Why We Sleep: Book Summary(+PDF)

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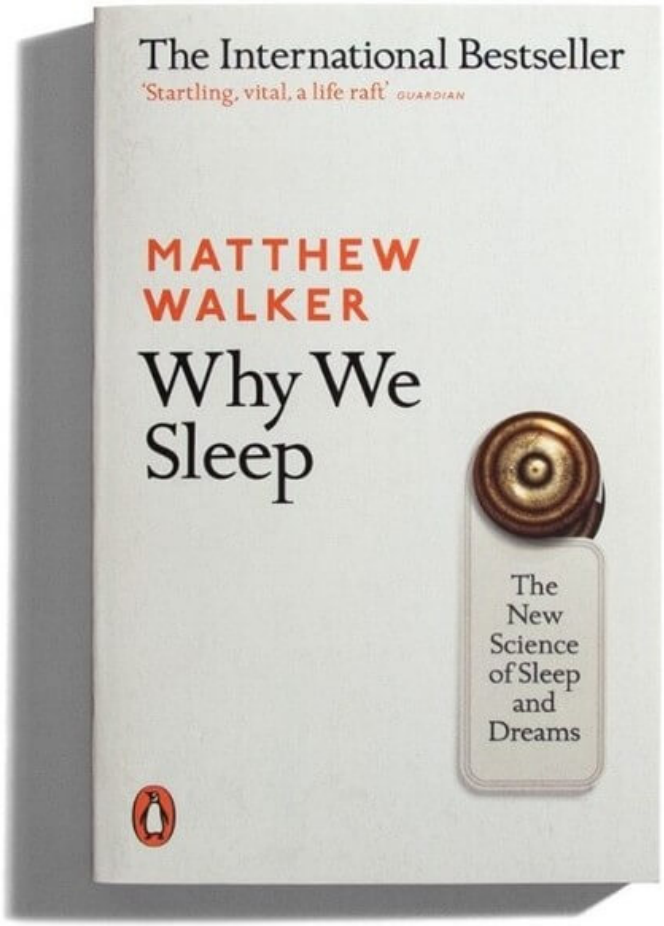
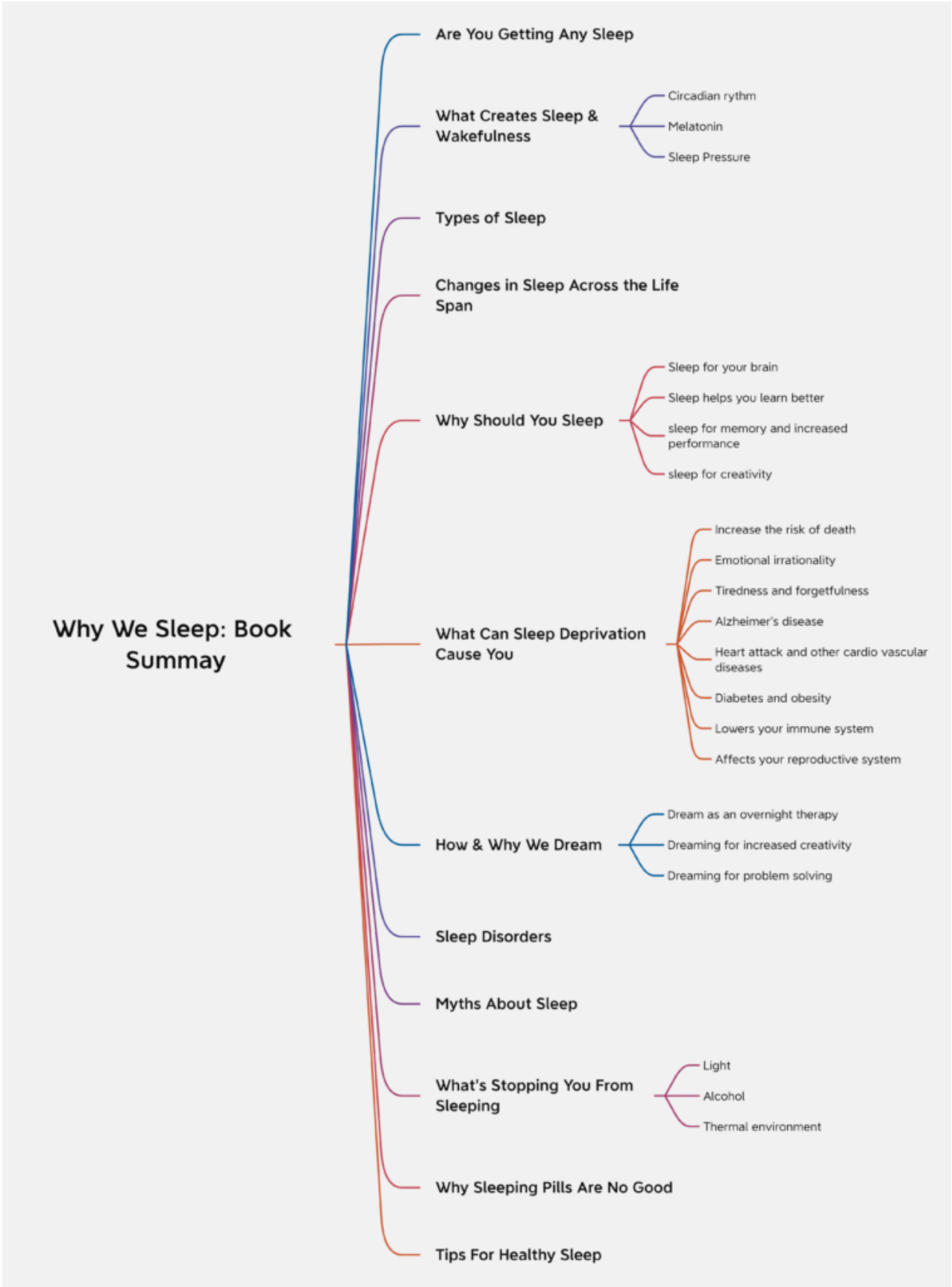
Prakash Joshi Pax August 8, 2021



The three basic drives in life are to eat, drink, and reproduce. Yet, the fourth biological drive across the entire animal kingdom is the drive to sleep.

This book reveals the truth about sleep: why it is infinitely more complex, profoundly more interesting, and alarmingly more health-relevant. Every scientific research has proved time and again that it is the single most effective thing we can do to reset our brain and body health each day.



Are You Getting Enough Sleep

How many hours of sleep did you get last night? If you didn't wake up feeling refreshed and fresh, you may have deprived yourself of sleep. If you feel as though you could fall asleep easily mid-morning, you are very likely not getting enough sleep or the quality of

your sleep is insufficient.

If you didn't set an alarm clock, would you sleep past that time? If so, you need more sleep than you are giving yourself. Do you find yourself at your computer screen reading and then rereading (and perhaps rereading again) the same sentence? This is often a sign of a fatigued, under-slept brain.

Do you sometimes forget what color the last few traffic lights were while driving? Simple distraction is often the cause, but a lack of sleep is very much another culprit.

Why Sleep?

Routinely sleeping less than six or seven hours a night demolishes your immune system, more than doubling your risk of cancer. Insufficient sleep is a key lifestyle factor determining whether or not you will develop Alzheimer's disease. Inadequate sleep—even moderate reductions for just one week—disrupts blood sugar levels so profoundly that you would be classified as pre-diabetic.

Short sleeping increases the likelihood of your coronary arteries becoming blocked and brittle, setting you on a path toward cardiovascular disease, stroke, and congestive heart failure.

The shorter the sleep, the shorter your life span. And if fact, human beings are the only species that will deliberately deprive themselves of sleep without any gain.

What Creates Sleep and Wakefulness

There are mainly two factors that determine when you want to sleep and when you want to be awake. The first factor is the internal twenty-four-hour clock located deep within your brain. And, the second one is a chemical substance that builds up in your brain and creates 'sleep pressure'. The longer you are awake, the more sleep pressure builds up in your brain increasing your drive to sleep more.

Circadian Rythm

Two researchers did a groundbreaking discovery by experimenting with themselves for 32 days in a dark cave. We sleep in a predictable and repeating pattern of prolonged wakefulness, paired with consolidated bouts of about nine hours of sleep. This is called the circadian rhythm.

The brain uses daylight for this resetting purpose since it is the most reliable signal that we have in our surroundings. But, daylight isn't the only signal that the brain depends upon for the purpose of biological clock resetting. Other reliable factors the brain depends on for the purpose of resetting your brain are cues such as food, exercise, temperature fluctuation, and even regularly timed social interaction.

All of these factors have the ability to reset the biological clock. And even though, all human beings display the same twenty-four-hour pattern, they have strikingly different rhythms. So, my rhythm is not your rhythm and your rhythm is not my rhythm.

For some people, the peak of wakefulness arrives in the early morning hours, while for others, it arrives early at night. Around 40% of the population are 'morning types', 30% are 'evening types', and the remaining 30% lie somewhere between morning and evening types.

Melatonin

Melatonin is a hormone produced by the body at night. The rise in melatonin starts soon after dusk, being released into the bloodstream from the pineal gland. But melatonin has a little effect on sleep generation contrary to what most people believe.

It starts rising soon after dusk and reaches its peak around 4 a.m. and thereafter beginning to drop as the dawn approaches.

Sleep Pressure

Sleep pressure is the second factor responsible for determining your sleep and wakefulness. There is a chemical in your brain called adenosine. It starts to increase in concentration with every waking minute that elapses. So, the longer you are awake, the more adenosine will accumulate. As a result, the desire to sleep increases. This is known as sleep pressure.

The signal of adenosine can be artificially muted by caffeine, the chemical that helps you feel more alert and awake. Caffeine is the second most traded commodity on the planet, after oil. Caffeine works by battling with adenosine receptors in the brain acting as a masking agent.

Types of Sleep

We don't just sleep. We cycle through two completely different types of sleep. Ther are REM sleep and NREM sleep, Rapid Eye Movement, and Non-Rapid Eye Movement.

REM sleep is the sleep in which brain activity is almost identical to that when we are awake, connected to the experience which we call dreaming, and is often described as dream sleep.

NREM sleep on the other hand has 4 stages, stages 3 and 4 being the deepest stages you experience.

During sleep, NREM and REM sleep plays out in a recurring battle. The battle between the two is lost and won every ninety minutes. While it is true that we go back and forth between NREM and REM sleep throughout the night every ninety minutes, the ratio of NREM sleep to REM sleep within each ninety-minute cycle changes dramatically across the night.

In the first half of the night, the vast majority of our ninety-minute cycles are consumed by deep NREM sleep and very little REM sleep. But as we transition through into the second half of the night, this see-saw balance shifts, with most of the time dominated by REM sleep, with little, if any, deep NREM sleep.

Changes in Sleep Across the Life Span

Sleep Before Birth

Prior to birth, a human infant will spend almost all of its time in a sleep-like state, much of which resembles the REM-sleep state. Any co-occurring arm flicks and leg bops that the mother feels from her baby are most likely to be the consequence of random bursts of brain activity that typify REM sleep.

Adults do not—or at least should not—throw out similar nighttime kicks and movements, since they are held back by the body-paralyzing mechanism of REM sleep. But in utero, the immature fetus's brain has yet to construct the REM-sleep muscle-inhibiting system adults have in place.

At this stage of in utero development, most of the time is spent in sleep. The twenty-four-hour period contains a mishmash of approximately six hours of NREM sleep, six hours of REM sleep, and twelve hours of an intermediary sleep state that we cannot confidently say is REM or NREM sleep, but certainly is not full wakefulness.

Even though total sleep time decreases in the last trimester, a paradoxical and quite ballistic increase in REM-sleep time occurs. In the last two weeks of pregnancy, the fetus will ramp up its consumption of REM sleep to almost nine hours a day. In the last week before birth, the REM-sleep amount hits a lifetime high of twelve hours a day.

Childhood Sleep

In contrast to monophasic sleep in adults, children sleep in polyphasic sleep of many short snippets of sleep. And, the older the child gets, the fewer, long, and more stable their sleep becomes.

Sleep in Adolescence

We see a decline in REM-sleep intensity in the first year of life, yet an exponential rise in deep NREM sleep intensity in mid-and late childhood, hitting a peak just before puberty and then damping back down.

Why Should You Sleep

Due to a lack of public education, most people don't realize how remarkable a panacea sleep truly is. Like Shakespeare said, "sleep is the chief nourisher in life's feast", the benefits of sleep are vast ranging from healing emotional wounds, helping you learn and

remember, provide solutions to your problems, preventing sickness and infections, and many more

Sleep for your brain

Sleep is not just the absence of wakefulness. It is much more complex and metabolically active than you think it is. Numerous functions of the brain are restored by and depend on sleep. All types of sleep that we mentioned earlier have their own importance. Thus, no one type of sleep is more important than the other. Sleep deprivation will not only reduce your performance but also will cause brain impairment.

Sleep helps you learn better

Sleep refreshes your ability to initially make new memories. While we are awake, our brain is constantly absorbing new information. The more you are awake throughout the day, the worse you become at learning and concentration. That's why trying to learn something at the end of the day is harder than it is in the morning.

Sleep is important also in protecting newly acquired information, providing immunity against forgetting. Memories move from the temporary storage of your brain to the permanent store after a good night's sleep. Early night sleep which is richer in deep NREM sleep provides superior memory retention relative to late-night REM-rich sleep.

Sleep for Memory and Increased Performance

Sleep strengthens things we have previously learned. There's a saying practice makes perfect but that's only a part of the equation. Practice doesn't make perfect. It is the practice followed by a night of sleep, that leads to perfection.

If you remember trying to learn something new, you might have noticed that even after trying a lot, you'll not be able to do it well the same day. But, after a good night's sleep, you'll see your performance increasing to a great extent.

This happens because your brain works hard during the night to transfer important information from your short-term memory to long-term memory. This makes it easy for you to operate below the level of your consciousness the next day when you wake up.

Sleep for Creativity

An increase in creativity is another huge benefit of quality sleep. Sleep helps your brain make new connections between the vast store of information in ways your brain would never attempt. The sleeping brain fuses together different information and helps to foster problem-solving abilities.

All of this happens during the dream stage which occurs in the late night also known as REM sleep.

How can Sleep Deprivation affect you?

Sleep deprivation increases the risk of death

If you deprive yourself of the required amount of 7–9 hours of daily sleep, there are many ways it might kill you. Even a small dose of sleep deprivation may cause a loss in your concentration. The most deadly consequences of these concentration failures are found in drowsy driving.

In the most developed nations, car crashes rank among the leading causes of death. There are two main reasons for drowsy driving: the first one is people completely falling asleep at the wheel and the second one is a momentary loss in concentration. And when you are driving at a speed of 30mile/hr, a second of blink is enough to cause an accident.

> *Get behind the wheel of a car when having slept just four hours or less the night before and you are 11.5 times more likely to be involved in a car accident.*

Sleep deprivation causes emotional irrationality

You might as well notice this in yourself or your surroundings too. When you don't receive a good sleep the night before, there are frequent swings in your moods. Inadequate sleep plays havoc with our emotions. Sleep deprivation leads to emotional reactivity. It has also been linked to aggression, bullying, and other behavioral problems.

Sleep deprivation causes tiredness and forgetfulness

An experiment showed that there was a 40% deficit in the ability of a sleep-deprived group to cram new facts into the brain relative to the group that obtained a full night of sleep. The process that forms blocks of memories within your brain is stunted by the state of sleep loss.

And, sleep also doesn't work like the bank. You cannot accumulate debt and hope to pay it off at a late point in time. Sleep for memory consolidation is an all-or-nothing event.

Sleep and Alzheimer's Disease

Dementia and cancer are the most feared diseases in the developed nations. And they both are related to inadequate sleep. Now, one in every ten adults over the age of sixty-five suffers from Alzheimer's disease. The sleep quality of deep NREM sleep deteriorates as we age which is also linked to a decline in memory.

Alzheimer's disease is associated with the buildup of a toxic form of a protein called beta-amyloid, which aggregates in sticky clumps, or plaques, within the brain. The more amyloid deposits there were in the middle regions of the frontal lobe, the more impaired the deep-sleep quality was in that older individual.

Inadequate sleep and the pathology of Alzheimer's disease interact in a vicious cycle. Although sleep alone is not the magic bullet that eradicates dementia prioritizing sleep across the life span is clearly becoming a significant factor for lowering Alzheimer's disease risk.

Sleep deprivation shortens your life

The shorter you sleep, the shorter will be your life. When you sleep deprive yourself, every organ in your body suffers. The leading causes of death in the developed nations such as cancer, obesity, diabetes, and heart attack are all linked to the lack of sleep. Here's how it is linked with all the major diseases of the developed nations:

Sleep loss and cardiovascular diseases(heart attack):

Research shows that people who sleep six hours or less are 400 to 500 % more likely to suffer one or more cardiac arrests than those sleeping seven or more hours. Sleeping for just 5–6 hours each night, you are more likely to suffer coronary arteries over the next five years relative to those individuals who sleep 7–8 hours.

Sleep deprivation also shuts off the growth hormone of your body, which heals your body. At the same time, it increases the level of the stress hormone, called cortisol in your body which causes more severe consequences in your body.

Sleep loss and metabolism(diabetes and weight gain):

The more you sleep deprive yourself, the more you are likely to eat. And as a result of overeating, you invite more problems for your body. Chronic sleep deprivation is now recognized as one of the major contributors to the escalation of type 2 diabetes throughout first-world countries.

Insufficient sleep will also prevent the meaningful absorption of all food nutrients and cause gastrointestinal problems. Plentiful sleep is what makes your gut happier.

Sleep loss and reproductive system:

Sleep deprivation also affects your reproductive system. Routinely sleeping less than six hours a night results in a 20 percent drop in follicular-releasing hormone in women—a critical female reproductive element that peaks just prior to ovulation and is necessary for conception. In males, it is related to less release of testosterone hormone.

A study found that women with irregular work schedules or especially night shifts had a 33% higher rate of abnormal menstrual cycles than those working regular hours.

Sleep deprivation also losses the nature of physical attractiveness.

Sleep loss and Immune system

If you have ever been caught with the flu, you'll have noticed that you just want to curl up in bed and sleep. And it's exactly what you should do. There is a bidirectional relationship between your sleep and your immune system.

In research done by sleep scientists, the infection rate in people who slept only 5 hours was 50% as compared to the 18% rate in people who slept 7–8 hours. A study demonstrated that a single night's of four-hour sleep such as going to bed at 3 a.m and waking up at seven a.m. swept away 70% of the natural killer cells circulating in the body, relative to a full eight-hour night of sleep.

Another study of 25,000 individuals showed a 40% increased risk of developing cancer in those who slept 6 hours or less compared to those sleeping seven hours a night or more. Not getting enough sleep every night will lower down the disease-fighting system of your body.

Sleep loss, genes, and DNA

Along with all the risks that sleep deprivation causes, it also erodes your biological life i.e. the genetic code. Thousands of genes within the brain and body depend upon consistent and sufficient sleep for their stable regulation.

Scientists observed that by depriving a mouse of sleep for just a day, the activity of these genes drops by over 200 %. Also, the research found that two individuals who are of the same chronological age would not appear to be of the same biological age if one was routinely sleeping five hours a night while the other was sleeping seven hours a night. The latter would appear 'younger', while the former would have aged way beyond their calendar years.

How and Why we dream

If you were to experience the symptoms of a dream when you are awake, you'd probably have to seek immediate psychological treatment.

You dream primarily during the REM sleep stage. But it's not the only stage you dream of during sleep. You technically dream in all stages of sleep. However, sleep researchers limit the definition of true dreaming to that which occurs in REM Sleep.

When you are in REM sleep and begin to dream, there is a sharp increase in brain activity. The emotional regions of the brain are up to 30% more active in REM sleep as compared to when we are awake. Here are some reasons why Dreaming is Important

Dreaming as overnight therapy

There is an ancient wisdom that says, " Time heals wounds". But sleep scientists have found that it's not time that heals wounds, It's when you being to dream in the REM sleep Stage that offers emotional resolution when you wake up the next morning. There are two critical functions of REM-sleep dreaming

- Sleeping to remember the valuable details and experiences
- Sleeping to forget the visceral and painful emotional experience

If you go back in your past and think of recall some of the strongest memories, you will notice that almost all of these memories will be of some emotional nature. But as you recall these memories, you will not be accompanied by the same degree of emotion that was present in the past. This is one of the major functions of the REM dream sleep stage, to help you heal your emotional wounds.

Dreaming for increased productivity

Deep NREM sleep strengthens your memory while REM sleep offers increased creativity. During this stage, you build connections between two distantly related informational elements that are not obvious when you are awake. REM sleep helps to make better connections between different individual facts and grasp them better.

Dreaming for problem-solving

It is often said that if you can't solve a problem 'sleep on it'.

> "A problem difficult at night is resolved in the morning after the committee of sleep has worked on it."—John Steinbec

Scientists conducted a study and found that the participants who reported dreaming showed almost ten times more improvement in their task performance upon waking than those who sleep just as much but didn't dream.

Sleep Disorders and Death Caused by No Sleep

Somnambulism:

It is some form of movement when you are asleep. It includes conditions like sleepwalking, sleep talking, sleep eating, sleep texing, sleep sex, and very rarely sleep homicide. Although sleepwalking doesn't require intervention, if the condition is compromising or possesses risk, there are effective treatments that can help.

Insomnia

Being sleep-deprived is not insomnia. Unable to fall asleep is. It is suffering from inadequate opportunity to sleep despite the adequate opportunity to get sleep. These people can't produce sufficient sleep quality of quantity even if they give themselves time to do so.

Difficulty falling asleep, waking up in the middle of the night, waking up too early in the morning, difficulty falling back to sleep after waking up, and feeling unrefreshed throughout the waking day, if any of these symptoms seem familiar to you, you should seek help from a sleep medicine doctor instead of a GP.

Narcolepsy

Narcolepsy is a neurological disorder, with its origin within the central nervous system. Excessive daytime sleepiness, sleep paralysis, and cataplexy are the major symptoms of narcolepsy.

Fatal Familial Insomnia

It is a disorder that makes the patients unable to sleep, sometimes completely void of sleep. A lack of sleep will kill a human being. Every patient diagnosed with FFI has died within ten months, some even more sooner.

Some Sleep Myths

Do you need 6.5 hours of sleep only?

Well-respected media outlets touted the findings as proof that human beings do not, after all, need a full eight hours of sleep, some suggesting we can survive just fine on six hours or less.

We know that many individuals in the modern world only give themselves 5 to 6.5 hours of sleep opportunity, which normally means they will only obtain around 4.5 to 6 hours of actual sleep.

The average life span of these hunter-gatherers is just fifty-eight years, even though they are far more physically active than we are, rarely obese, and are not plagued by the assault of processed foods that erode our health.

Any adult sleeping on average of 6.75 hours a night would be predicted to live only into their early sixties.

Is sleeping more than 9 hours too much?

The relation between sleep and death risk is not linear. There is an increase in death risk once the average sleep amount passes nine hours resulting in a tilted backward J Shape.

Although no biological mechanism shows sleep to be in any way harmful has been discovered. But this doesn't mean you should sleep sixteen to eighteen hours.

Anything done to the extreme is not good. There should be an adequate balance between sleep and wakefulness. In humans, it should be around sixteen hours of wakefulness and eight hours of sleep, for an adult.

What's Stopping you from sleeping?

Light

Light is one of the most powerful inventions of modern society but it also has its own disadvantages. The electric light put an end to the natural order of things. It deceives your brain to believe that the night is still day. The situation worsened when blue lights were invented.

Blue light has twice as harmful effect on melatonin suppression as light from incandescent bulbs. And even more, we are continuously staring at led-powered screens a few inches away from our retina.

Using LED devices at night impacts our natural sleep rhythms, the quality of our sleep, and how alert we feel during the day.

Alcohol

Some people might argue over alcohol helping them put to sleep. But the truth however is that alcohol just sedates you out of wakefulness. It is also known to be one of the most powerful suppressors of REM sleep.

When you drink alcohol, you'll also wash away much of what you have learned as a result of blocking your REM sleep.

Thermal Environment

It is one of the most underappreciated factors determining the ease with which you will fall asleep tonight. It is always easy to fall asleep in a room that is too cold than too hot. The cold temperature of the environment drags your body to the correct temperature required for sleep.

Sleeping Pills Might be Hurting You

Sleeping pills do not provide natural sleep, can damage health, and increase the risk of life-threatening diseases. Scientists found that people who were taking sleeping pills had no different sleep patterns than the ones who weren't taking. The only difference the sleeping pill made was shortening the time it took them to sleep.

Also, sleeping pills don't provide the same restorative immune benefits as natural sleep rather they deteriorated health. Instead of taking pills, here's what you can do to help you get better sleep:

- Establish a regular bedtime and wake-up time
- Go to bed only when sleepy and avoid sleeping on the couch early/mid-evenings
- Never lie awake in bed for a significant time period; rather, get out of bed and do something quiet and relaxing until the urge to sleep returns
- Avoid daytime napping if you are having difficulty sleeping at night

Tips For Healthy Sleep

- Stick to a sleep schedule. Go to bed and wake up at the same time even if you have to use alarm clocks.
- Don't exercise too late in the day. Don't exercise two or three hours before bed.
- Avoid caffeine and nicotine 8 hours prior to bed.
- Don't take naps after 3 p.m. They can make it harder to fall asleep at night.
- Relax before bed. Don't overschedule your day so that no time is left for unwinding.
- Make your bedroom dark, cool and gadget-free
- Try to get natural sunlight at least for 30 minutes every day.
- Don't lie in bed awake. If you find yourself problem falling asleep, get up and do something relaxing until you feel sleepy.