreams we remember in the morning are _____ during REM sleep, and REM sleep itself is also a mystery. _____ we are asleep, our brainwaves _____ active as or _____ we are awake, _____ often impossible to _____ REM sleep _____ wakefulness _____ just _____ brainwave activity. What are the functions of REM sleep? Why do we have dreams? First, REM sleep _____ emotional recovery. When we have a _____ experience _____ the day, REM sleep takes the emotional sharp _____ off those difficult memory so that we find them less emotionally intense the next morning. REM sleep also boosts our creativity. During REM sleep, our brain organizes and _____ information and knowledge _____ memory. _____ that the brain is _____ every _____ of ideas and experiences: _____ we never think _____ during _____ and _____ wakefulness. We often _____ a solution for a _____ difficult problem, probably because REM sleep _____ a wide variety of possibilities. REM sleep plays these important _____ mental health and creativity, and dreams may have something to do _____ functions. Dreams are often _____ and _____ because REM sleep is the session for psychological recovery and _____ - _____ brainstorming. Do dreams have some significant _____? Or are they _____ by-products of REM sleep, just like the _____? _____, we haven't found a clear answer. Sleep _____ and _____ are still working to _____ the mystery of dreams.

During Japan's Heian Period, people believed that seeing someone in their dreams indicated the person was secretly in love with them. In modern days, Sigmund Freud and other psychologists regarded dreams as targets for psychological analysis, assuming that dreams reflect our deepest wishes, which turned out to be non-scientific. Dreams have long been a mystery for humanity, so have been for sleep scientists in the last several decades. Most of the dreams we remember in the morning are seen during REM sleep, and REM sleep itself is also a mystery. Even though we are asleep, our brainwaves are as active as or more than when we are awake, so it is often impossible to distinguish REM sleep from wakefulness measuring just electrical brainwave activity. What are the functions of REM sleep? Why do we have dreams? First, REM sleep offers us emotional recovery. When we have a distressing experience during the day, REM sleep takes the emotional sharp edges off those difficult memory so that we find them less emotionally intense the next morning. REM sleep also boosts our creativity. During REM sleep, our brain organizes and combines distantly related information and knowledge in our memory. It seems that the brain is trying every possible combination of ideas and experiences: combinations we never think of during rational and obstinate wakefulness. We often wake up with a solution for a previously difficult problem, probably because REM sleep figured it out from a wide variety of possibilities. REM sleep plays these important roles for our mental health and creativity, and dreams may have something to do with those functions. Dreams are often emotional and bizarre because REM sleep is the session for psychological recovery and mold-breaking brainstorming. Do dreams have some significant role in themselves? Or are they merely by-products of REM sleep, just like the heat from a lightbulb? Up till now, we haven't found a clear answer. Sleep researchers and neuroscientists are still working to resolve the mystery of dreams.

assume	仮定する、決めてかかる	obstinate	頑固な
distinguish	識別する	bizarre	奇妙な
intense	強烈な	mold-breaking	型破りな
combine	組み合わせる	by-product	副産物
rational	合理的な、理性的な	obstinate	頑固な

The Science of Sleep #4

One of the most popular questions on sleep is _____ morning types and evening types. Generally speaking, morning types are _____, _____ evening types are often _____ lazy. For example, you _____ seen an article introducing a successful _____ who gets up early everyday. _____, studying or working before sunrise _____ and _____. However, _____ such impressions, what does science _____ say? Is an early _____ actually _____? To _____, one's sleeping _____, also known as chronotype, is mostly _____ by _____. For example, if you are an evening person, it is _____ that _____ of your parents is an evening type. What time we feel _____ or _____ is _____. If you are an evening type, your body and brain will not be able to function well in the early morning, _____ you try. _____ speaking, morning types, evening types, and _____ between each account for one-third of the population. The reason for this division _____ the hunter-gatherer era. In order to increase their _____ rate, humans evolved so that each one has a _____ of their lives _____ the same community. A community _____ people with different chronotypes is unlikely to face the most _____ situation, _____ everyone in the community _____ asleep. Genetics divides people into _____ chronotypes, _____ only a _____ of diligence or _____. _____, praise for early birds is _____ the logic. If morning types are more likely to be successful, it is probably because they can focus on their most important work in time _____ refreshed and _____ by _____ and meetings. Being a morning type is not the _____ of their success. What is important is to find a sleeping _____ you.

One of the most popular questions on sleep is about morning types and evening types. Generally speaking, morning types are praised, while evening types are often labeled as lazy. For example, you must have seen an article introducing a successful executive who gets up early everyday. Seemingly, studying or working before sunrise appears diligent and admirable. However, putting aside such impressions, what does science exactly say? Is an early bird actually praiseworthy? To put it simply, one's sleeping pattern, also known as chronotype, is mostly determined by genetics. For example, if you are an evening person, it is likely that one or both of your parents is an evening type. What time we feel drowsy or energized is fixed primarily by birth. If you are an evening type, your body and brain will not be able to function well in the early morning, no matter how hard you try. Roughly speaking, morning types, evening types, and those in between each account for one-third of the population. The reason for this division lies in the hunter-gatherer era. In order to increase their survival rate, humans evolved so that each one has a different rhythm of their lives within the same community. A community composed of people with different chronotypes is unlikely to face the most vulnerable situation, where everyone in the community falls asleep. Genetics divides people into different chronotypes, so it is not only a matter of diligence or discipline. First of all, praise for early birds is oversimplifying the logic. If morning types are more likely to be successful, it is probably because they can focus on their most important work in time when they are refreshed and uninterrupted by calls and meetings. Being a morning type is not the direct cause of their success. What is important is to find a sleeping habit that fits you.

label	レッテルを貼る	determine	左右する、規定する
executive	経営幹部	genetics	遺伝学、遺伝的特徴
seemingly	一見すると	drowsy	眠たい、うとうとする
diligent	勤勉な、熱心な	vulnerable	もろい、脆弱な
early bird	早起きの人（くだけて）	discipline	自己管理
praiseworthy	称賛に値する	oversimplify	過度に単純化する

The Science of Sleep #5

_____ have a good night of sleep, what can we do? First and _____, we need to _____ a _____ sleeping habit: going to bed and getting up at the same time everyday, _____ weekdays or weekends. Most living creatures, including Homo sapiens, have an _____ 24-hour clock, _____ a circadian _____, and _____ sleeping habits _____ biorhythm. If you wake up 3 hours _____ weekends _____ weekdays, it is _____ having 3 hours of _____ every week. Sometimes we have to _____ or get up earlier than usual. In this case, it's better to _____ the usual bedtime or wake-up time, rather than _____ the _____ sleep time. Second, _____ your phone before bedtime. _____ blue light but also the _____ and _____ from social media can _____ your sleep. Thirdly, we need to _____ the time we drink alcohol and _____. You might be under the impression that alcohol _____ you have a _____ sleep. In fact, alcohol _____ the _____ sleep, _____ negatively affects the quality of sleep. Your sleep becomes _____ awakenings, _____ we don't usually remember. Alcohol also _____ REM sleep, especially _____ the _____ of the night. You should avoid drinking at least 3 hours before bedtime. Caffeine also has a huge impact on our sleep. _____ five to seven hours to remove caffeine in your body by half, and a half is still powerful. The _____ coffee should be taken _____ before 3 p.m. There are also things proven to _____ the quality of sleep, such as _____, _____ during the day, and taking a _____ 90 minutes before bedtime. Good sleep is the greatest _____ for your tomorrow self. It's _____ making every effort to _____.

In order to have a good night of sleep, what can we do? First and foremost, we need to establish a regular sleeping habit: going to bed and getting up at the same time everyday, whether on weekdays or weekends. Most living creatures, including Homo sapiens, have an internal 24-hour clock, known as a circadian rhythm, and irregular sleeping habits significantly distract this biorhythm. If you wake up 3 hours later on weekends than on weekdays, it is virtually equal to having 3 hours of jet lag every week. Sometimes we have to stay up late or get up earlier than usual. In this case, it's better to maintain either the usual bedtime or wake-up time, rather than shifting the entire sleep time. Second, stay away from your phone before bedtime. Not only blue light but also the stimulation and excitement from social media can disrupt your sleep. Thirdly, we need to take care of the time we drink alcohol and caffeinated beverages. You might be under the impression that alcohol helps you have a sound sleep. In fact, alcohol facilitates the onset of sleep, but it negatively affects the quality of sleep. Your sleep becomes fragmented with brief awakenings, which we don't usually remember. Alcohol also suppresses REM sleep, especially during the latter half of the night. You should avoid drinking at least 3 hours before bedtime. Caffeine also has a huge impact on our sleep. It takes five to seven hours to remove caffeine in your body by half, and a half is still powerful. The last cup of coffee should be taken preferably before 3 p.m. There are also things proven to enhance the quality of sleep, such as mindfulness meditation, moderate exercise during the day, and taking a bath 90 minutes before bedtime. Good sleep is the greatest gift for your tomorrow self. It's worth making every effort to ensure it.

foremost	まず第一に	facilitate	円滑にする
distract	散らす、紛らわす	fragment	粉々にする
virtually	実質的に、ほぼ	suppress	抑える
jet lag	時差ボケ	preferably	できれば、なるべく
disrupt	混乱させる	meditation	瞑想
sound (adj)	ぐっすりとした	moderate	適度な、中くらいの